Expanded Project Notification Form
Submitted Pursuant to Article 80 of the Boston Zoning Code

Barry's Corner Residential and Retail Commons Project

Submitted to:
BOSTON REDEVELOPMENT AUTHORITY
One City Hall Square
Boston, MA 02201

Submitted by:
SAMUELS & ASSOCIATES
333 Newbury Street
Boston, MA 02115

HARVARD UNIVERSITY
Holyoke Center
1350 Massachusetts Avenue
Cambridge, MA 02138

December 14, 2012

SAMUELS & ASSOCIATES

HARVARD UNIVERSITY

Expanded Project Notification Form

Submitted Pursuant to Article 80 of the Boston Zoning Code

Barry's Corner Residential and Retail Commons Project

Submitted to:

Boston Redevelopment Authority

Submitted by:

Samuels & Associates

Harvard University

In conjunction with:

Epsilon Associates Inc.
Elkus Manfredi Architects
Goulston & Storrs
CDM Smith Inc.
McPhail Associates, Inc.
McNamara/Salvia, Inc.
Rowan Williams Davies & Irwin Inc.
The Green Engineer, LLP
Vanasse Hangen Brustin Inc.

December 14, 2012

Table of Contents

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

LIST OF APPENDICES

List of Figures

List of Figures (Continued)

List of Tables

Executive Summary

EXECUTIVE SUMMARY

ES.1 Background and Project Description

This Expanded Project Notification Form (PNF) is being submitted to start the formal public review of the Barry's Corner Residential and Retail Commons project (the "Project"). The Project—being proposed by Barry's Corner Property LLC (a Samuels & Associates Entity) and Harvard University[1]—is a critical step in realizing the vision for and creating a new, vibrant, pedestrian-friendly destination in the North Allston neighborhood.

Harvard, the City of Boston, and the Allston community have worked together to develop a vision to transform the underutilized Barry's Corner area into a center of community and university life. Consistent with past planning, this vision sees the transformation of this underutilized area into an active and animated crossroads where the University and neighborhood meet and mix. In June 2012, the University, with input from members of the Allston community, selected the Boston-based Samuels & Associates to design and develop the Barry's Corner Residential and Retail Commons project. The Project will serve as a catalyst in what is envisioned for Harvard's development of research, academic, athletic, and office and retail development activity that will cluster around, and grow to define, Barry's Corner.

ES.1.1 Building Program

The Project entails the redevelopment of a 2.67 acre site located at the intersection of North Harvard Street and Western Avenue in Allston to be ground-leased to Samuels & Associates. It includes the construction of an approximately350,000 square foot building consisting of:

- approximately 325 rental residential units;
- approximately 45,000 square feet of ground floor retail space and residential amenities; and
- approximately 180 below-grade parking spaces and 41 new on-street parking spaces within the Project site.

The overall Project site is 2.67 acres and consists of two areas: (i) the 2.03 acre development site that contains the proposed buildings and will be created by subdivision and subsequently ground-leased by Harvard to Barry's Corner Property LLC; and (ii) the 0.64 acre area along the westerly and northerly borders of the development site, on which will be located two new privately-owned and maintained publicly-accessible streets.

[1] The Project will be owned and managed by Samuels & Associates. Harvard is a Co-proponent in order to assure clarity and certainty in responsibility for fulfilling community benefit commitments made to the City and neighborhood in connection with the Project.

Barry's Corner is poised to become a community, social, and academic hub within the North Allston neighborhood, providing a concentration of retail in a mixed-use setting that will incorporate meaningful gathering spaces for community residents.

Key to the vision for North Allston is the creation of a walkable, neighborhood-oriented, mixed-use environment at Barry's Corner. This new commons will include publicly accessible open spaces, wide sidewalks with trees and outdoor chairs and tables, ground floor uses that engage pedestrians, and shops and restaurants designed to create a destination for neighbors, residents, members of the Harvard community, workers, and visitors.

Figure ES-1 depicts a site plan for the Project.

ES.1.2 Urban Design

The Project site has been designated as a new development site in Barry's Corner. The urban design opportunities for Barry's Corner include:

- creating a vibrant mix of uses that will attract a variety of users;
- providing meaningful open space that is a shared amenity between building residents and the public;
- creating a main street-like environment with community-oriented shops and services, with housing on upper floors;
- introducing additional connections from the existing North Allston residential neighborhood to Smith Field;
- transforming this portion of Western Avenue into a pedestrian-friendly corner by means of building orientation, careful attention to scale, and treatment of sidewalks and landscape, and the relationships of private development to public realm.

ES.1.3 Architecture

Design of the Project requires an architecture that defers to public realm—meaning the architecture calls attention to the image and identity of public spaces. Thus, strong, consistent, and defined streetwalls along public ways are important. The buildings are planned with prominent frontages on all orientations, and each orientation will play a different role in place-making. The Project buildings will respond specifically and appropriately to each orientation and contribute to the quality of the urban fabric.

0 75ft 150ft

Existing Site Boundary
Project Site
Development Site

* The parking lot shown to the north and the area to the west of the building at 175 North Harvard Street are shown for illustrative purposes. The design of these areas will evolve over time.

ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure ES-1

Project Site Plan

On Western Avenue and North Harvard Street, continuous active edges will line the public streets and activate both widened sidewalks and new open space. Newly-created "Smith Field Drive[2]," will provide vehicular access for this important city park, and "Grove Street" will evolve over time as an important pedestrian access from the existing grove of trees on the eastern side of North Harvard Street to Smith Field along a street with wide sidewalks, active edges, and residences with direct access from the street.

In terms of massing, the Project consists of the construction of two buildings which share a single level podium. The north building ranges from seven to nine stories in height and is located along "Grove Street." The south building is six stories tall and has frontage on "Smith Field Drive," Western Avenue, and North Harvard Street.

ES.1.4 Benefits

Project-related benefits include housing creation, urban design and public realm improvements, job opportunities (including approximately 500 construction jobs and 250 permanent full- and part-time jobs), expanded retail and service options, a corresponding increase in demand to support local retail and services, and additional tax revenues. By transforming a light industrial site to a mixed-use residential and retail development, the Project will contribute substantially to the improvement of the pedestrian environment, the retail vitality of the neighborhood, and the urban design and architectural character of this area of Allston.

The Barry's Corner Residential and Retail Commons project—in combination with the range of institutional initiatives being proposed separately by Harvard—will help achieve these goals and contribute to the vitality of Barry's Corner.

ES.2 Summary of Impacts

ES.2.1 Transportation

The Transportation Study that is summarized in Chapter 2 and provided in Appendix B indicates that the Project's impacts can be reduced and managed by the proposed set of transportation improvements including a range of Transportation Demand Management (TDM) measures to encourage and support the use of non-auto travel to and from the site, investment in improvements to the Barry's Corner intersection, and access management approaches at the site driveways.

---

2 The street names used in this document for the newly created streets ("Smith Field Drive," "Smith Field Drive Extension," and "Grove Street") are illustrative only; it is anticipated that they may be re-named in the future.

The Transportation Study compares Existing Conditions to future No Build and Build conditions. The existing site has a substantial amount of surface parking that will be replaced with below grade and off-street parking for residents and customers of retail tenants. The parking design and access to parking has been designed to accommodate internal queuing to diminish potential congestion on surrounding streets.

The Project will implement a number of transportation improvements, including the construction of "Grove Street" and "Smith Field Drive" and the installation of new signal equipment at Barry's Corner. In addition, the Project will work with the City to modify striping and parking regulations to address anticipated future conditions. The TDM program includes secure bicycle storage for building residents and employees, bicycle racks for general public use, access to Harvard's shuttle bus service, and on-site parking spaces for community car-sharing services (e.g., Zipcar).

ES.2.2 Wind

A pedestrian wind study was conducted for the proposed Project. The objective of the study was to assess the effect of the Project on local wind conditions in pedestrian areas around the study site. The results of the analysis are typical of urban development projects of this scale. The Project does not create any dangerous locations or safety exceedances in terms of wind gusts at any of the locations studied. The analysis showed that at the vast majority of the 60 sensor locations studied, pedestrian level wind conditions were suitable for walking or better on an annual basis. Several downwind locations, both on- and offsite, are improved by the Project and are expected to become suitable for standing or sitting. At only 5 locations has the Project created uncomfortable wind conditions on an annual basis, including areas which did not exist in the No Build Configuration. It is anticipated that the minor discomfort at these locations can be mitigated with localized solutions such as landscaping, wind screens or building canopies.

ES.2.3 Shadow

Using a computer based shadow study based on BRA-approved methodology, the Project team evaluated the existing and proposed conditions for shadows at four key dates throughout the year that represent the range of seasonal sun positions. The shadow study shows that the Project will create limited new shadows consistent with urban development that, when combined with the proposed public realm enhancements in the area, will not detrimentally affect the use of sidewalks or public areas (including Smith Field) in the vicinity of the Project site.

New shadow from the Project will generally be cast onto the site, its new roadways ("Smith Field Drive" and "Grove Street"), a portion of Harvard's campus immediately north of the site and the surrounding streets. New shadow on Smith Field will be limited to the morning hours, with only small portions of new shadow during the noon time period. Some areas of Smith Field under shadow in the existing condition will be free from shadow due to the demolition of existing structures necessary for the development of the Project. The increase in shadows within the Project area is not expected to have an adverse impact on the public use of the newly created pedestrian areas within the Project.

ES.2.4 Daylight

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and in the surrounding area. Due to the small scale of the existing building and openness of the site, the Project will create new daylight obstruction when viewed from the surrounding streets. However, the new daylight obstruction from three of the four viewpoints, including from Smith Field, will be similar to the surrounding area and typical of the North Allston area.

ES.2.5 Air Quality

The air quality analysis was conducted to determine the impact of pollutant emissions from mobile source emissions generated by the Project. The analysis looks at intersections studied for the transportation analysis that meet the criteria outlined in the BRA Development Review Guidelines for a microscale analysis. The air quality analysis results show that the carbon monoxide (CO) concentrations at all receptors will be well under applicable Federal National Ambient Air Quality Standards (NAAQS) thresholds.

ES.2.6 Groundwater and Geotechnical

Construction of the proposed development is not expected to have adverse short or long-term impacts on soil or groundwater conditions. It is anticipated that a lateral earth support system will be required to support the excavation adjacent to the existing public roadways. Excavation for the building foundations will require dewatering of the excavation. Excavation and below-grade construction will be conducted in accordance with applicable local, state and federal regulations.

ES.2.7 Solid and Hazardous Waste

The Project will require the demolition of existing buildings and associated site work along with excavation of the site for future underground parking. Solid waste and demolition debris will be characterized at the site to determine if there is any need for special handling and disposal. The Project will require the contractor to transport and dispose of all construction debris and materials in accordance with applicable laws. The site is in a previously developed urban environment. The Project Team will undertake an exploration program to characterize the site and soils to determine the appropriate management of soils during construction.

Operational solid waste from the Project will be collected within a trash room on-site. Recycling by both retail and residential tenants will be encouraged and coordinated to limit the amount of waste sent to landfills. To encourage recycling, the Project will implement a recycling program throughout the building. Trash and recycling will be collected on a regular basis.

ES.2.8 Noise

Baseline noise levels were measured in the vicinity of the proposed Project and were compared to predicted noise levels based on reference sound data for mechanical equipment identified by the Project team. These predicted noise levels were compared to the City of Boston Zoning District Noise Standards and the Massachusetts Department of Environmental Protection Noise Policy. The noise analysis indicates that predicted noise levels from Project mechanical equipment with appropriate noise attenuation measures will comply with applicable state and local regulations at all modeled locations.

ES.2.9 Construction

The Project will require its contractors to develop construction protocols to control any impacts that might occur during the construction period. These protocols will be included in a Construction Management Plan (CMP) for the Project that will be prepared and submitted to the Boston Transportation Department for review and approval prior to issuance of a building permit. Truck routing and efforts to minimize the impacts on the surrounding area will be identified in the CMP. Measures will be implemented on-site and on construction equipment to minimize airborne dust from the site and air quality impacts associated with emissions from construction equipment. Measures, such as sound attenuation equipment and the timing of noise generating activities, will be implemented to minimize the noise impact on the surrounding area.

Construction methodologies that ensure public safety and protect nearby businesses will be employed. Techniques such as barricades, walkways, painted lines, and signage will be used as necessary. Construction management and scheduling—including plans for construction worker commuting and parking, routing plans and scheduling for trucking and deliveries, protection of existing utilities, maintenance of fire access, and control of noise and dust—will minimize impacts on the surrounding environment.

ES.2.10 Green Building/Sustainability

To comply with Article 37 of the Boston Zoning Code, the Project team intends to measure the results of their sustainability initiatives using the framework of the LEED (Leadership in Energy and Environmental Design) rating system. As a new residential apartment building, the Project is categorized as a LEED BD&C – NC 2009 (New Construction) project. The Project team seeks to exceed Article 37 requirements by achieving a Gold level certification under the LEED rating system. A LEED scorecard will be submitted to demonstrate compliance with Article 37 and will include a description of the Project's approach in pursuing each of the identified LEED points.

ES.2.11 Historic Resources

The Project will not adversely impact historic resources. There are no inventoried or State-Register listed properties within the Project site. Removal of the existing buildings associated with the Project will not have an adverse impact on any historic resources as the buildings are not included in the Inventory of Historic and Archaeological Assets.

There are certain properties listed on the State and National Registers of Historic Places and the Inventory of Historic and Archaeological Assets of the Commonwealth within the vicinity of the Project site, including Harvard Stadium; however, the Project will not adversely affect those resources.

ES.2.12 Infrastructure Systems

Based on initial investigations, the existing water, wastewater, stormwater, and energy infrastructure systems in the area have adequate capacity for the incremental increase in demand associated with the development and operation of the Project.

Chapter 1.0

Introduction and Project Description

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Project Summary

Barry's Corner Property LLC (a Samuels & Associates Entity) and the President and Fellows of Harvard College ("Harvard" or "Harvard University" or "University") (collectively the "Co-proponents"), jointly submit this document describing a project to be constructed by Samuels & Associates (and its affiliated entity) on property ground leased from Harvard. The Project will be owned and managed by Samuels & Associates. Harvard is a Co-proponent in order to assure clarity and certainty in responsibility for fulfilling community benefit commitments made to the City and neighborhood in connection with the Project. The Project site is an approximately 2.67 acre site located at the threshold of Harvard's campus in the Allston neighborhood of Boston.

The Barry's Corner Residential and Retail Commons project (the "Project") includes the construction of approximately 325 units of rental housing and approximately 45,000 square feet of retail space and residential amenities. A below-grade parking garage will include approximately 180 parking spaces and the Project also includes approximately 41 new on-street parking spaces along the two new streets within the Project site. The Project will bring new residents to Allston, new commercial and social activity to Barry's Corner, and act as a catalyst for redevelopment in the neighborhood.

This Expanded Project Notification Form (PNF) is being submitted to the Boston Redevelopment Authority (BRA) to initiate review of the Project under Article 80B, Large Project Review, of the Boston Zoning Code.

1.2 Background

The Project is among the first development to move forward following a multiyear planning effort by Harvard. The University's recent Institutional Master Plan Notification Form (IMPNF) filing outlined nine institutional projects in addition to the resumed construction of a health and life science center along Western Avenue.

In June 2011, the Harvard Allston Work Team – a group charged with recommending strategies for achieving a cohesive scientific, academic, and learning campus environment in Allston and identifying opportunities for development – released a set of recommendations for Allston development. Included in that document was the recommendation that Harvard, working with a third-party real estate developer, should "enhance the vibrancy of Barry's Corner through […] investments in rental housing, retail and other amenities."

The Work Team's recommendation for housing and retail in Barry's Corner was consistent with past planning conducted by the BRA, the Harvard Allston Task Force, Harvard University, and members of the Allston community.

In September 2011, the President and the Harvard Corporation endorsed the Work Team recommendations. Harvard issued a Request for Proposals (RFP) seeking a real estate developer for a housing and mixed-use project in Barry's Corner. A key component of the RFP and selection process was an unprecedented selection committee comprised of administrators, faculty members and two members of the Harvard Allston Task Force. In June 2012, as a result of that process, Harvard engaged Samuels & Associates to work with the University on the development of a residential and retail project in Barry's Corner. One of the important factors in the selection process was Samuels & Associates' proven track record in community development and in designing and building projects that provide placemaking opportunities through streetscape and public amenities. Since June of 2012 there have been eleven Allston Task Force meetings where the Project has been discussed.

1.3 Development Experience

Samuels & Associates is a real estate development and management firm based in Boston. Steven Samuels, Chief Executive Officer of Samuels & Associates, has overseen the successful development of over fifty projects in seven states, including many urban projects that satisfy the needs of communities and enhance local neighborhoods. A pioneer in urban planning and development in Boston, Samuels & Associates has produced a number of high quality mixed-use retail venues in Boston neighborhoods providing a full complement of necessity retail to the surrounding neighborhoods.

Samuels & Associates has been actively involved in the revitalization of the historic Fenway neighborhood, including working with the Fenway neighborhood on the rezoning efforts that began in 1997 and helped shape the vision of an urban village for the Boylston Street corridor. Additionally, Samuels & Associates has developed three signature projects—Trilogy, 1330 Boylston, and Fenway Triangle Mixed Use Project—all of which have served as the catalyst for the redevelopment of Boylston Street in the Fenway. Trilogy, which was completed in 2006 and is located on the north side of Boylston Street within the Fenway Triangle, added 576 residential units, ground floor restaurants, and retail to the neighborhood. 1330 Boylston, completed in 2008, is located on the south side of Boylston Street and includes 200 residential units as well as a new home for the Fenway Community Health Center. The most recent project, the Fenway Triangle Mixed Use Project, consists of two mixed use buildings with residential and office uses proposed above a retail base at 1325 Boylston Street. This project commenced construction in late 2012.

Samuels & Associates supports a full range of Boston community organizations, including the Boston Main Streets Foundation, the Boston Medical Center, the Boston Police Activities League, the Fenway Alliance, Fenway Civic Association, Fenway Community Development Corporation, the Allston Community Development Corporation, and others.

1.4 Public Participation

Harvard interacts with neighbors and community members through a myriad of community- and school-based programs and also works regularly with a task force of neighborhood representatives regarding Allston planning and development. The task force was first convened in the mid-1980's in preparation for the University's first Institutional Master Plan, filed in 1989. In January, 2006, Boston Mayor Thomas M. Menino announced a new Harvard-Allston Task Force (the "Task Force") to serve as an advisory group to the BRA as Harvard began its new institutional master planning process for the expanded Allston campus.

During the early stages of the development of the RFP for the selection of a development partner for this Project, the Task Force and residents specifically focused on the selection criteria that would be included in the RFP. In addition, Harvard included two members of the Task Force on the RFP selection committee that chose Samuels & Associates to design and develop this Project.

Since being selected as a real estate partner in June 2012, the Samuels & Associates team and Harvard have met with the Task Force on a regular basis to discuss this project. Early meetings focused on urban design issues and the scale of both the residential and retail components of the Project, including the number of units and approximate retail square footage. The early goal was to understand how community needs and ideas for amenities might be incorporated into the Project and to find a common vision for Barry's Corner.

Throughout the summer of 2012, meetings focused on different alternatives for the building massing and other design issues, such as the location of open space within the Project, the location of loading and parking, the size of the retail spaces and the types of tenants that this space could accommodate, façade treatments, and more. These meetings included a valuable discussion of the trade-offs inherent in the decision of including Project parking fully below-grade vs. partially below-grade.

The most recent meetings this fall have focused on refining the building massing, in response to community comments regarding building height along North Harvard Street and Western Avenue. The design team presented alternative ways to address these comments and sought Task Force and community feedback. Meetings also included discussions on the proposed residential unit mix, parking requirements, and the affordability component. The Project presented in this Expanded PNF represents the results of these discussions with the Task Force and the larger Allston community.

The Project team is committed to continuing these meetings with the Task Force and Allston community throughout the review of this Expanded PNF.

1.5 Project Description

1.5.1 Project Elements

The Project involves the redevelopment of a site that is located north and west of the intersection of Western Avenue and North Harvard Street in the North Allston neighborhood of Boston. The existing site includes most of the building known as 219 Western Avenue, a single story building containing approximately 47,500 square feet of space currently home to a number of Harvard uses including mail room services, the Harvard University Information Technology department, the Harvard ceramics studio, a Harvard University Police Department training facility, fleet and landscape services, and storage space.

The overall Project site is 2.67 acres and consists of two areas: (i) the 2.03 acre development site that contains the proposed buildings and will be created by subdivision and subsequently ground-leased by Harvard to Barry's Corner Property LLC; and (ii) the 0.64 acre area along the westerly and northerly borders of the development site, on which will be located two new privately-owned and maintained publicly-accessible streets. The newly created private streets are "Grove Street," which will border the site to the north, and "Smith Field Drive," which will border the site to the west[1]. The Project team will work with the appropriate City agencies, including the Boston Parks & Recreation Department, on the treatment of the edge of the Project site which abuts Smith Field.

In addition, the "Smith Field Drive Extension" will continue to the north outside of the Project site but within Harvard's campus in order to provide access to North Harvard Street.

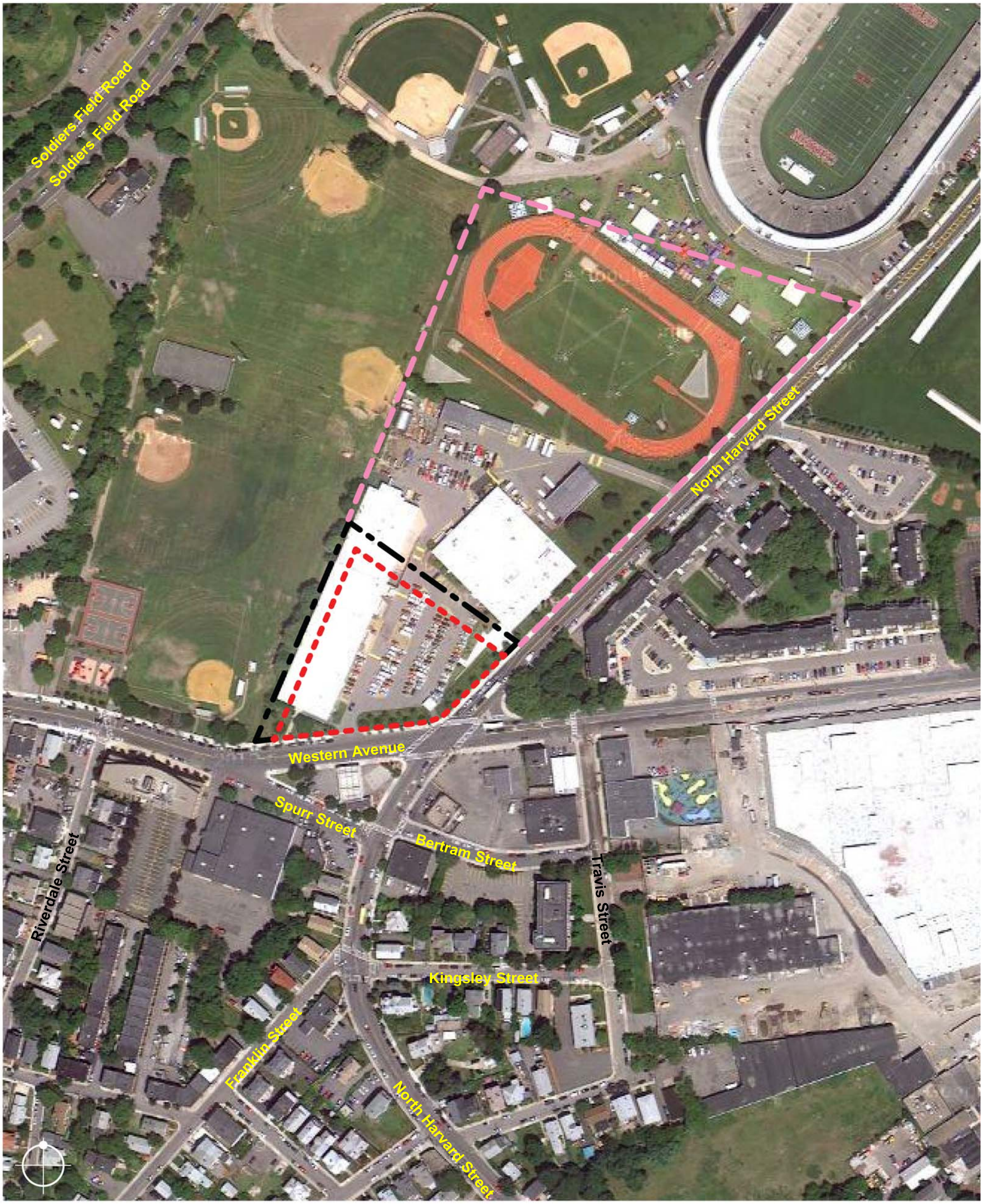
Figure 1-1 depicts an aerial view of the existing Project area, Figure 1-2 presents photographs of the existing conditions, and Figure 1-3 depicts the existing neighborhood context, showing the land uses in the area.

To accommodate the Project, the existing institutional uses at 219 Western Avenue will be relocated and all of the existing building at 219 Western Avenue, two smaller maintenance buildings (with addresses at 141 and 155 North Harvard Street), and the adjacent surface parking lot will all be demolished.[2]

---

1 These street names are illustrative only; it is anticipated that they may be re-named in the future.

2 The relocation of most of the existing uses at 219 Western Avenue to 28 Travis Street is being addressed via a separate regulatory process. An Institutional Master Plan Notification Form to start the process for an Institutional Master Plan Amendment was submitted to the BRA in October 2012. One use, the Harvard ceramics studio, is being relocated to 224 Western Avenue as allowed by underlying zoning.



Existing Site Boundary — Project Site — Development Site

ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

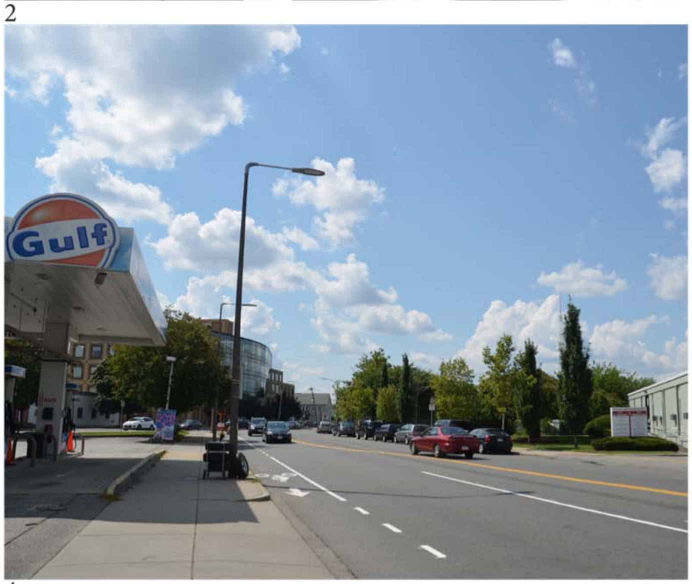
Figure 1-1

Aerial View

1

2

3



4

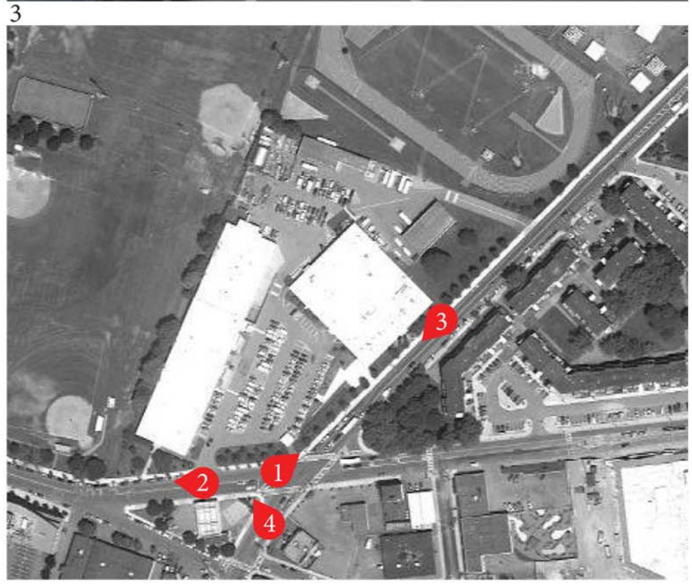
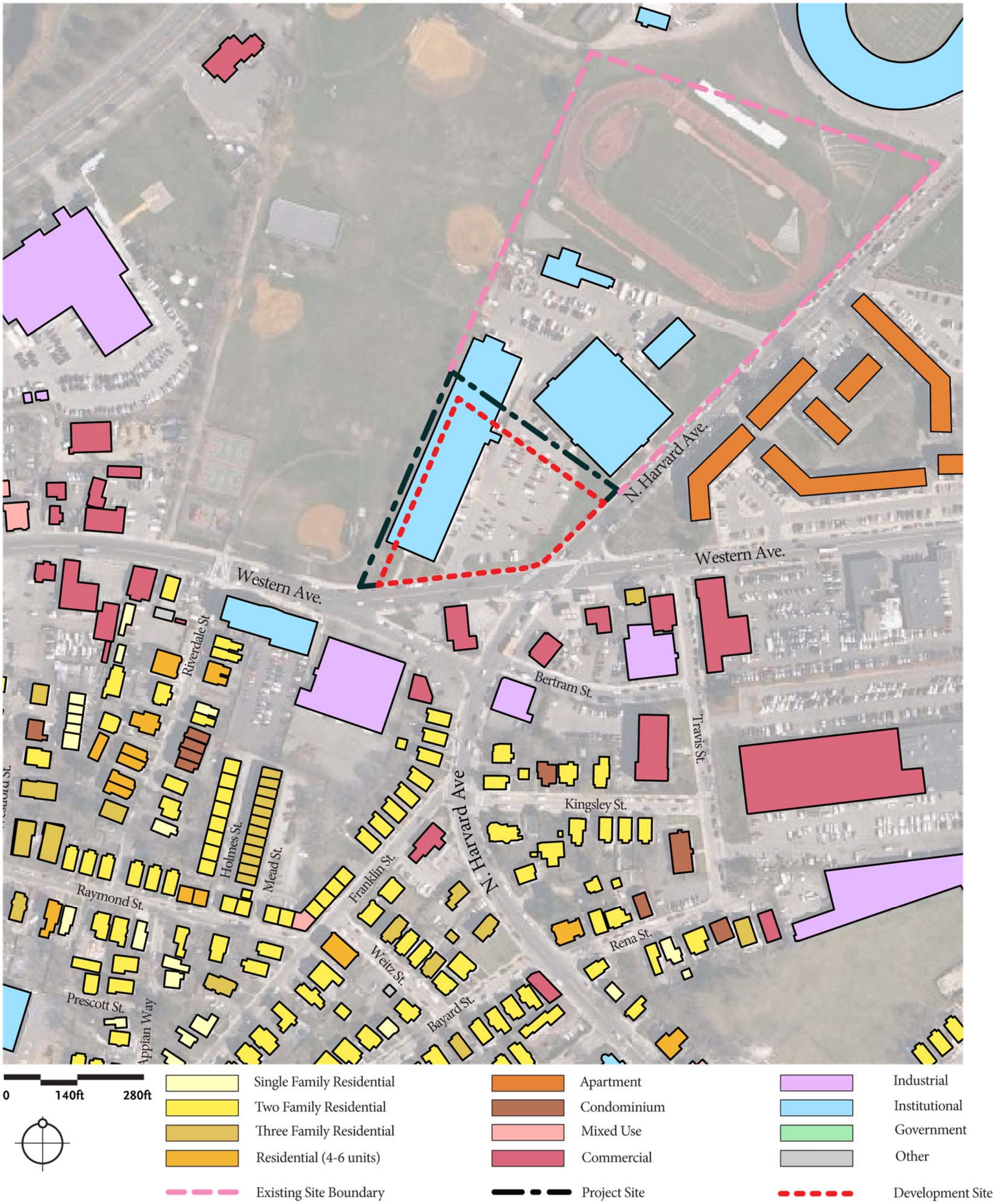


Figure 1-2

Existing Conditions Photographs



Source: BRA, 2012

ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 1-3

Neighborhood Context

The Project consists of the construction of two residential buildings which share a single level podium; parking is located in a below-grade parking garage as well as on the newly created streets. The program consists of residential uses on the upper floors, residential, amenity and retail uses on the ground floor, and parking in the basement. The north building ranges from seven to nine stories in height and is located along "Grove Street." The south building is six stories tall and has frontage on "Smith Field Drive," Western Avenue, and North Harvard Street. The buildings contain approximately 325 residences with a gross floor area of approximately 350,000 square feet, exclusive of the below grade space.

Figure 1-4 depicts the Project site plan and Figure 1-5 depicts a rendered perspective of the Project.

1.5.2 Ground Floor Uses

The ground floor podium includes approximately 45,000 square feet of commercial/retail space. The remaining portion of the ground floor, approximately 25,000 square feet, may contain residences, residential amenity spaces—such as resident lobbies, mail and fitness center—and mechanical, service and similar functions. A multiple bay loading dock in the north building will service both residential buildings and the retail spaces for deliveries, recycling and trash.

Figure 1-6 depicts the ground floor plan for the Project.

1.5.3 Access and Parking

Residents will access the buildings from lobbies on Western Avenue and "Grove Street" for the south and north buildings, respectively. In addition, some ground floor residences may have direct entrances on "Grove Street" and "Smith Field Drive." The buildings are connected at the second floor with an amenity area which includes club room, game room, and similar communal spaces. Retail spaces will have customer entrances along Western Avenue and North Harvard Street.

The Project provides approximately 180 parking spaces in the below-grade garage, which is accessed from "Grove Street." In addition, approximately 41 on-street parking spaces are provided within the Project site on "Grove Street" and "Smith Field Drive." Secure covered parking for 325 bicycles is also provided in the garage.

* The parking lot shown to the north and the area to the west of the building at 175 North Harvard Street are shown for illustrative purposes. The design of these areas will evolve over time.

ELKUS | MANFREDI ARCHITECTS

Figure 1-4

Project Site Plan

Figure 1-5

Perspective Looking West

ELKUS | MANFREDI ARCHITECTS

Figure 1-6

Ground Floor Plan

1.5.4 Building Program

Table 1-1 provides the building program for the Project.

Table 1-1 Project Dimensions and Building Program*

Project site:	2.67 acres total 2.03 acre development site 0.64 acres of new streets
Uses:	Residential – 325 units of rental housing Retail –45,000 GSF
Square feet of gross floor area:	350,000 GSF
Demolition of existing facilities:	47,500 GSF
Maximum floor area ratio:	4.0
Building heights:	Three to nine stories
Parking spaces:	Approximately 180 spaces within the building Approximately 41 spaces on the new streets
Current zoning of site:	Harvard University Institutional Subdistrict
Proposed zoning:	The site will be rezoned to be part of the Western Avenue/Soldiers Field Road Community Commercial Subdistrict and the Project will be the subject of a Planned Development Area (PDA) Development Plan application

* measured in accordance with the Boston Zoning Code; all dimensions are approximate

1.5.5 Schedule

Demolition of the existing building on-site is anticipated to commence in the fall of 2013. Construction is expected to last approximately 24-28 months. The building core, shell and retail spaces are anticipated to be complete in advance of the residential unit finishes.

1.5.6 Graphics

Additional graphics are included in Chapter 4, Urban Design, and Appendix A.

1.6 Relationship to Harvard University IMPNF

In October 2012 Harvard filed an Institutional Master Plan Notification Form (IMPNF) outlining the near-term, ten-year development of Harvard University's campus in Allston. The IMPNF also includes a "Long-Term Framework Plan" that provides a general framework of streets, open spaces, development sites and other parameters that inform the University's long-term development.

Harvard's IMPNF is intended to provide the neighborhood, the City of Boston and the Commonwealth of Massachusetts with the information needed to ensure that the area's institutional presence, physical transformation, economic development, environmental enhancement and transportation improvements will continue to reflect the priorities of the University, the City of Boston, the community, and the Commonwealth of Massachusetts. One such priority is the enhancement of Barry's Corner; and as such, Barry's Corner is an integral part of both the University's IMPNF and its Long-Term Framework Plan.

Consistent with past planning efforts involving the City of Boston and the Allston neighbors, the institutional projects described in Harvard's IMPNF will establish a diverse mix of uses. The goal is to address academic needs, while providing ground floor activation on development parcels, creating new housing and retail and service opportunities, and developing sufficient density to support retail and active pedestrian streetscapes. Barry's Corner is the intersection of neighborhood and University, and efforts to enhance vibrancy there will serve all constituencies: scientists and researchers who will work in the Health and Life Science Center; the future residents of the Barry's Corner Residential and Retail Commons project; users of the Harvard Innovation Lab; neighborhood families who frequent local stores and restaurants, the Harvard ceramics studio, the Harvard Ed Portal and Ed Portal Annex, and Smith Field; the local leaders, business executives and students who spend time at Harvard Business School and Athletics; and all of the residents of and visitors to Allston.

The Barry's Corner Residential and Retail Commons project—in combination with the range of institutional initiatives proposed in Harvard's IMPNF—will help achieve these goals and contribute to the vitality of Barry's Corner.

1.7 Public Benefits

Project-related benefits include housing creation, urban design and public realm improvements, job opportunities, expanded retail and service options, new local retail and services, and additional tax revenues. By transforming a light industrial site to a mixed-use residential and retail site, the Project will contribute substantially to the improvement of the pedestrian environment, the retail and service vitality of the neighborhood, and the urban design and architectural character of this area of Allston. Specific public benefits include:

Urban Design Benefits and Site Improvements

- **Neighborhood Activation**
  - ***New Retail and Service Development*** – Provide approximately 45,000 square feet of community-oriented, ground-floor retail space, which will both create activity around the site and provide amenities to the neighbors and building residents.
  - ***Improved Pedestrian Activity*** **-** Encourage pedestrian activity through new retail and residential uses creating liveliness along Western Avenue and North Harvard Street.

- *Catalyzed Neighborhood Development* - Redevelop an underutilized urban site into a vibrant transit- and pedestrian-oriented mixed-use development that will catalyze future development in the area.

♦ **High Quality Urban Design**

- ***Enhanced Streetscape and Public Realm*** – Enhance the streetscape and the pedestrian experience through the use of signage, street furniture, lighting, landscaping, and the provision of an outdoor seating area for potential restaurant occupancy.

- ***High Quality Architecture*** **-** Improve the urban design characteristics and aesthetic character of the Project surroundings through the introduction of high-quality architecture to the site and the enhancement of the public realm.

♦ **New and Improved Open Space**

- ***New Open Space*** **-** Provide approximately 3,600 square feet of new public open space within the site, including 2,200 square feet within the southwest corner of the Project site which will connect to the adjacent Smith Field, and approximately 1,400 square feet of open space along North Harvard Street.

- ***Create a Presence on the Park*** – Enhance public access to Smith Field through a new roadway at the edge of the park, while using this new roadway to create a separation between the Project and the Park.

Transportation Improvements

♦ **Creation of New Streets**

- Improve pedestrian access to Smith Field and enhance vehicular circulation by creating two new streets ("Smith Field Drive" and "Grove Street") within the Project site.

♦ **Creation of New Parking**

- ***Below Grade Parking*** **-** Provide approximately 180 on-site parking spaces for building residents.

- ***Street Level Parking*** **-** Provide approximately 41 on-street parking spaces within the Project site for users of the Project.

♦ **Promotion of Alternative Modes of Transportation**

- ***Hubway Station*** – Maintain the Hubway bike sharing station within Barry's Corner, possibly at a new location on the northeast quadrant of Barry's Corner.

- *Harvard Shuttle Bus* – Work with public agencies to extend the Harvard Shuttle bus service into Barry's Corner and provide access to this service for residents and employees of the Barry's Corner Residential and Retail Commons project and neighborhood residents with ID card issued by the Education Portal.

- ***Bicycle Parking*** **-** Provide on-site bike parking for retail customers, visitors, and employees as well as covered/secured bike parking for building residents.

- ***Improved Bicycle Lanes*** **-** Create opportunities for an extension of the existing bike lane within Barry's Corner by widening Western Avenue in front of the site.

- ***Zipcars*** **-** Accommodate parking for Zipcar spaces at a location that is easily accessible for the building residents and the neighborhood at large.

- ***TDM*** **-** Implement a Transportation Demand Management (TDM) Plan to encourage the use of alternate transportation and discourage single-occupancy vehicle trips.

♦ **Enhanced Pedestrian Circulation and Safety**

- Enhance pedestrian safety and circulation by proposing corridor upgrades, including improved sidewalk spaces, improved/upgraded sidewalks and street crossings, and improved illumination of pedestrian walkways.

Infrastructure Improvements

♦ **Introduce Sustainable Design Features -** Incorporate state-of-the-art sustainable features into the design of the Project—both the retail and residential components—where feasible and reasonable, to achieve LEED Gold Certification and exceeding the requirements of the Boston Zoning Code.

♦ **Use On-Site Infrastructure -** Utilize the existing adequate infrastructure capacity without requiring any major infrastructure upgrades.

♦ **Upgrade On-Site Drainage System -** Incorporate green infrastructure, resulting in reduced rates and volumes of stormwater discharged to the Boston Water and Sewer Commission stormwater drainage system and, ultimately, the Charles River.

Economic and Community Benefits

♦ **New Housing Units -** Provide approximately 325 new units of much-needed market-rate rental housing in close proximity to downtown Boston, and consistent with the Mayor's Executive Order, a portion of these will be set aside as affordable rental housing.

- **New Job Creation-** Enhance the economy within the Allston neighborhood by providing new job opportunities and a source of customers for local retail and service establishments.

  - Create approximately 500 construction jobs in a variety of trades.

  - Create approximately 250 new transit-accessible employment opportunities (permanent part-time and full-time jobs).

- **Increased Tax Revenues -** Provide property tax revenues to the City of Boston by converting this property to a taxable use.

As the approval process for the Project unfolds, Harvard and Samuels—with the input of the Harvard Allston Task Force, the BRA, and the North Allston community—will develop an approach to community benefits that will honor the principle of mutual benefit.

1.8 Project Identification and Team

Project Name:	Barry's Corner Residential and Retail Commons Project
Location:	North Harvard Street and Western Avenue, Allston
Co-proponents:	Barry's Corner Property LLC c/o Samuels & Associates 333 Newbury Street Boston, MA 02115 (617) 247-3434 Steven Samuels Joel Sklar Leslie Cohen
	President and Fellows of Harvard College Holyoke Center 1350 Massachusetts Avenue Cambridge, MA 02138 Lisa Hogarty
Architect:	Elkus Manfredi Architects 300 A Street Boston, MA 02210 (617) 426-1300 David Manfredi Steven Dube

Attorney:	Goulston & Storrs 400 Atlantic Avenue Boston, MA 02110 (617) 574-6597 Douglas Husid Matthew J. Kiefer
Permitting Consultant:	Epsilon Associates, Inc. 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Cindy Schlessinger Geoff Starsiak
Transportation Consultant:	Vanasse Hangen Brustlin 101 Walnut Street Watertown, MA 02472 (617) 924-1770 Michael Regan Mark Junghans
Geotechnical and Environmental Consultant:	McPhail Associates, Inc. 2269 Massachusetts Avenue Cambridge, MA 02140 (617) 868-1420 Ambrose Donovan Joe Lombardo
Civil Engineer:	CDM Smith Inc. 50 Hampshire Street Cambridge, MA 02139 (617) 452-6000 John Keating Virginia Roach
Structural Engineer:	McNamara/Salvia, Inc. 160 Federal Street, 5th Floor Boston, MA 02110 (617) 737-0040 John Matuszewski
Wind Consultant:	Rowan Williams Davies & Irwin Inc. (RWDI) 650 Woodlawn Road West Guelph, Ontario, Canada N1K 1B8 (519) 823-1311 Derek Kelly

Sustainability Consultant:	The Green Engineer, LLP Sustainable Design Consulting 54 Junction Square Dr. Concord, MA 01742 (978) 369-8978 Christopher Schaffner Sarah Michelman

Chapter 2.0

Transportation Executive Summary

2.0 TRANSPORTATION

2.1 Summary of Impacts

The Transportation Study that is summarized in Chapter 2 and provided in Appendix B indicates that the Project's impacts can be reduced and managed by the proposed set of transportation improvements including a range of Transportation Demand Management (TDM) measures to encourage and support the use of non-auto travel to and from the site, investment in improvements to the Barry's Corner intersection, and access management approaches at the site driveways.

The Transportation Study compares Existing Conditions to future No Build and Build conditions. The existing site has a substantial amount of surface parking that will be replaced with below grade and off-street parking for residents and customers of retail tenants. The parking design and access to parking has been designed to accommodate internal queuing to diminish potential congestion on surrounding streets.

The Project will implement a number of transportation improvements, including the construction of "Grove Street" and "Smith Field Drive" and the installation of new signal equipment at Barry's Corner. In addition, the Co-proponents will work with the City to modify striping and parking regulations to address anticipated future conditions. The TDM program includes secure bicycle storage for building residents and employees, bicycle racks for general public use, access to Harvard's shuttle bus service and on-site parking spaces for community car-sharing services (e.g., Zipcar).

2.2 Introduction

The Co-proponents have actively participated in numerous Harvard Allston Task Force meetings with the BRA to ensure that the Project is consistent with the urban design goal of the neighborhood to establish a mix of pedestrian-scale streets to provide enhanced access to public parks and neighborhood amenities. The Co-proponents and their transportation consultant have also met with the Boston Transportation Department (BTD) during the development of this document to review the Transportation Study methodology and scope and to discuss potential transportation-related mitigation measures that were analyzed as part of the study. Site circulation and proposed transportation improvements for the Project have been coordinated with Harvard University's Allston Campus Institutional Master Plan (IMP) effort. Coordination will continue as each proceeds through the permitting process and as the Project and IMP projects move into the development phase.

The transportation impacts of the Project were evaluated in accordance with the BTD's Transportation Access Plan Guidelines and the BRA's Development Review Guidelines. This chapter presents a summary of the Transportation Study completed for the proposed Project. The full Transportation Study, which includes a detailed traffic analysis, is attached at the end of this document as Appendix B.

2.3 Methodology

The Transportation Study was completed in accordance with BTD's Transportation Access Plan Guidelines[1] and the BRA's Development Review Guidelines[2]. The study documents existing transportation conditions including traffic, pedestrians, transit and bicycle conditions on the surrounding transportation network; describes the site access, parking and loading issues and goals of the proposed Project; estimates potential future impacts of the proposed Project; and, identifies potential mitigation measures. The transportation study evaluates transportation conditions for various years and scenarios including:

- 2012 Existing Conditions
- 2017 Future No-Build Conditions
- 2017 Future Build Conditions, with and without proposed transportation improvements

The 2017 No Build Scenario does not include the Barry's Corner Residential and Retail Project, but does include approved projects (e.g., the Allston Health and Life Science Center) and non-Harvard projects that are currently within the BRA's review process. The 2017 No Build Scenario also includes the 28 Travis Street/38 Travis Street/90 Seattle Street, which involves relocating the existing uses at 219 Western Avenue, and the Bright Hockey Center renovation project. The 2017 Build scenario includes the Barry's Corner Residential and Retail Project and the projects in the No Build scenario.

The 2012 Existing Conditions assessment includes an inventory of roadway, parking, transit, pedestrian and bicycle conditions and analyses of crash history and intersection traffic operations for the study area. To identify current traffic flow characteristics along the major roadways serving the Project study area, peak-hour and daily traffic volumes were collected on roadways and intersections in and around the study area during April 2012. Data were collected at study area intersections during weekday morning (7:00 a.m. – 9:00 a.m.) and evening (4:00 p.m. – 6:00 p.m.) peak periods in April 2012 The turning movement/ classification counts (TMCs) identified current motorized, bicycle and pedestrian traffic volumes traveling through the key intersections. It should be noted that traffic volumes were collected prior to construction activities that began on the Anderson Memorial Bridge.

An analysis of the data indicated that the morning peak hour occurred from 8:00 a.m. to 9:00 a.m. and that the evening peak hour occurred from 5:00 p.m. to 6:00 p.m. Consistent with BTD's guidelines, Synchro 6 software, based on the 2000 Highway Capacity Manual [HCM][3], was used to model level of service (LOS) operations at the study area intersections during the morning and evening peak hours. The term LOS is used to denote the different operating conditions that occur

1 Boston Transportation Department, Transportation Access Guidelines, 2001.

2 Boston Redevelopment Authority, Article 80 - Development Review and Approval. January 2007.

3 Transportation Research Board, Highway Capacity Manual, Washington, D.C., 2000.

on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay, and freedom to maneuver. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level of service is derived directly from the calculation of delay experienced by the user.

To determine the impacts of the site-generated traffic volumes on the surrounding roadway network, future traffic conditions were developed, including the identification of planned roadway improvements in the study area. A five-year horizon (2017) was evaluated, based on typical guidelines for preparing traffic studies. The future traffic projection includes regional background traffic growth, additional vehicular traffic associated with specific planned developments near the Project site and planned roadway improvements resulting in the 2017 No-Build conditions. Specific planned developments included the Harvard's Health & Life Sciences Center, New Brighton Landing and Charlesview Redevelopment projects.

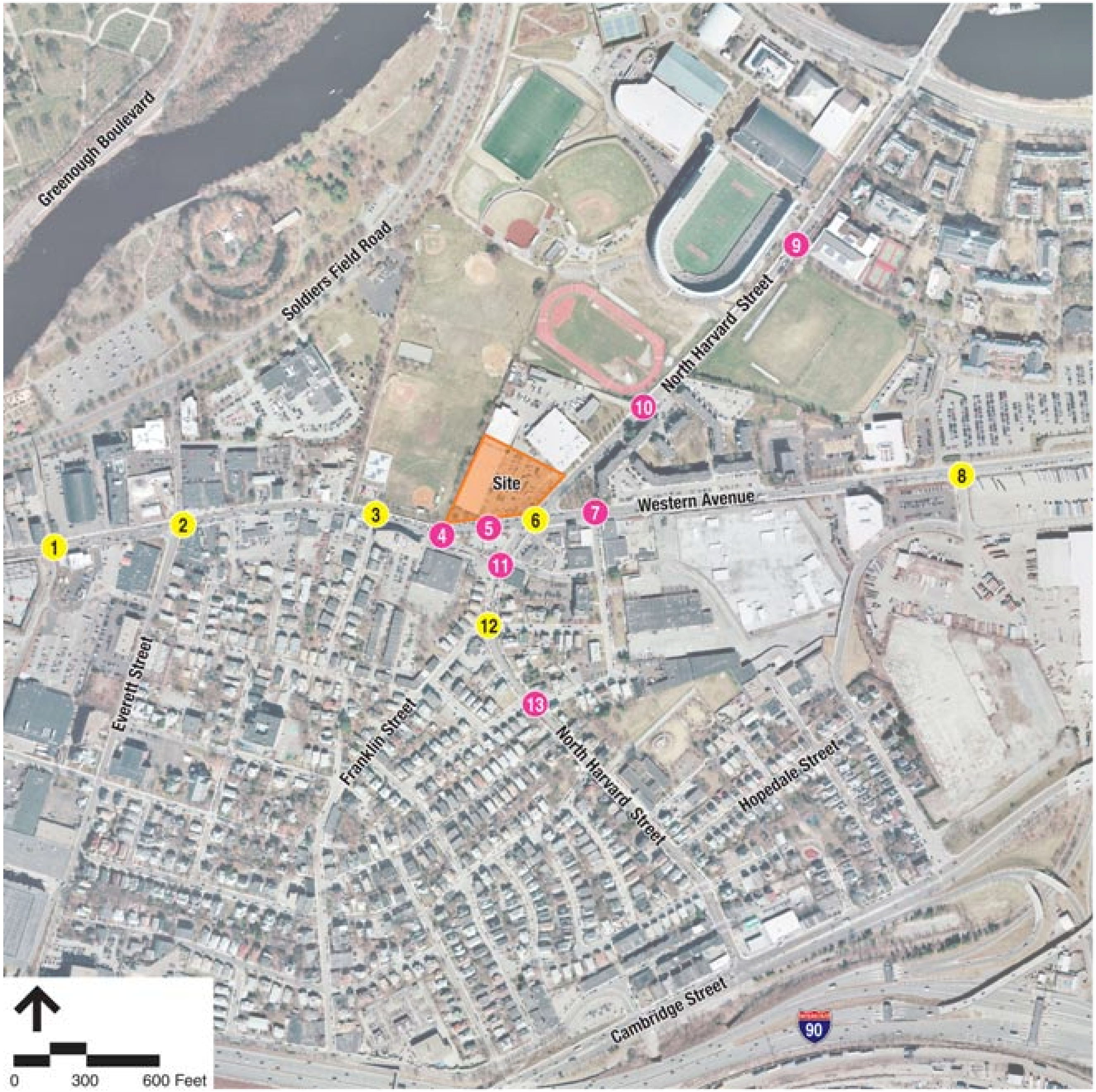
Standard traffic engineering practice and BTD guidelines were used to determine the various transportation characteristics of the Project. Trip generation is based on Institute of Transportation Engineers (ITE) trip generation rates for the mix of retail and residential land uses. Travel mode share and distribution of traffic were each developed based on neighborhood-level data provided by BTD. Parking demand estimates are based on BTD guidelines by land use and City neighborhood as well as parking data for Harvard affiliated housing. Loading demand is estimated by using ITE/National Cooperative Highway Research Program (NCHRP) data and local empirical data for each land use.

Anticipated site-generated traffic volumes were overlaid upon the 2017 No-Build traffic volume networks to reflect the year 2017 Build conditions in the study area. The 2017 Build condition also includes the relocation of the existing 219 Western Avenue site traffic to the 28 Travis Street site as proposed in Harvard's recently submitted IMPNF.

2.4 Study Area

The Project site is located in the northwest corner of the Western Avenue and North Harvard Street signalized intersection (Barry's Corner). The transportation study area includes thirteen intersections, as presented in Figure 2-1, generally radiating outward from Barry's Corner in all directions along Western Avenue and North Harvard Street. The study area contains six signalized intersections and seven unsignalized intersections, including both existing and proposed site driveways.

On-street parking is provided on both sides of Western Avenue to the west of North Harvard Street and on the south side of the street to the east of Barry's Corner. On-street parking is provided on both sides of North Harvard Street to the south of Western Avenue and on the east side of the street north of Western Avenue. On-street spaces are unregulated with the exception of two-hour/resident exempt spaces on Western Avenue to the west of North Harvard Street.



Signalized Intersection

Unsignalized Intersection

Study Area Intersections

1. Western Avenue at Telford Street
2. Western Avenue at Everett Street
3. Western Avenue at Riverdale Street
4. Western Avenue at Spurr Street
5. Western Avenue at Existing Site Driveway
6. Western Avenue at North Harvard Street
7. Western Avenue at Travis Street
8. Western Avenue at Batten Way/Hague Street
9. North Harvard Street at Gordon Road
10. North Harvard Street at Existing Site Driveway
11. North Harvard Street at Spurr Street
12. North Harvard Street at Kingsley Street/ Franklin Street
13. North Harvard Street at Bayard Street/ Rena Street

Vanasse Hangen Brustlin, Inc.

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 2-1

Study Area

The transportation system within the Study Area has the following general characteristics:

- This area is served by MBTA bus transit (Routes 66, 70A, 70, 86) and is within a one-half mile walk to the existing Harvard University shuttle stop at Harvard Business School.
- Bike lanes are available on North Harvard Street from Soldiers Field Road to Cambridge Street and on Western Avenue, between Soldiers Field Road (to the east) and Barry's Corner. This section of Western Avenue includes an eastbound cycle track, the first cycle track in Boston.
- The Project site is within one-half mile of the I-90 Allston Landing interchange and Soldiers Field Road.
- Sidewalks are available along the street network with pedestrian signals at each signalized intersection, including the Western Avenue at Riverdale Street intersection which provides pedestrian access to the adjacent Smith Field.
- Average Daily Traffic (ADT) volumes on Western Avenue are approximately 20,200 vehicles per day (vpd) and approximately 13,400 vpd on North Harvard Street.
- Barry's Corner has an exclusive pedestrian phase for pedestrians. Pedestrians push a button and all traffic stops when the pedestrian phase is called up by the signal controller.
- The intersection of Everett Street and Western Avenue operates at LOS E during the morning peak hour. The other Study Area intersections operate at LOS D or better during the morning and afternoon peak hours.

2.5 Site Access and Circulation

The Project includes the construction of two new roadways: "Smith Field Drive" and "Grove Street". "Smith Field Drive" will be a one-way northbound street with a parking lane and a sidewalk on its eastern side. "Grove Street" will be a two-way street with parking and sidewalks on each side of the street. The design and operation of these roadways is consistent with the roadway network that is envisioned as part of Harvard University's Ten-Year Plan for its Campus in Allston and will accommodate both motorized and bicycle traffic. The Project will provide accessible pedestrian level amenities within the site that complement the existing pedestrian network, such as activated pedestrian plazas and a secondary pedestrian corridor to Smith Field via "Grove Street".

The evaluation of the site driveways as part of the Build conditions analysis revealed that it would not be advisable to provide full access from "Smith Field Drive" to Western Avenue and "Grove Street" to North Harvard Street. Due to sight distance limitations and operational problems for exiting vehicles, "Smith Field Drive" is proposed to operate as a one-way northbound roadway between Western Avenue and "Grove Street". The intersection of "Grove Street" and North

Harvard Street is close to Barry's Corner and queuing vehicles from the signal will necessitate that "Grove Street" operate as only right-turn in/right-turn out through regulatory left-turn restriction signage.

A secondary driveway to North Harvard Street will be required to provide full access to and from the north. This "Smith Field Drive Extension", which is shown in Figure 2-2, will be provided through the adjacent 175 North Harvard Street property controlled by Harvard University. The resultant driveway location is far enough away from the Barry's Corner intersection to safely allow unrestricted turn movements. Emergency access to the site will be available from all driveways and loading access will be from "Smith Field Drive" and "Smith Field Drive Extension" to the proposed loading dock location on "Grove Street".

2.6 Site Parking

Parking for the residential units will be provided in an off-street parking garage with approximately 180-spaces that will connect with "Grove Street." The short-term parking demand of the retail portion of the Project will be met through shared use of available spaces within the Project's parking garage, particularly during midday hours on weekdays, and new on-street spaces created within the site and available on-street spaces. The Co-proponents will create 41 new on-street spaces within the site, including 16 spaces on "Grove Street" that will be used by visitors and tenants of 175 North Harvard Street including the Educational Portal and Silk Road. It is also anticipated that parking demand on Western Avenue and North Harvard Street will significantly decline once Charlesview tenants relocate to the new Brighton Mills site, creating new parking opportunities for retail customers.

The Project will provide on-site parking spaces for community car-sharing services (e.g., Zipcar). In addition, the Project will modify Western Avenue directly south of the site to provide approximately ten on-street parking spaces in front of the site and a delineated westbound bike lane. The Project will provide secure bicycle storage for building residents and employees in accordance with the City's Bicycle Parking Guidelines, and will install bicycle racks at grade for general public use.

2.7 Key Transportation Findings

The development program of approximately 325 apartment units and approximately 45,000 square feet of retail space results in 95 and 205 new vehicle trips in the morning and evening peak hours, respectively. Traffic generated by the Project represents approximately six percent of the a.m. peak hour and ten percent of the p.m. peak hour traffic volume in Barry's Corner. The Transportation Study identified the need for improvements to the Barry's Corner intersection to address traffic impacts and current deficiencies in the existing signal equipment and intersection design. Other issues included the need to improve the location and management of on-street parking and the opportunity to consolidate transit stops once Charlesview residents are relocated to the new housing complex.

The study also indicated that the Western Avenue at Everett Street intersection is projected to operate at LOS E and F during the morning and afternoon weekday peak hours respectively of the No-Build condition and LOS F during both weekday peak hours of the Build conditions. Exclusive pedestrian phasing and the resultant long cycle lengths are projected to negatively impact queues and delay at this location. The signal controller, phasing and timing were upgraded in 2012 by the Charlesview Redevelopment project in conjunction with BTD, so no further improvements are proposed by the Project at this location.

2.7.1 Barry's Corner Traffic Operations

At Barry's Corner, the intersection accommodates a combination of pedestrian, bicycle and vehicle traffic with mixed results. Bicycles enjoy almost full accommodation within dedicated lanes, with the exception for the westbound movement out of the intersection. Pedestrian crossings are accommodated with the current exclusive pedestrian phase but result in extended pedestrian wait times from the longer cycle length. That longer cycle length combined with large numbers of left-turning vehicles on the northbound and eastbound approaches results in poor LOS (LOS E or worse) and long queues during the No-Build and Build peak hour conditions.

Improvements have been identified that bring the intersection operations of the Build condition back to No-Build levels and address increased traffic queues. The first set of proposed improvements seeks to reduce delay and improve the efficiency of the intersection by updating the traffic signal timing, phasing and equipment. This includes installing loop detectors on North Harvard Street and taking steps to convert the current exclusive pedestrian phasing to concurrent pedestrian crossings. Concurrent crossings allow pedestrians to cross while traffic on the parallel street is moving, affording pedestrians more frequent opportunities to cross the street, while improving traffic operations by reducing vehicular delay. Several measures are also proposed to support the implementation of concurrent pedestrian crossings at Barry's Corner:

- Convert the northbound left-turn phasing from a permitted/protected to a protected operation.
- Implementing a "No Turn on Red" restriction for the southbound right-turn on North Harvard Street.

A second set of measures seeks to reduce the impacts of longer queues at the intersection. These measures include:

- Modifying striping on Western Avenue to lengthen the eastbound left-turn lane to 250 feet.
- Implementing peak hour on-street parking restrictions on northbound North Harvard Street, approximately five spaces south of Bertram Street.
- Restriping the southbound North Harvard Street approach to Barry's Corner and relocating the bus stop to lengthen the right-turn lane on this approach.

2.7.2 Transit

The Route 66 and Route 86 share two sets of stops on North Harvard Street that are within 500 feet of each other: the Barry's Corner stops in front of the Project site and a second set of bus stops to the north in front of the existing Charlesview residences. The proximity of these stops delays passengers on the bus. The relocation of Charlesview residences affords the opportunity to consolidate these bus stops at one location near Barry's Corner. This is also an opportunity to relocate the southbound bus stop further from the intersection. Today, the southbound bus stop at Barry's Corner is located in the southbound North Harvard Street right-turn lane. This configuration results in conflicts between Route 66 buses headed southbound on North Harvard Street and bicyclists on this approach. Moving the bus stop north of "Grove Street" would eliminate this conflict.

2.7.3 Parking

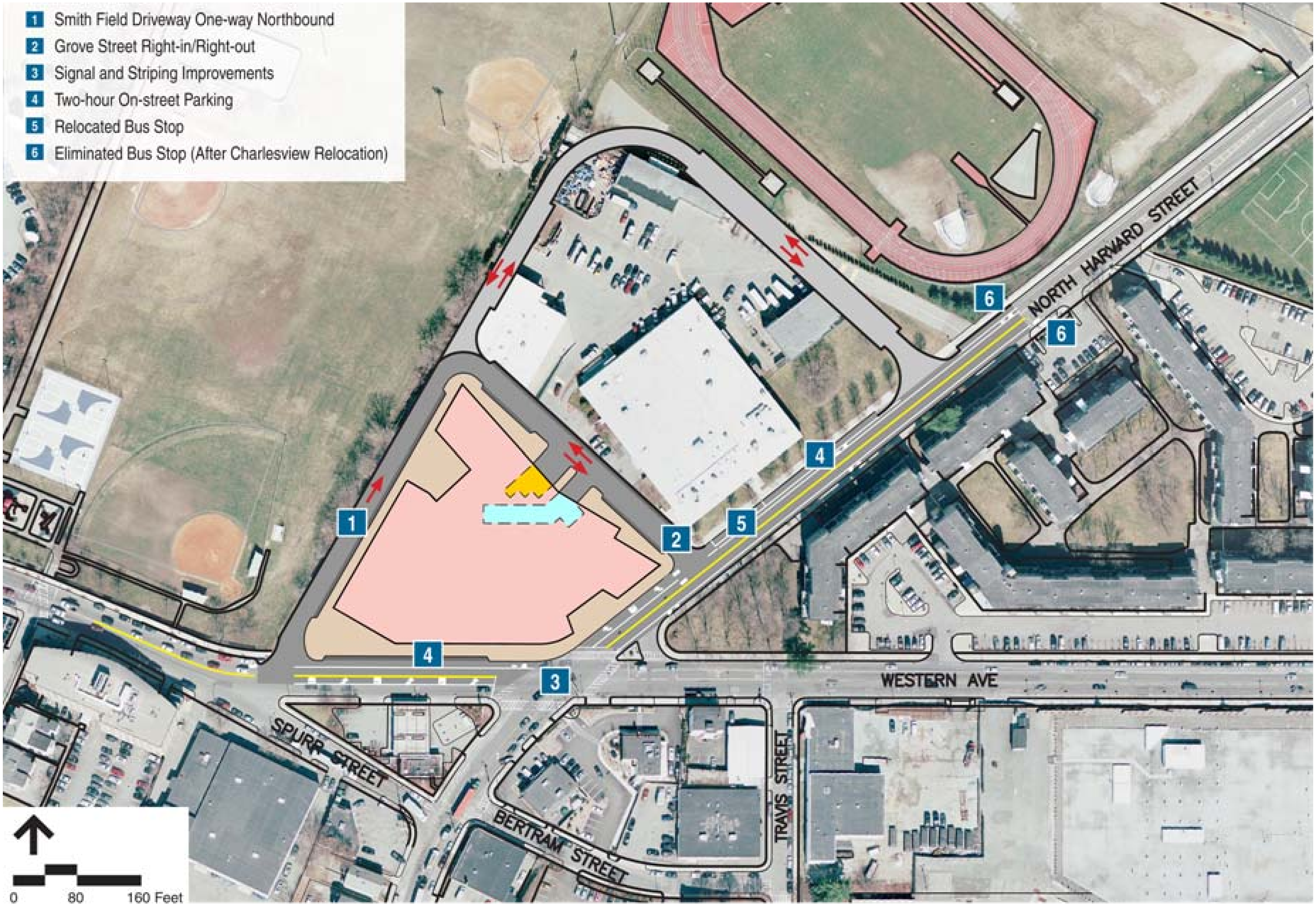
The Projects includes approximately 180 parking spaces within the garage that would meet the overnight parking demand for the residential portion of the Project's program. The short-term parking demand of the Project will be met by newly created spaces on "Smith Field Drive," "Grove Street" And Western Avenue. However, retail uses in the Project and other businesses would also benefit from additional short-term parking opportunities in Barry's Corner.

Observations indicate that the sections of North Harvard Street and Western Avenue next to the Project site are used for long-term parking, including parking by some residents of Charlesview. This type of parking is generally incompatible with the evolution of Barry's Corner into a mixed use district with active retail uses. The relocation of the Charlesview residences affords the opportunity to implement two-hour parking on North Harvard Street and Western Avenue in Barry's Corner. In addition, it is also possible to relocate parking from the east side of North Harvard Street, next to Charlesview, to the west side of the street to increase its proximity to new retail uses and to improve the alignment of traffic lanes through the intersection.

2.8 Proposed Transportation Improvements

A primary goal of the Project is to help transform the Barry's Corner area into a vibrant, urban environment with an emphasis on pedestrian and bike connectivity. The Project includes two new streets, "Smith Field Drive" and "Grove Street," that provide attractive pedestrian connections along the site and to Smith Field. The pedestrian realm on North Harvard Street and Western Avenue will be improved in front of the site to enhance Barry's Corner. Proposed improvements are focused on improving multimodal access to the site and at Barry's Corner.

The Transportation Study and information in this document have identified specific roadway and intersection improvements that further this goal and are sufficient to reduce and manage the traffic impacts expected from the proposed Project. The proposed improvements, which are



Vanasse Hangen Brustlin, Inc.

Figure 2-2

Proposed Transportation Improvements

identified in Figure 2-2, are consistent with the City's Complete Streets guidelines and emphasize accommodation of pedestrians and bicycles within the street environment. These measures will be formalized in the Transportation Access Plan Agreement (TAPA) that will be executed with BTD.

2.8.1 Site Access and Circulation

The proposed site access and circulation is designed to mitigate potential impacts at the site driveways by prohibiting traffic from making turns that could also affect the operation of Barry's Corner. These measures include:

- **One-way "Smith Field Drive"** – Operate "Smith Field Drive" as a one-way street from Western Avenue to "Grove Street" to reduce potential conflicts caused by traffic that would otherwise use this driveway to exit the site onto Western Avenue.

- **"Grove Street" Turn Restrictions** – Restrict turns at the "Grove Street" intersection with North Harvard Street to right-in/right-out operation to reduce conflicts at this location.

- **"Smith Field Drive Extension"** – Provide a secondary, two-way driveway connection to North Harvard Street through the adjacent 175 North Harvard Street property to accommodate access to and from the north for vehicles that would otherwise use "Grove Street."

2.8.2 Improvements to Barry's Corner

Improvements at Barry's Corner are aimed at improving operations for all users, including pedestrians, bicyclists, transit riders, and motorists. The proposed improvements will bring intersection operations back to No-Build levels while improving the pedestrian and bike experience at Barry's Corner. In addition, these measures include proposed changes to MBTA bus stop locations and on-street parking regulations in Barry's Corner. The Co-proponents will work with BTD to develop and implement the following measures.

- **Improvements to Traffic Signal** – Update the traffic signal timing, phasing and equipment to provide concurrent pedestrian crossings.

- **Pavement Marking Enhancements** – Restripe approaches and modify parking regulations to improve the accommodation of traffic queues and alignment of traffic lanes.

- **Pedestrian Ramps –** Provide ADA-compliant pedestrian crossings.

- **On-street Parking Regulation Changes** – Improve on-street parking opportunities by implementing two-hour parking regulations and relocating spaces on North Harvard Street in front of the Project (after Charlesview is relocated).

- **Bus Stop Consolidation** – Relocate the southbound North Harvard Street MBTA bus stop location to a point north of the "Grove Street" driveway and coordinate with BTD and the MBTA to eliminate the North Harvard Street bus stops north of Barry's Corner when the Charlesview residents are relocated.

2.8.3 Transportation Demand Management

Consistent with the City's goals to reduce auto dependency, the Project will offer Transportation Demand Management (TDM) measures to encourage alternative modes of transportation. Measures being considered as part of the Project include:

- **Bike Storage** – Provide secure bicycle storage for building residents and employees in accordance with the City's Bicycle Parking Guidelines.

- **Public Bike Racks** – Install bicycle racks at grade for general public use.

- **Hubway Station** – Maintain the Hubway bike sharing station within Barry's Corner, possibly at a new location on the northeast quadrant of Barry's Corner.

- **Parking Fees in New Garage** – Charge market rates for parking.

- **Zipcar** – Provide two on-site parking spaces for a community car-sharing organization (e.g. Zipcar).

- **Harvard Shuttle Bus** – Work with public agencies to extend the Harvard Shuttle bus service into Barry's Corner and provide access to this service for residents and employees of the Barry's Corner Residential and Retail Commons project and for neighborhood residents with ID card issued by the Education Portal.

- **Transportation Coordinator** – Designate an on-site Transportation Coordinator to oversee parking and loading operations as well as promote alternative transportation measures.

- **Employee Transit Pass Sales** – Encourage commercial tenants to provide on-site transit pass sales to employees.

- **Employee Transit Pass Subsidies** – Encourage commercial tenants to provide a 50 percent transit subsidy.

- **Transit Pass Sales for Residents** – Encourage the residential property manager to provide on-site pass sales to residents.

- **Transit Information** – Provide transit information such as maps and schedules to new residents and tenants in an orientation package. Provide this information in the residential lobbies.

In addition, the Co-proponents will work with BTD to develop appropriate measures to integrate these transportation elements into a cohesive a Barry’s Corner “Transportation Hub” concept.

Chapter 3.0

Environmental Review Component

3.0 ENVIRONMENTAL REVIEW COMPONENT

3.1 Introduction

This chapter presents information on the environmental conditions in the vicinity of the Project site and the potential changes that may occur as a result of the Project. A key goal of the Project is to redevelop the site for higher and better uses while avoiding or minimizing potential adverse environmental impacts.

As discussed in more detail below, the Project-related impacts, which are to be expected in any low- to mid-rise development of this scale, are counterbalanced by the significant benefits for the neighborhood and city created by the Project. Temporary construction-period impacts will be managed to minimize disruption to the surrounding neighborhood.

In accordance with Article 80 of the Code, this expanded PNF considers the potential for Project impacts in the following categories following Article 80 Large Project Review guidelines:

- Wind
- Shadow
- Daylight
- Solar Glare
- Air Quality
- Water Quality
- Flood Hazard
- Groundwater and Geotechnical
- Solid and Hazardous Waste
- Noise
- Construction
- Rodent Control
- Green Building/Sustainability

As demonstrated in the following sections, the Project has been designed to minimize and mitigate its environmental impacts.

3.2 Wind

3.2.1 Summary of Impacts

A pedestrian wind study was conducted for the proposed Project. The objective of the study was to assess the effect of the Project on local wind conditions in pedestrian areas in and around the study site. The results of the analysis are typical of urban development projects of this scale. Of the 60 sensor locations studied, 53 of them are at grade level and the remaining seven are located within the building footprint – at the podium or roof level. In terms of pedestrian level wind conditions, all but seven of the locations tested were suitable for walking or better on an annual basis in the Build Configuration. The Project does not create any dangerous locations throughout the year nor any annual safety exceedances in terms of wind gusts at any of the locations studied.

Many downwind locations both within the Project site and further along Western Avenue and North Harvard Street will actually experience improved conditions due to the Project and will become suitable for standing or sitting as opposed to their current categorization of suitable for walking.

Of the seven locations categorized as uncomfortable on an annual basis in the Build Configuration (only five of which were due to the proposed Project), two are upwind of the Project and have experienced no change as a result of the Project. Of the remaining five locations, three are located on site at the corners of the building, where wind acceleration is expected, one is located on the roof top terrace, and the last one is located on Western Avenue directly across from the southern face of the Project. Specific mitigation measures, if necessary, will be determined as the design process proceeds. It is anticipated that the minor discomfort at these locations can be mitigated with localized solutions such as landscaping, wind screens or building canopies.

3.2.2 Methodology and Overview

The study involved wind simulations on a 1:400 scale model of the proposed building and surroundings. These simulations were conducted in RWDI’s boundary-layer wind tunnel at Guelph, Ontario, for the purpose of quantifying local wind speed conditions and comparing to the criteria recommended by the Boston Redevelopment Authority for gauging wind comfort in pedestrian areas. A list of the drawings used for the construction of the model can be found in Appendix C.

Major buildings, especially those that protrude above their surroundings, often cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings intercept these faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around corners of buildings may also cause increases in wind speed. Conversely, if a building is surrounded by others of equivalent height, it may be protected from the prevailing upper level winds, resulting in no significant changes to the local pedestrian level wind environment. The most effective way to assess potential pedestrian level wind impacts around a proposed new building is to conduct scale model tests in a wind tunnel. Information concerning the site and surroundings was derived from site photographs and site plans.

Information concerning the site and surroundings was derived from site photographs and site plans.

Two configurations were simulated:

- No Build Configuration: includes all existing surrounding buildings, and
- Build Configuration: includes the proposed Project, the previously approved Harvard Allston Science Complex, and all existing surroundings.

The wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1,500 foot radius of the study site. The mean speed profile and turbulence of the natural wind approaching the modeled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with 60 specially designed wind speed sensors to record the mean and fluctuating components of wind speed at a full scale height of five feet above grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 wind directions, in 10 degree increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long term meteorological data, recorded during the years 1981 to 2011 at Boston's Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

3.2.3 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root mean square wind speed) of 31 miles per hour (mph) should not be exceeded more than one percent of the time. The second set of criteria used by the BRA to determine the acceptability of specific locations is based on the work of Melbourne. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the 1-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed). They are as follows:

Table 3.2-1 BRA Mean Wind Criteria*

Dangerous	> 27 mph
Uncomfortable for Walking	> 19 and ≤ 27 mph
Comfortable for Walking	> 15 and ≤ 19 mph
Comfortable for Standing	> 12 and ≤ 15 mph
Comfortable for Sitting	< 12 mph

* Applicable to the hourly mean wind speed exceeded one percent of the time.

The wind climate found in a typical downtown location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BRA effective gust velocity criterion of 31 mph.

3.2.4 Test Results

Table 1 in Appendix C presents the mean and effective gust wind speeds for each season as well as annually. Figure 3.2-1 graphically depicts the wind comfort conditions at each of the 60 wind measurement location based on the annual winds for the Build Configuration.

Project and Surrounding Sidewalks (Locations 41-60)

In most locations, the conditions around the proposed Project (Locations 41-60, both at and above grade level) were predicted to be suitable for walking or better, and the safety criterion for all of the locations was met on an annual basis. At only three of the 12 pedestrian level locations studied in this area, uncomfortable conditions were found (locations 42, 45, and 50). All three of these locations are found at corners of the building, which is where wind acceleration typically occurs. Such situations can be mitigated with the use of canopies and/or wind screens, either natural or mechanical. It is expected that the proposed street trees will also help mitigate wind conditions around the Project. There are three on-site locations (Locations 41, 44, 54) where wind conditions have been improved to standing or sitting categories as a result of the Project.

Off-site Sidewalks and Buildings (Locations 1-40)

The proposed Project is not projected to cause significant wind activity, or any safety exceedances, at any off-site locations on an annual basis, and conditions are projected to be generally suitable for walking or standing, with some locations suitable for sitting (Figure 3.2-1). There are two upwind areas (Location 17 and 28) that are existing uncomfortable conditions in the No Build Configuration, and have experienced no change as a result of the project. A total of seven off site areas (Locations 1, 4 19, 31, 32, 37, and 38) are expected to experienced improvement as a result of the project, advancing to suitable for standing or sitting from their current condition. At only a few areas (Locations 14, 15, and 16) are conditions projected to decrease one level, as a result of the Project. Specific mitigation measures, if necessary, will be determined as the design process proceeds. It is anticipated that any discomfort at these locations can be mitigated with localized solutions such as on site landscaping or building canopies that will serve to decelerate wind crossing the site and improve adjacent offsite conditions.

3.3 Shadow

3.3.1 Summary of Impacts

Using a computer based shadow study based on BRA-approved methodology; the Project team evaluated the existing and proposed conditions for shadows at four key dates through the year that represent the range of seasonal sun positions. The shadow study shows that the Project will create limited new shadows consistent with urban development that, when combined with the proposed public realm enhancements in the area, will not detrimentally affect the use of sidewalks or public areas (including Smith Field) in the vicinity of the Project site.

Figure 3.2-1

Pedestrian Wind Comfort Conditions – Build

New shadow from the Project will generally be cast onto the site, its new roadways ("Smith Field Drive" and "Grove Street"), a portion of Harvard's campus immediately north of the site and the surrounding streets. New shadow on Smith Field will be limited to the morning hours, with only small portions of new shadow during the noon time period. Some areas of Smith Field under shadow in the existing condition will be free from shadow due to the development of the Project. The increase in shadows within the Project area is not expected to have an adverse impact on the public use of the newly created pedestrian areas within the Project.

3.3.2 Methodology

The following shadow study has been prepared using methodologies consistent with accepted practices for such studies completed under Article 80 review, as is typically required by the BRA. A shadow impact analysis was conducted using a three-dimensional model to investigate shadow impacts from the Project during three time periods (9:00 a.m., 12:00 p.m., and 3:00 p.m.) during the summer solstice (June 21), autumnal equinox (September 21), vernal equinox (March 21), and the winter solstice (December 21). In addition, shadow studies were conducted for the 6:00 p.m. time period during the summer solstice and autumnal equinox.

The shadow analysis presents net new shadow from the building, as well as the existing shadow, and illustrates the incremental impact of the Project. The analysis focuses on open spaces such as Smith Field and the grove of trees along North Harvard Street, major pedestrian areas, sidewalks and MBTA bus stops adjacent to and in the vicinity of the Project site. Since the site includes a one-story building and surface parking lot, the Project will create new shadow in the surrounding area. Shadows have been determined using the applicable Altitude and Azimuth data for each study date.

3.3.3 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, new shadow from the Project will be cast to the northwest. New shadow will be cast across the new "Smith Field Drive" and a portion of Smith Field.

At 12:00 p.m., new shadow will be cast to the north. New shadow will generally be limited to the site and the adjacent new roadways, except for a small portion on Smith Field, most of which is already under shadow from the existing building on the site, and a very small portion of Harvard's campus north of the site. The new shadow from the Project will create less of an impact on Smith Field than the existing building on the site during this time period.

At 3:00 p.m., new shadow will be cast to the northeast and be limited to the site and "Grove Street" and a portion of Harvard's campus north of the site.

The shadow study for the vernal equinox is presented in Figure 3.3-1 to 3.3-3.

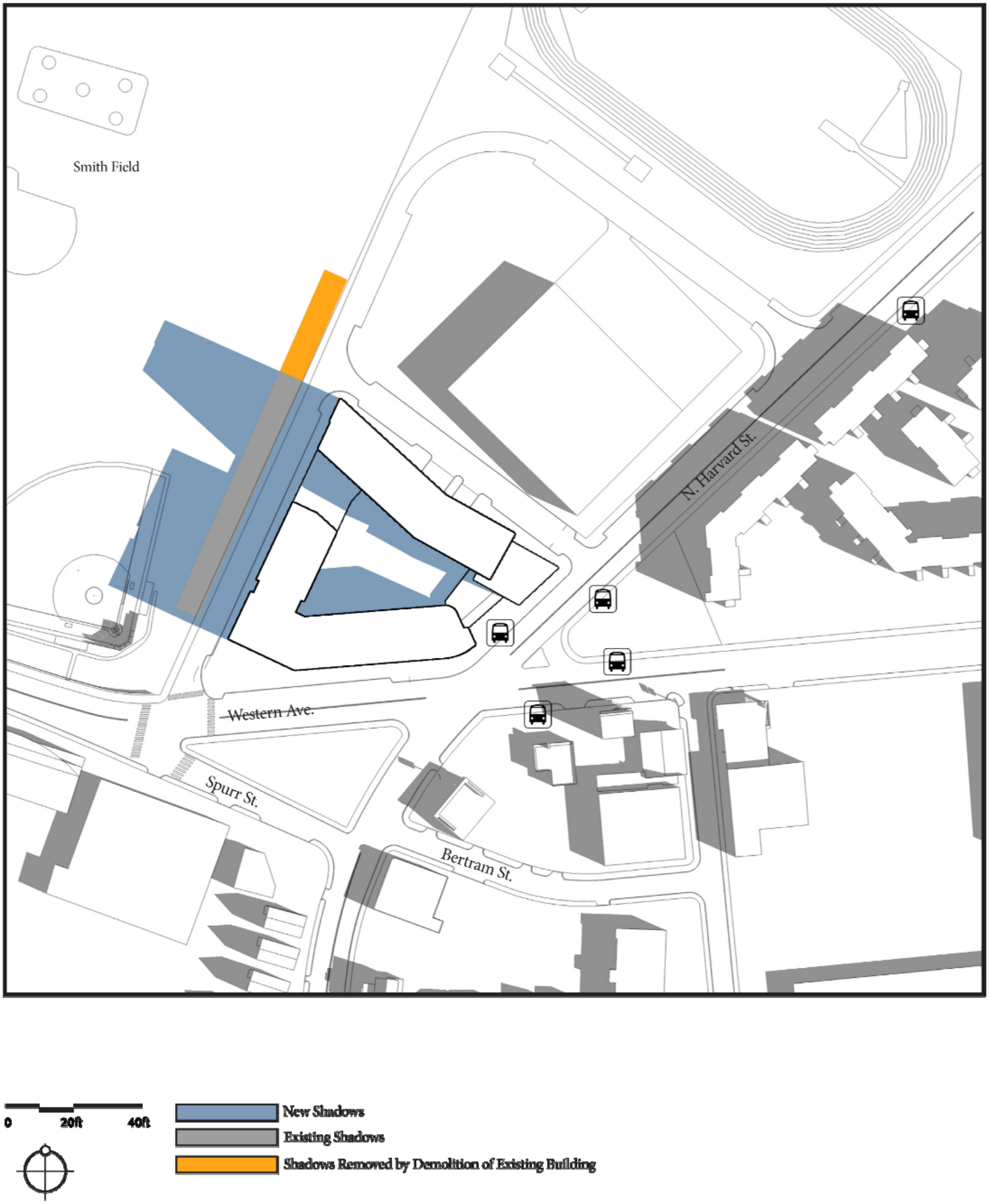


Figure 3.3-1

Shadow Study - March 21, 9:00 a.m.

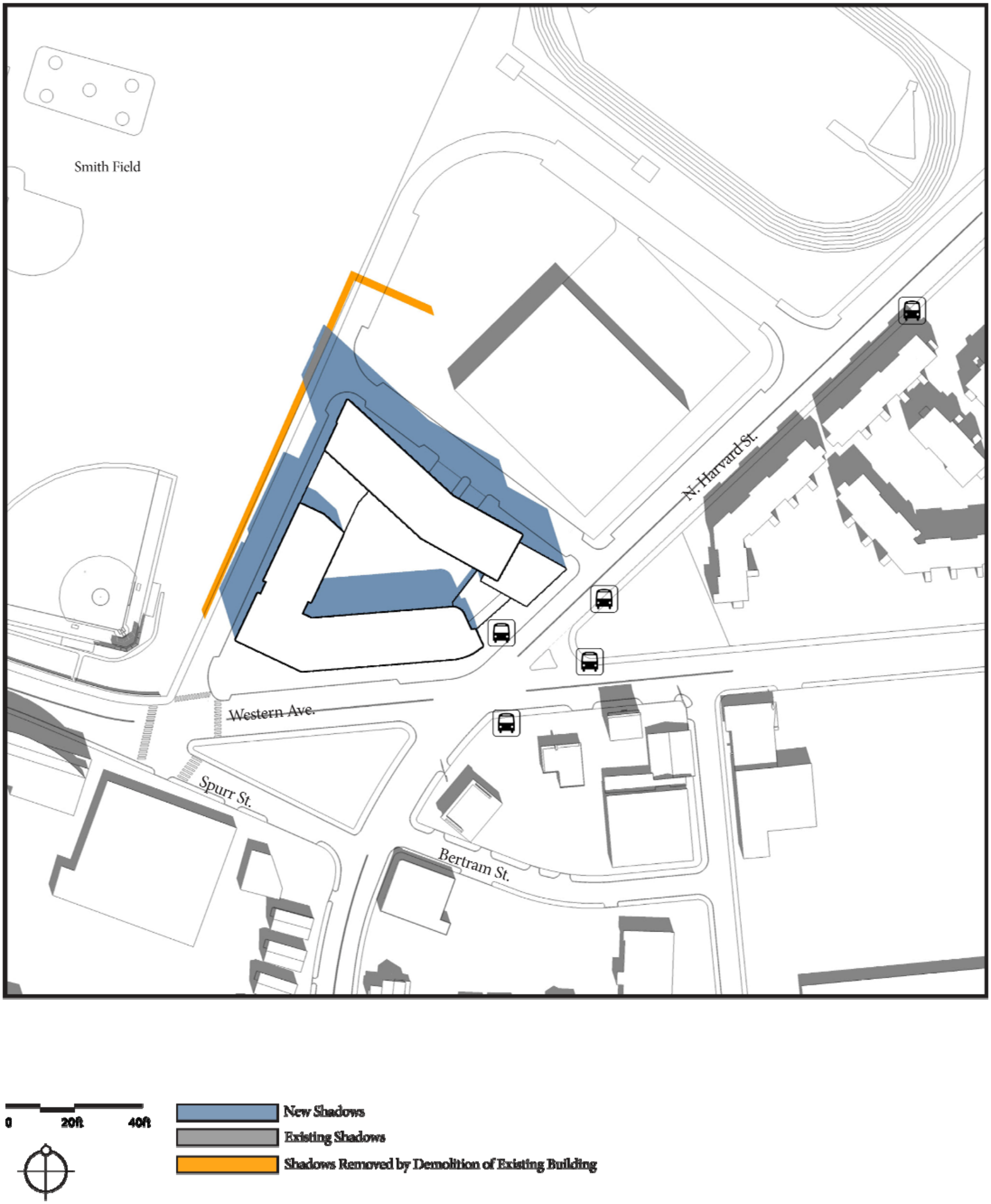


Figure 3.3-2

Shadow Study - March 21, 12:00 .p.m.

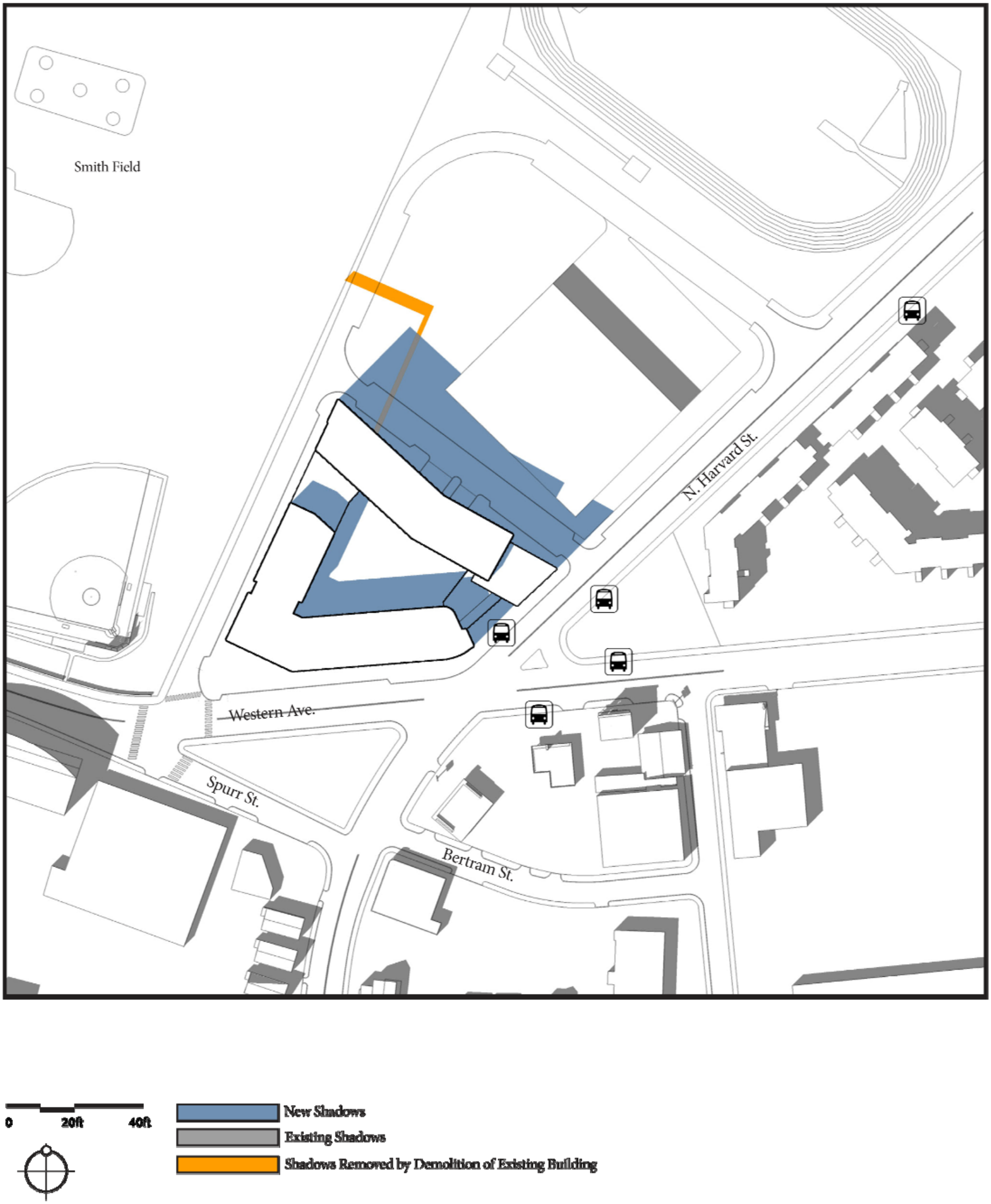


Figure 3.3-3

Shadow Study – March 21, 3:00 p.m.

3.3.4 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, new shadow will be cast to the northwest. New shadow will be cast onto the new “Smith Field Drive” and a portion of Smith Field. New shadow from the Project will extend beyond the current shadow from the existing building on the south side of Smith Field, while further north, a portion of Smith Field under shadow currently will be free from shadow with development of the Project.

At 12:00 p.m., new shadow will be cast to the north and will be limited to the Project site, including the new roadways.

At 3:00 p.m., new shadow will be cast to the northeast and will generally be limited to the Project site and the new ”Grove Street”, except for a small portion of new shadow in North Harvard Street and its western sidewalk and a minor portion of Harvard’s campus north of the site. New shadow will also be cast onto a portion of an existing bus stop.

At 6:00 p.m., new shadow will be cast to the east. New shadow will be cast across North Harvard Street and its sidewalks, a small portion of Western Avenue and its northern sidewalk, a small portion of the Harvard campus north of the site and the grove of trees east of the site. The existing MBTA bus stops on North Harvard Street and one on Western Avenue will also be in shadow.

The shadow study for the summer solstice is presented in Figure 3.3-4 to 3.3-7.

3.3.5 Autumnal Equinox (September 21)

At 9:00 a.m. during the autumnal equinox, new shadow from the Project will be cast to the northwest. New shadow will be cast across the new “Smith Field Drive” and a portion of Smith Field. New shadow from the Project will extend beyond the current shadow from the existing building on the south side of Smith Field, while further north, a portion of Smith Field under shadow currently will be free from shadow with development of the Project.

At 12:00 p.m., new shadow is cast to the north. New shadow will generally be limited to the site and the adjacent new roadways, except for a small portion on Smith Field and a small portion of Harvard’s campus north of the site. Areas of Smith Field currently under shadow due to the existing building on the site will be free from shadow with the development of the Project.

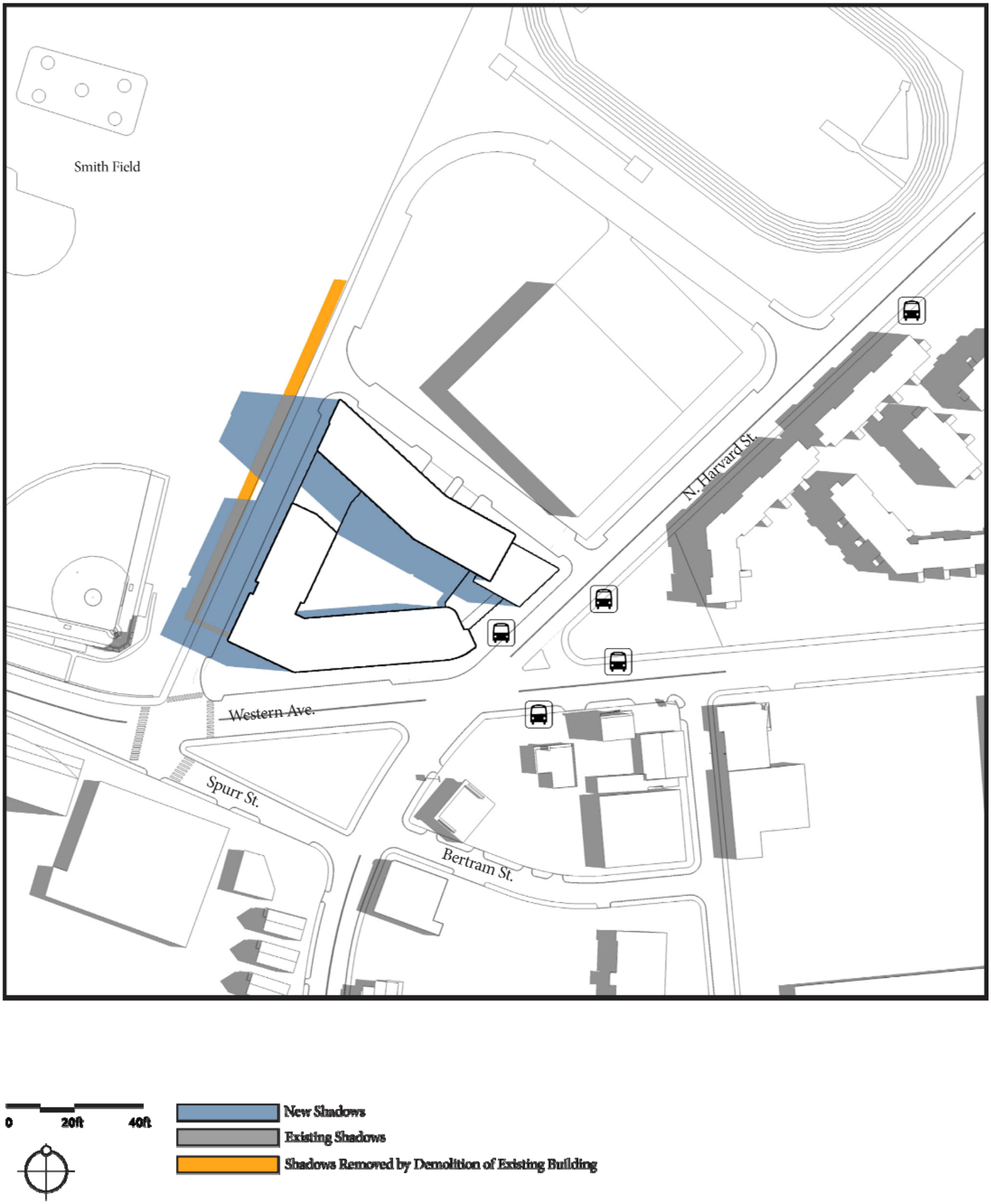


Figure 3.3-4

Shadow Study – June 21, 9:00 a.m.

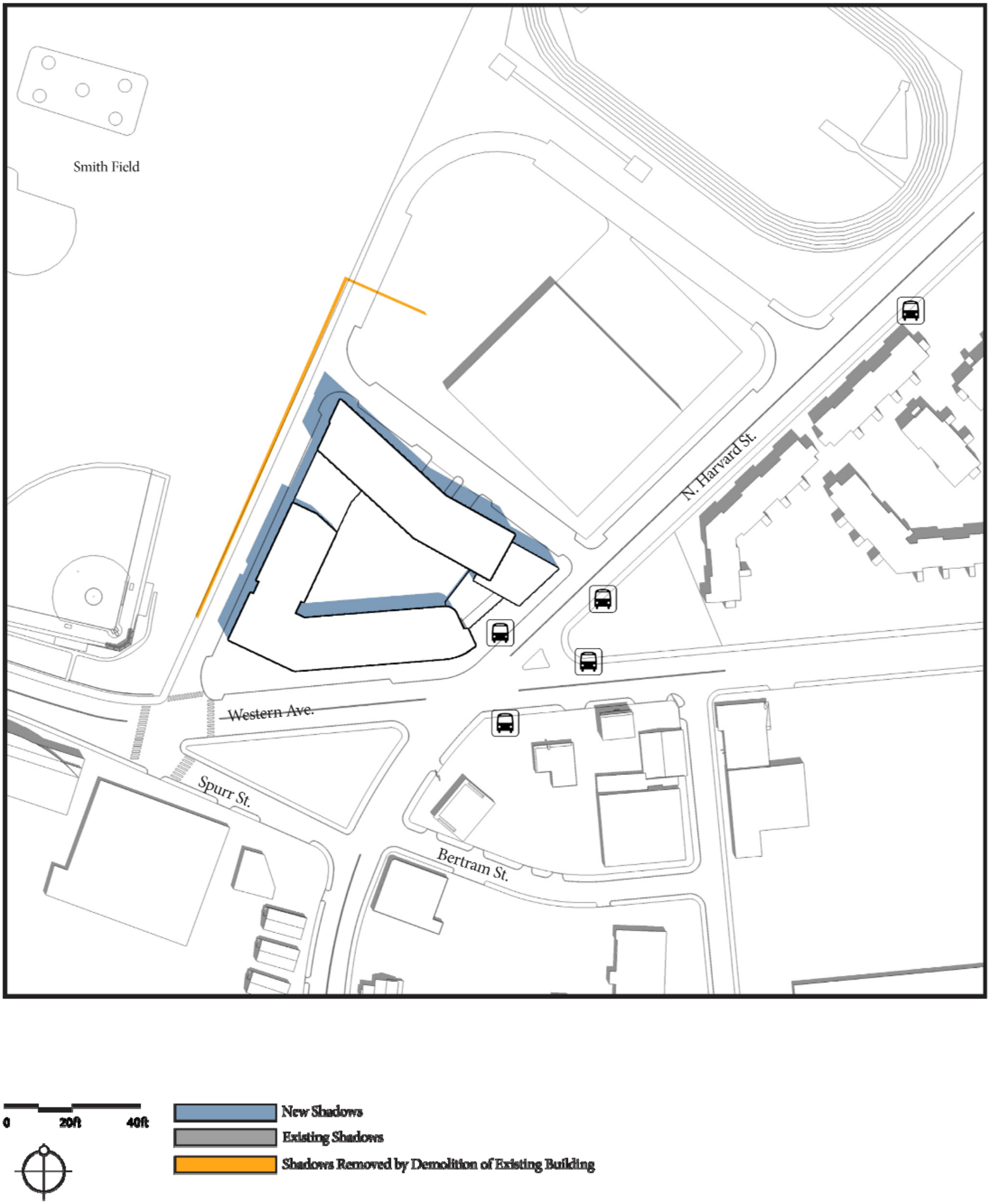
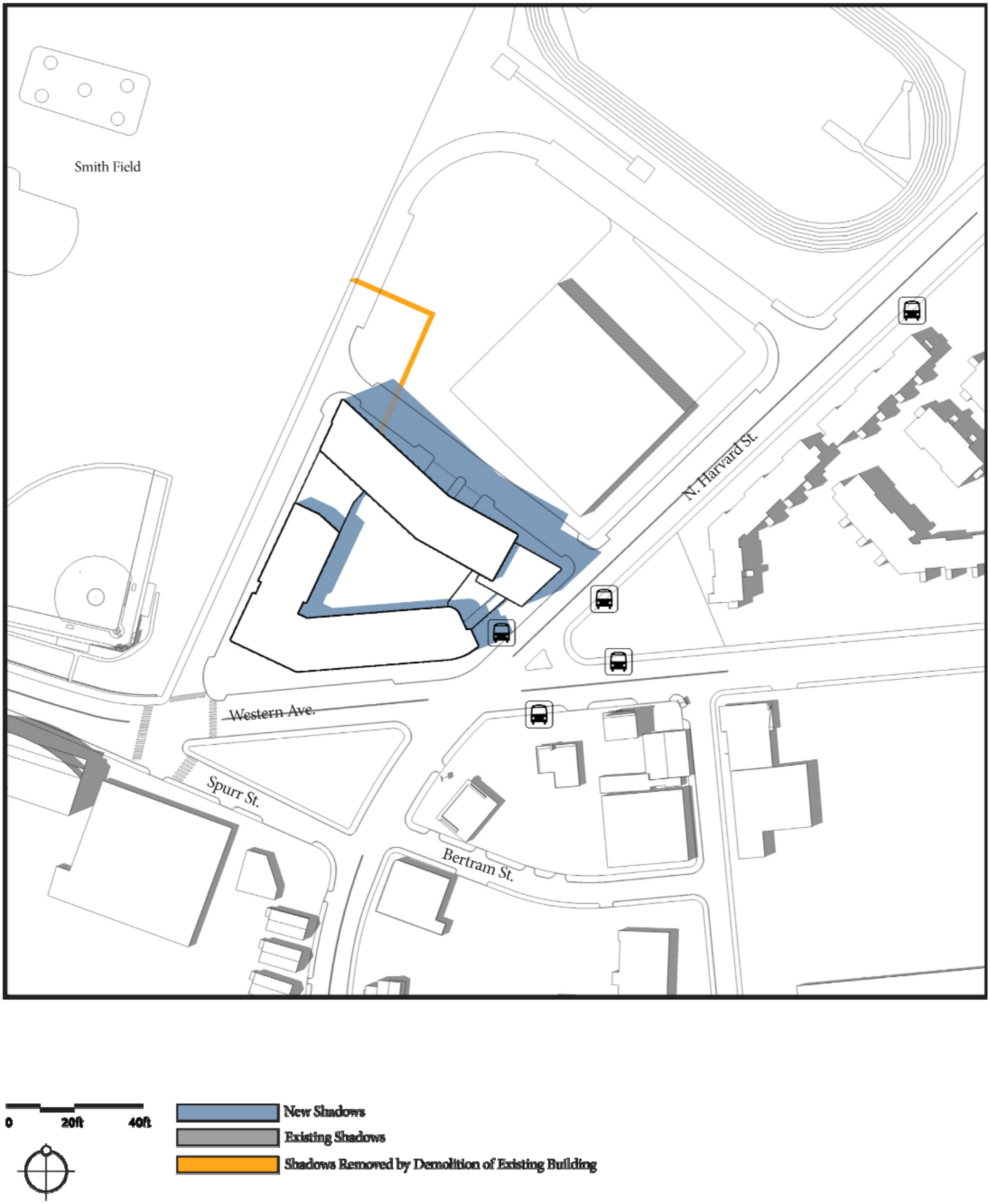


Figure 3.3-5

Shadow Study – June 21, 12:00 p.m.

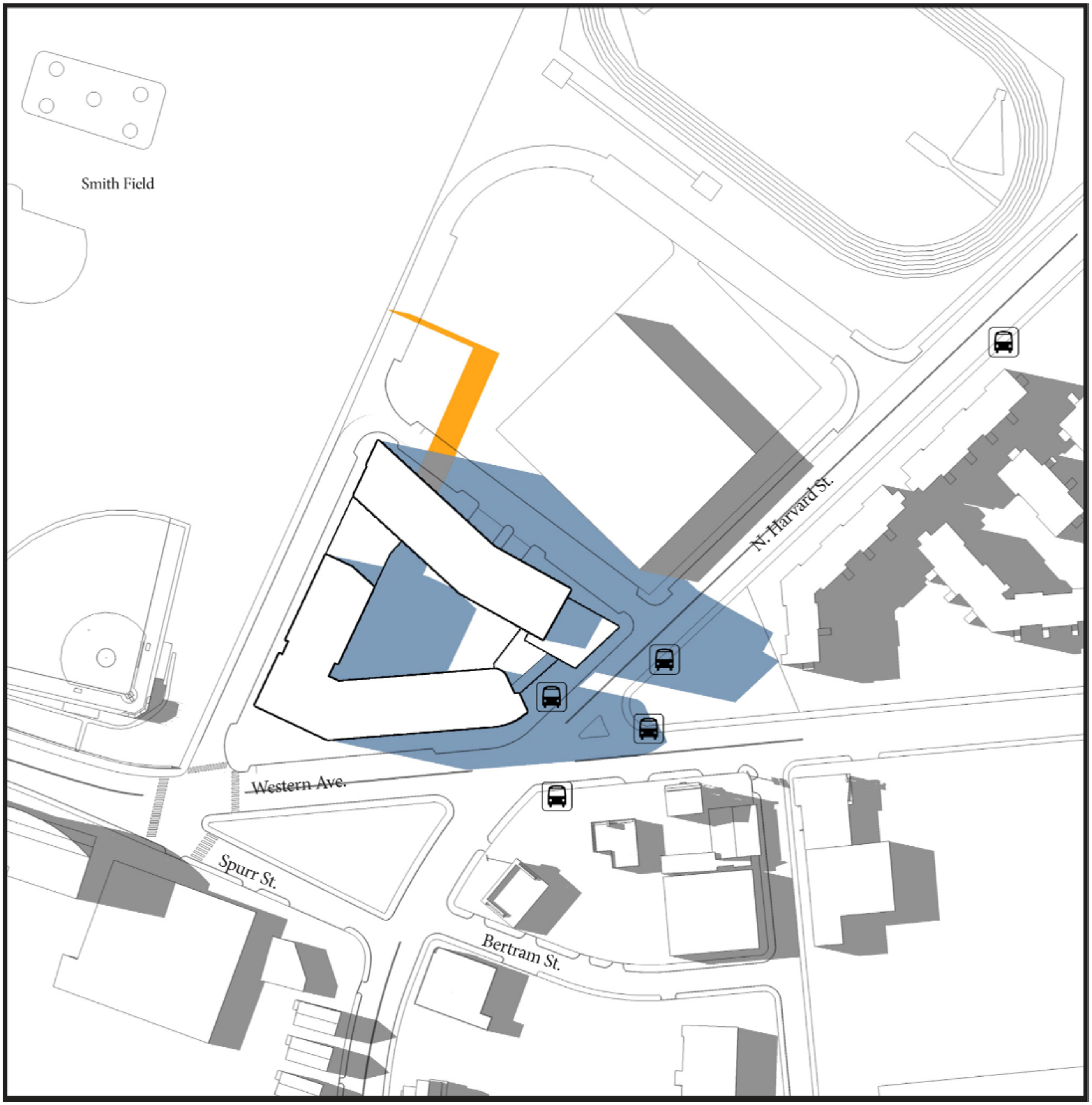


ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.3-6

Shadow Study – June 21, 3:00 p.m.



0 20ft 40ft

New Shadows

Existing Shadows

Shadows Removed by Demolition of Existing Building

ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.3-7

Shadow Study – June 21, 6:00 p.m.

At 3:00 p.m., new shadow will be cast to the northeast and be limited to the site, including "Grove Street," and a portion of Harvard's campus north of the site.

At 6:00 p.m., new shadow will be cast to the east. New shadow will be cast onto the site, across North Harvard Street and its sidewalks and MBTA bus stops, and the grove of trees east of the site. A portion of the Charlesview Apartments site will also be in new shadow.

The shadow study for the autumnal equinox is presented in Figure 3.3-8 to 3.3-11.

3.3.6 Winter Solstice (December 21)

The winter solstice creates the least favorable conditions for sunlight in New England. The sun angle during the winter is lower than in any other season, causing the shadows in urban areas to elongate and be cast onto large portions of the surrounding area.

At 9:00 a.m. during the winter solstice, new shadow is cast to the northwest. New shadow will be cast across the Project site and its new roadways, a portion of Smith Field including areas under shadow in the existing condition, and a small portion of Harvard's campus north of the site.

At 12:00 p.m., new shadow will be cast to the north. New shadow will be cast across the Project site and its new roadways, a minor portion of Smith Field, and a portion of Harvard's campus north of the site. Areas of Smith Field currently under shadow due to the existing building on the site will be free from shadow with the development of the Project.

At 3:00 p.m., new shadow will be cast to the northeast. New shadow will be cast across "Grove Street" and a portion of Harvard's campus north of the site.

The shadow study for the winter solstice is presented in Figure 3.3-12 to 3.3-14.

3.3.7 Conclusions

As the site currently includes a one story building and surface parking lot, the construction of the Project will increase shadow in the surrounding area. New shadow from the Project will generally be cast onto the site, its new roadways ("Smith Field Drive" and "Grove Street"), and portions of Harvard's campus immediately north of the site. No new shadow will be cast onto North Harvard Street during 11 of the 14 time periods studied. New shadow on nearby bus stops will be limited to four time periods in the afternoon and evening. No new shadow will be cast onto Western Avenue during 13 of the 14 time periods studied. New shadow on Smith Field will generally be limited to the morning hours, and be only on minor areas adjacent to the Project site by noontime. Some areas of Smith Field that are under shadow in the existing condition will be free from shadow due to the demolition of the existing building in connection with the development of the Project. There is no new shadow on the grove of trees across North Harvard Street to the east of the Project site during 12 of the 14 time periods studied; new shadow is limited to the 6:00 p.m. time periods studied (June 21 and September 21).

Figure 3.3-8

Shadow Study – September 21, 9:00 a.m.

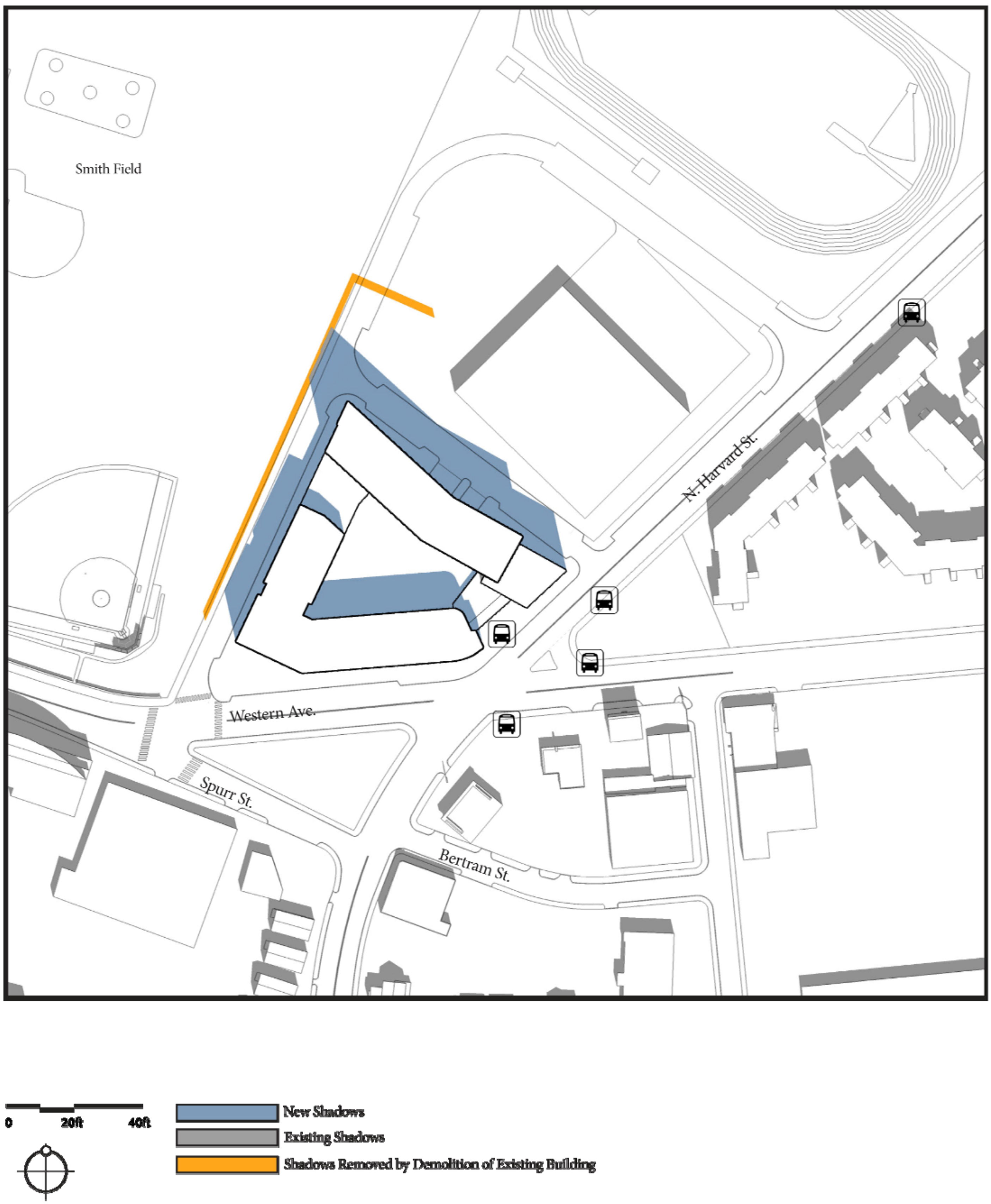
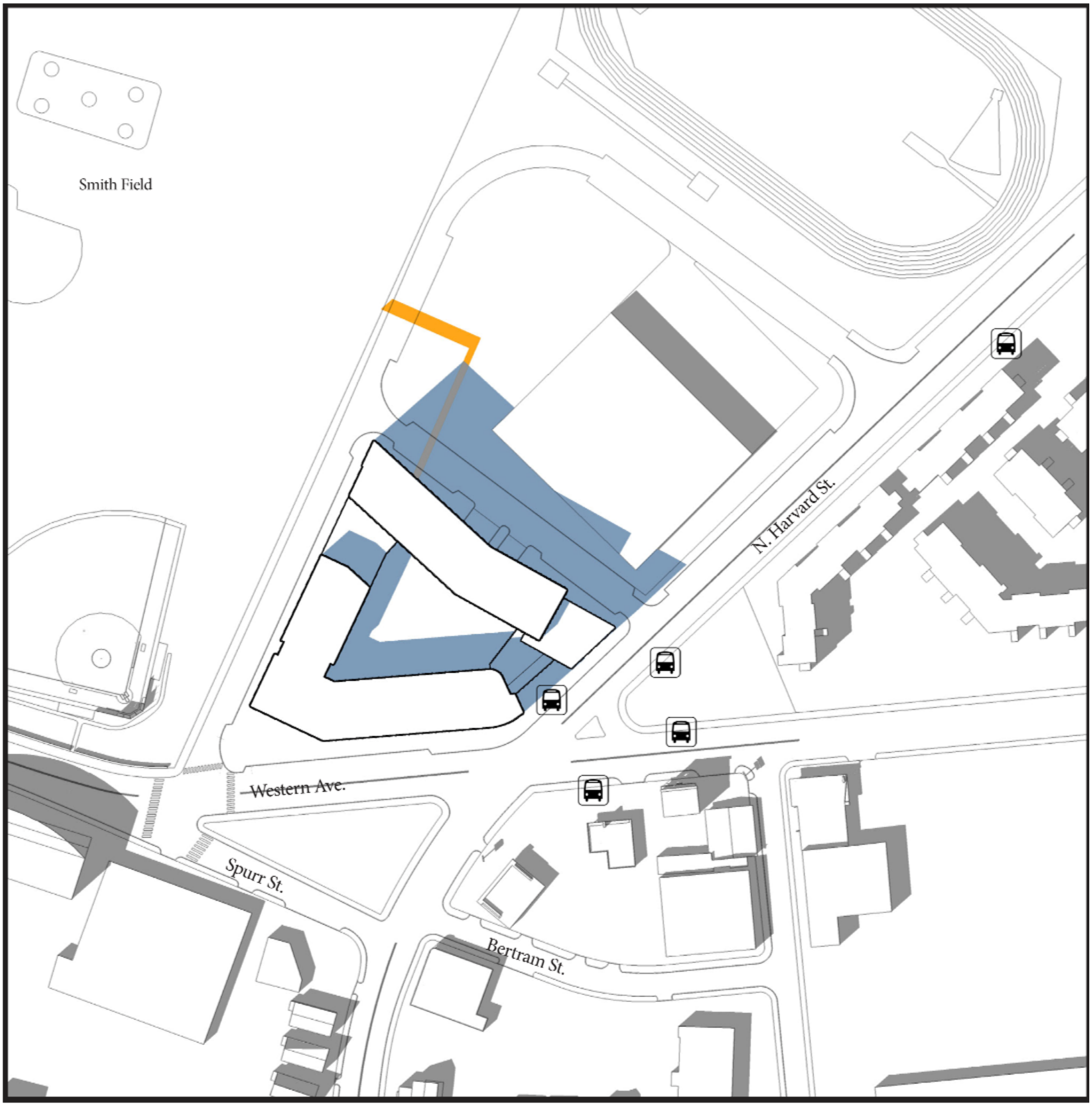


Figure 3.3-9

Shadow Study – September 21, 12:00 p.m.



0 20ft 40ft

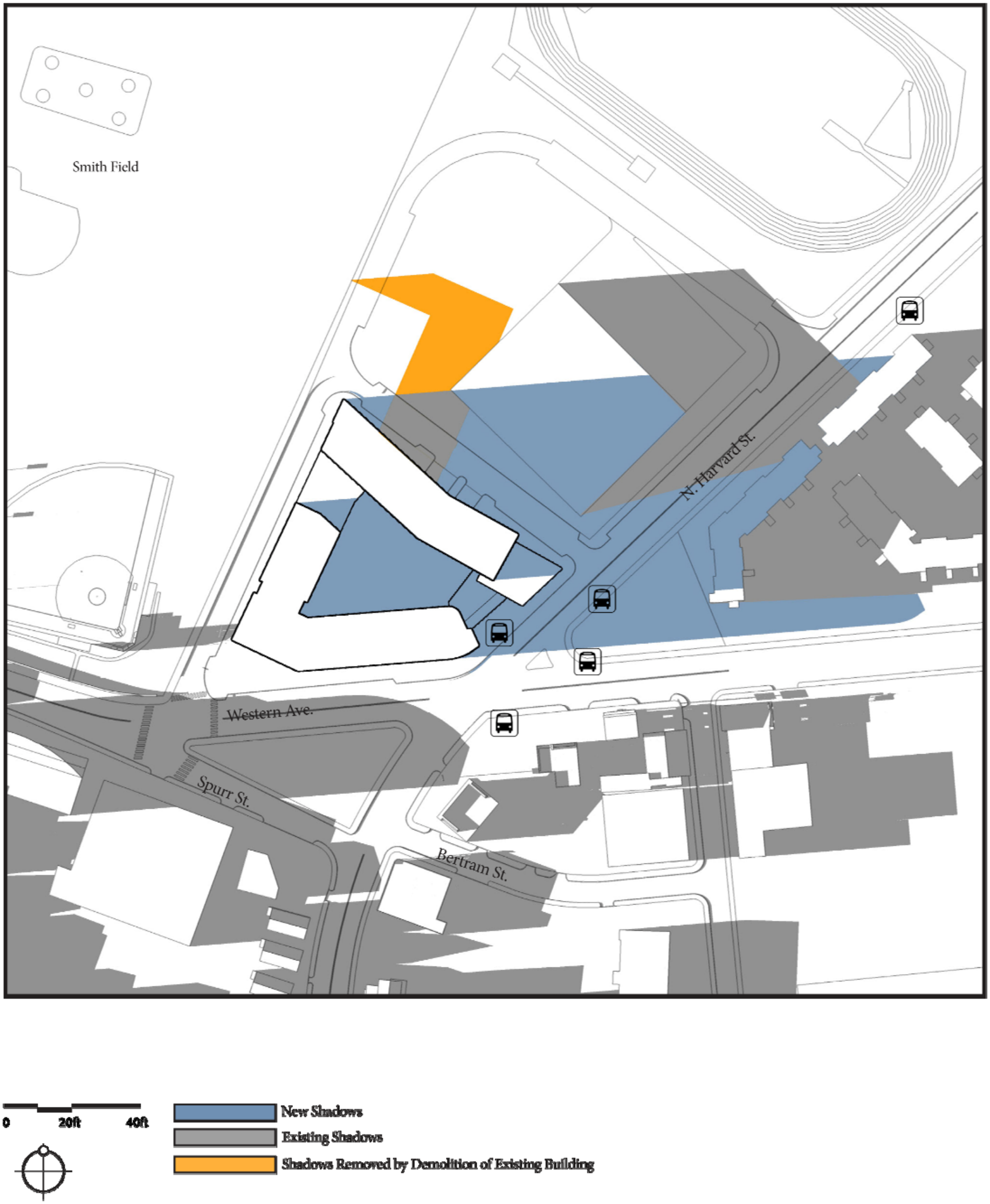
New Shadows
Existing Shadows
Shadows Removed by Demolition of Existing Building

ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.3-10

Shadow Study – September 21, 3:00 p.m.



ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.3-11

Shadow Study – September 21, 6:00 p.m.

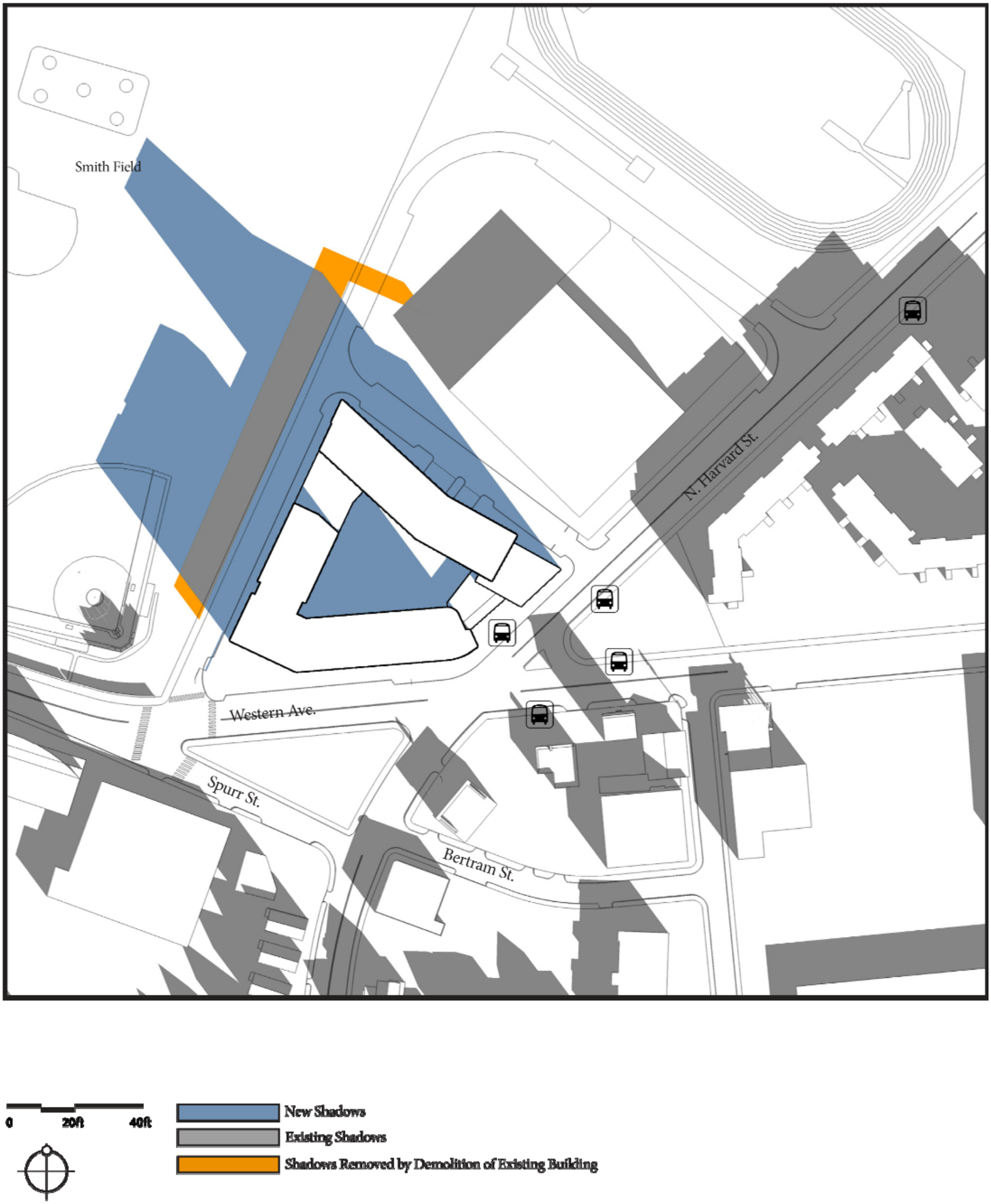


Figure 3.3-12

Shadow Study – December 21, 9:00 a.m.

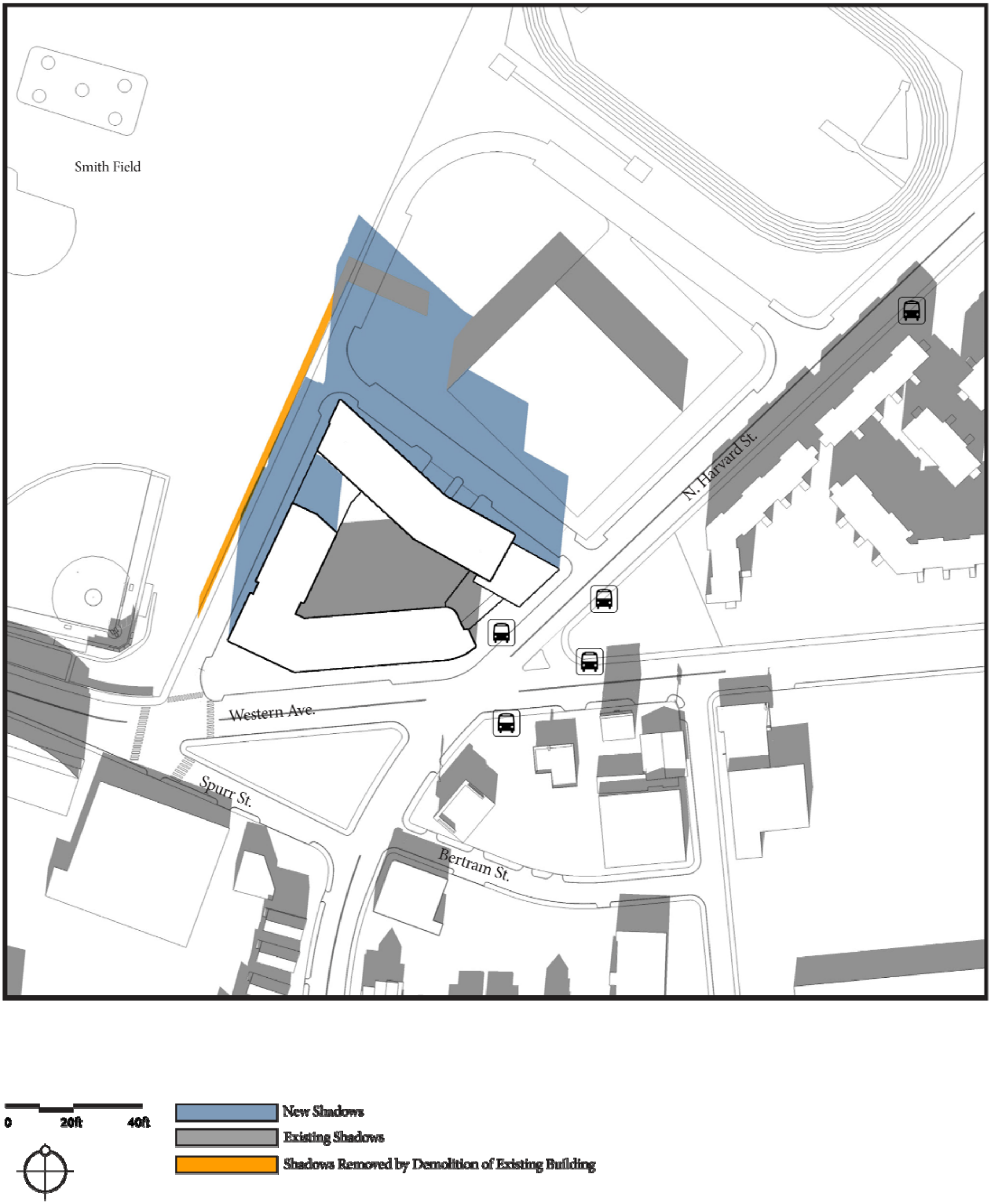
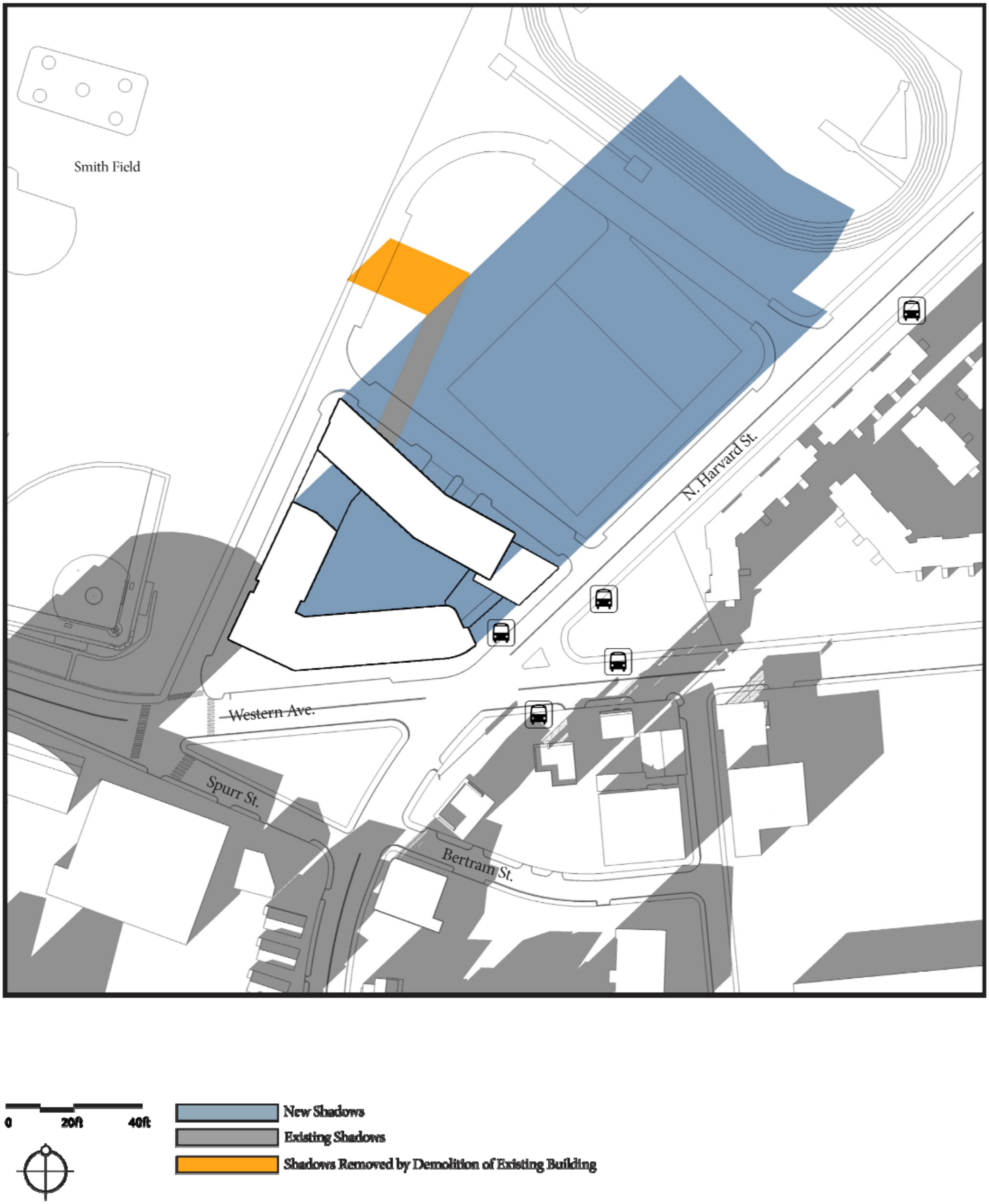


Figure 3.3-13

Shadow Study – December 21, 12:00 p.m.



ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.3-14

Shadow Study – December 21, 3:00 p.m.

3.4 Daylight

3.4.1 Summary of Impacts

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and in the surrounding area. Due to the small scale of the existing building and openness of the site, the Project will create new daylight obstruction when viewed from the surrounding streets. However, the new daylight obstruction from three of the four viewpoints, including from Smith Field, will be similar to the surrounding area and typical of the North Allston area.

3.4.2 Methodology/ BRADA Software

The purpose of a daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching the streets and the sidewalks in its immediate vicinity. A daylight analysis for the proposed Project considers the existing and proposed conditions on the site and daylight obstruction values of the surrounding area.

The daylight analysis was performed utilizing the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program.[1] This program measures the percentage of sky that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

Using BRADA, a silhouette view of the building is taken at ground level from the middle of the adjacent city streets or pedestrian ways centered on the proposed building. Viewpoints from other areas, such as open spaces, can also be accommodated in most conditions. The façade of the building facing the viewpoint, including heights, setbacks, corners and other features, is plotted onto a base map using lateral and elevation angles. The two-dimensional base map generated by BRADA represents a figure of the building in the "sky dome" from the viewpoint chosen. The BRADA program calculates the percentage of daylight that will be obstructed on a scale of zero to 100 percent based on the width of the view, the distance between the viewpoint and the building, and the massing and setbacks incorporated into the design of the building; the lower the number, the lower the percentage of obstruction of daylight from any given viewpoint.

The analysis compares three conditions: Existing Conditions; Proposed Conditions; and the Area Context. For the Existing and Proposed Conditions, viewpoints were chosen along Western Avenue (Viewpoint 1), North Harvard Street (Viewpoint 2), the proposed "Grove Street" (Viewpoint 3) and from within Smith Field (Viewpoint 4). Three area context points were considered in order to provide a basis of comparison to existing conditions in the surrounding area, including Charlesview Apartments from North Harvard Street (AC1), Teele Hall from

[1] Method developed by Harvey Bryan and Susan Stuebing, computer program developed by Ronald Fergle, Massachusetts Institute of Technology, Cambridge, MA, September 1984.

Western Avenue (AC2) and 178 Western Avenue from Western Avenue (AC3). The viewpoints and area context viewpoints are shown on Figure 3.4-1. Figures 3.4-2 to 3.4-4 show the results of the daylight analysis.

3.4.3 Viewpoints

Western Avenue – Viewpoint 1

Western Avenue borders the Project site to the south. Viewpoint 1 was taken from the center of Western Avenue looking directly north at the Project site. This view of the existing site leaves most of the sky dome free from obstruction, having a daylight obstruction value of 2.8%, with the existing building on the far left side. The development of the Project will increase the daylight obstruction value to 57.7%. This daylight obstruction value is similar to that found along Western Avenue and in other areas of Allston.

North Harvard Street – Viewpoint 2

Viewpoint 2 was taken from the center of North Harvard Street, which borders the Project site on the east. Due to the location of the existing building on the opposite side of the Project site, the existing daylight value is 0%. The Project will increase the daylight obstruction value to 30.4%. The daylight obstruction value is minimized due to the open space between the two larger components of the Project, leaving a large view of the sky, and is similar to the daylight obstruction values in the surrounding area.

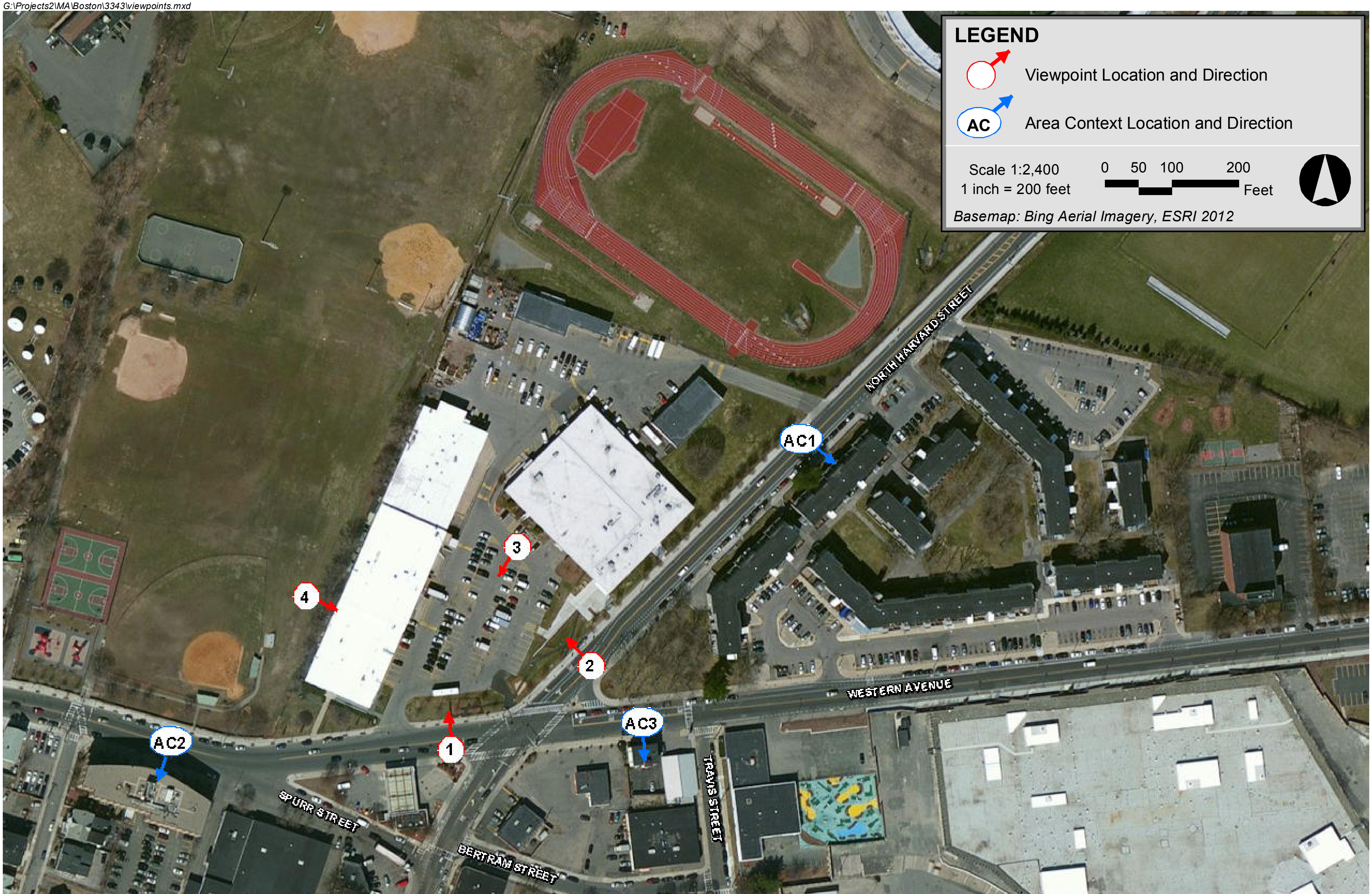
"Grove Street" – Viewpoint 3

The Project proposes a new roadway on the north side of the Project site called "Grove Street." From the location of this roadway in the existing condition, the viewpoint looks at the surface parking lot, and therefore the daylight obstruction value is 0%. In the proposed condition, this roadway is relatively narrow with parking lanes on each side and approximately 10 foot sidewalks. The façade of the building generally extends from the ground to the roof. The daylight obstruction value will be 86.4%. However, this façade includes setbacks in the middle portion of the façade which have not been accounted for in the daylight analysis, and therefore the daylight obstruction value is conservative and expected to be less. The daylight obstruction value is typical of urban areas.

Smith Field – Viewpoint 4

Viewpoint 4 was taken from within Smith Field just west of the Project site. The existing building on the site has a minimal setback from the property line and extends across the extent of this view, creating a daylight obstruction value of 44.6%. The Project includes a new roadway, "Smith Field Drive", as a separation between Smith Field and the new building. This set back, plus the open space and large view of the sky between the larger building components, results in a similar daylight obstruction value from this viewpoint, 45.9%.

G:\Projects2\MA\Boston\3343\viewpoints.mxd

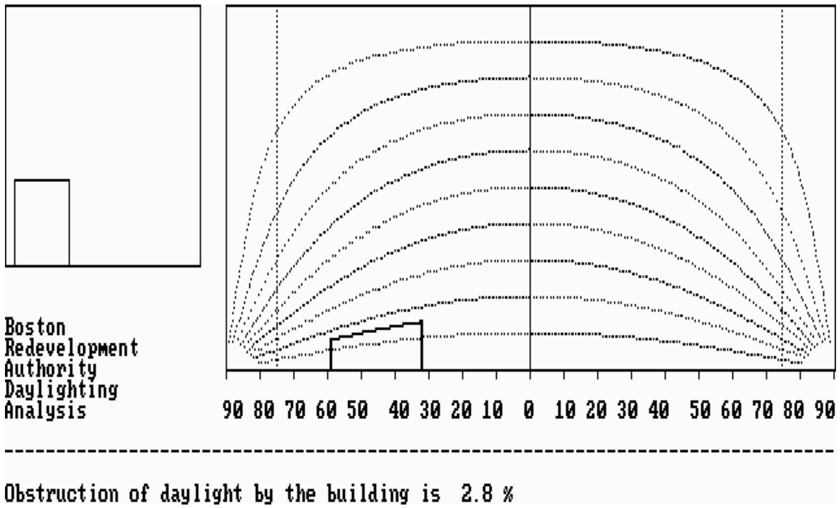


Epsilon ASSOCIATES INC.

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.4-1
Daylight Analysis Viewpoints

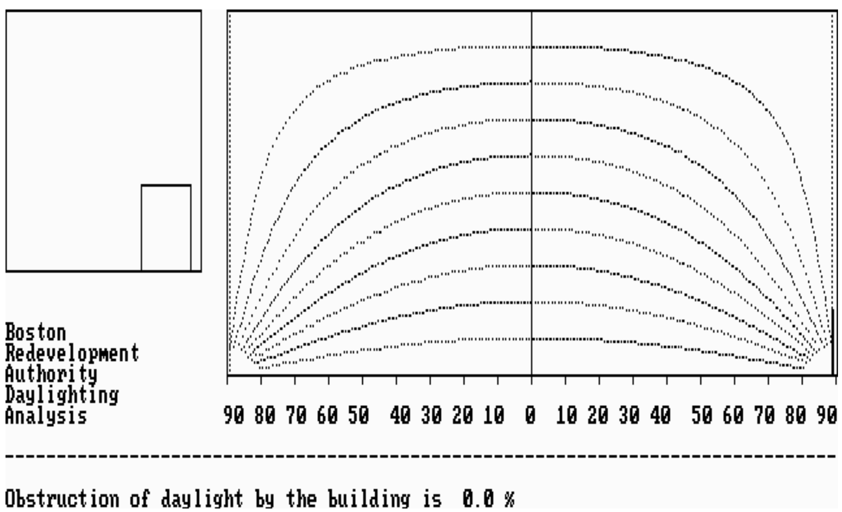
Viewpoint 1



Viewpoint 2

Due to the location of the existing building opposite the site from the Viewpoint 2, the Daylight Obstruction Value is 0%.

Viewpoint 3



Viewpoint 4

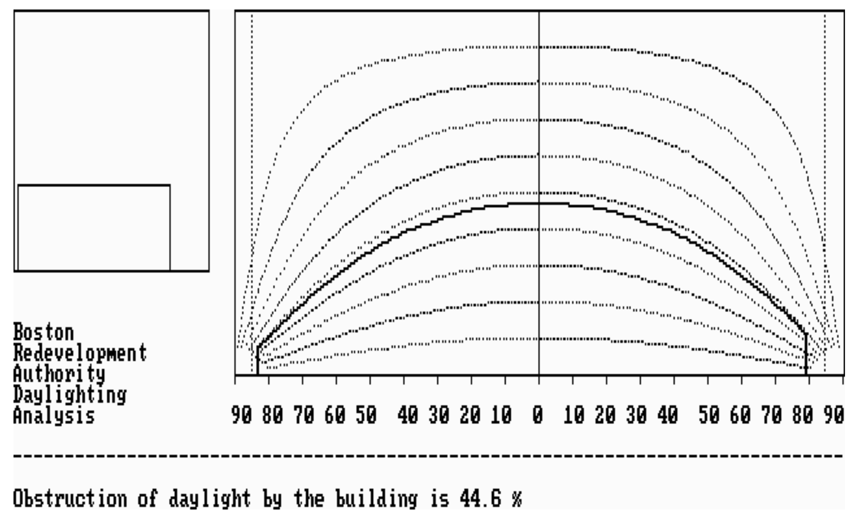
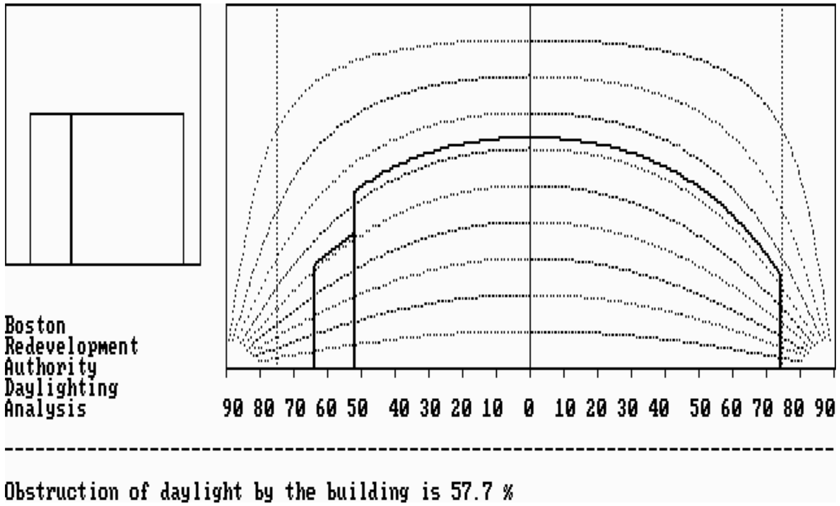


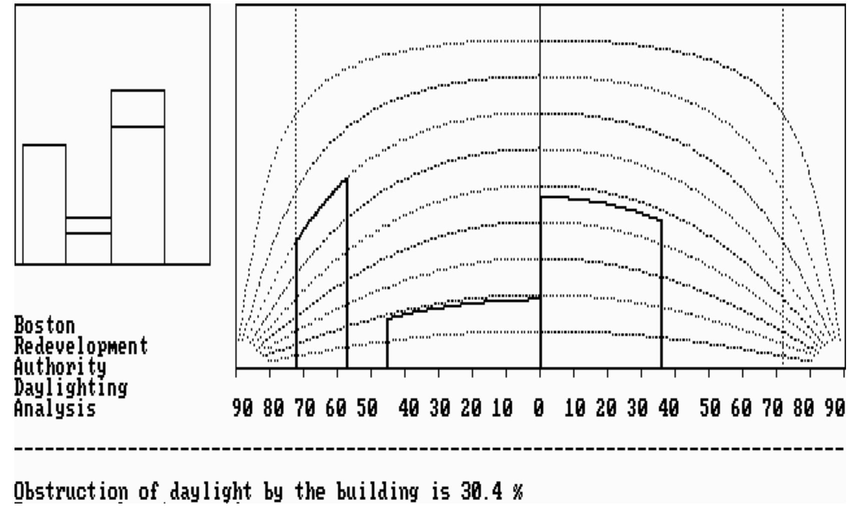
Figure 3.4-2

Daylight Analysis – Existing Condition Viewpoints

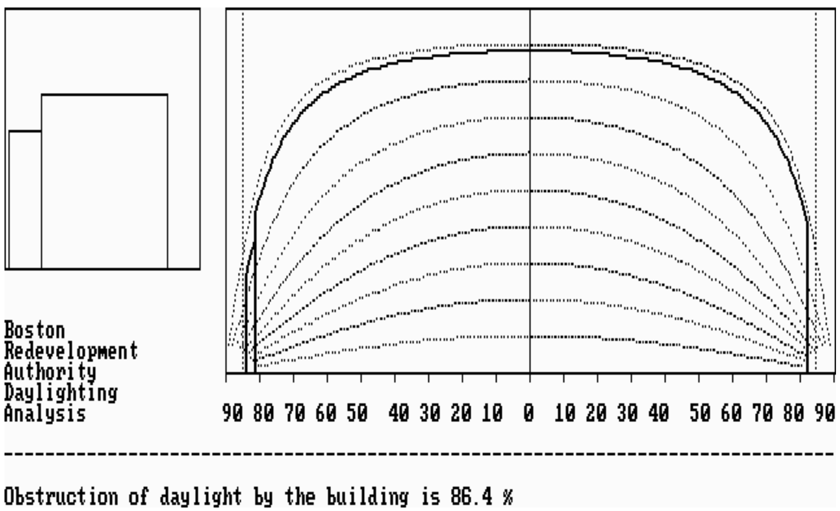
Viewpoint 1



Viewpoint 2



Viewpoint 3



Viewpoint 4

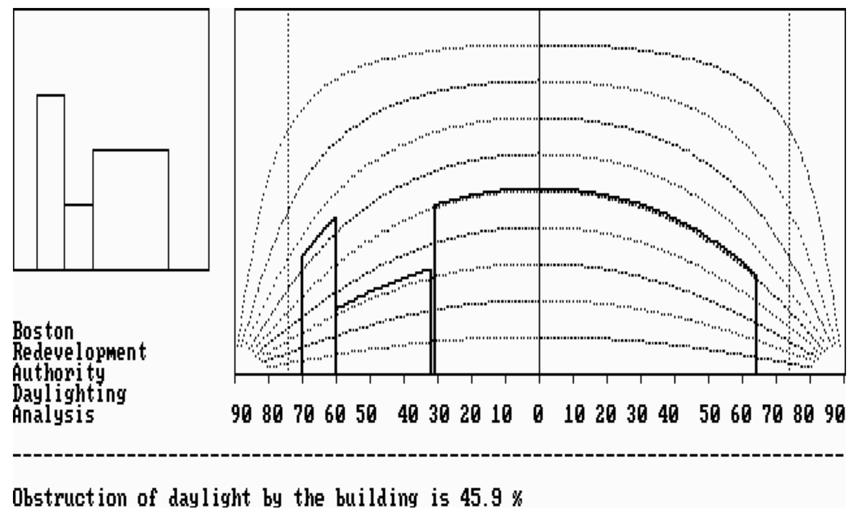
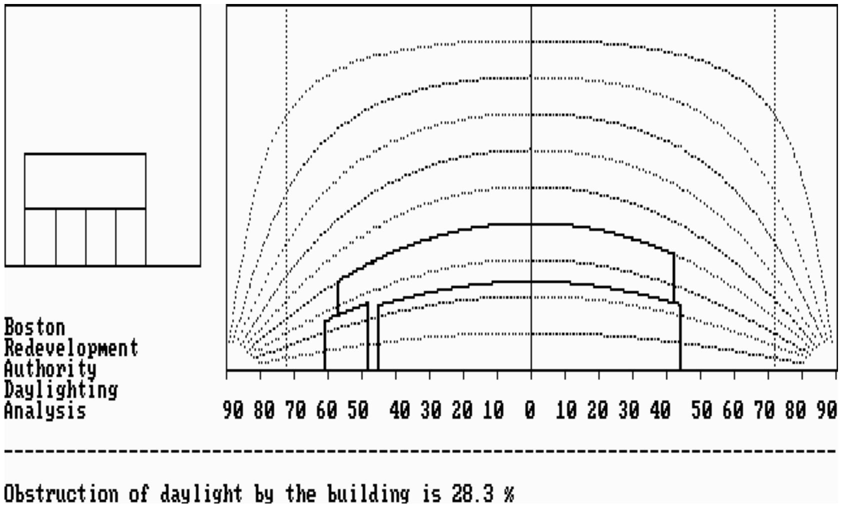


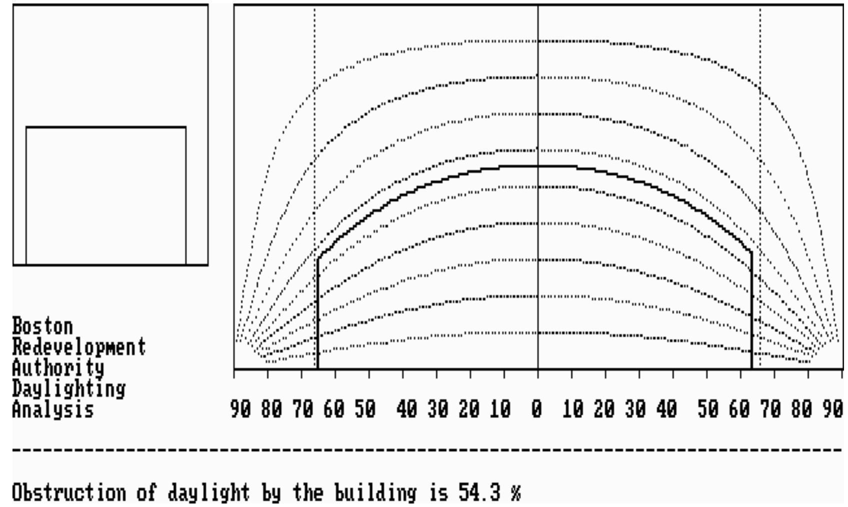
Figure 3.4-3

Daylight Analysis – Proposed Condition Viewpoints

AC1



AC2



AC3

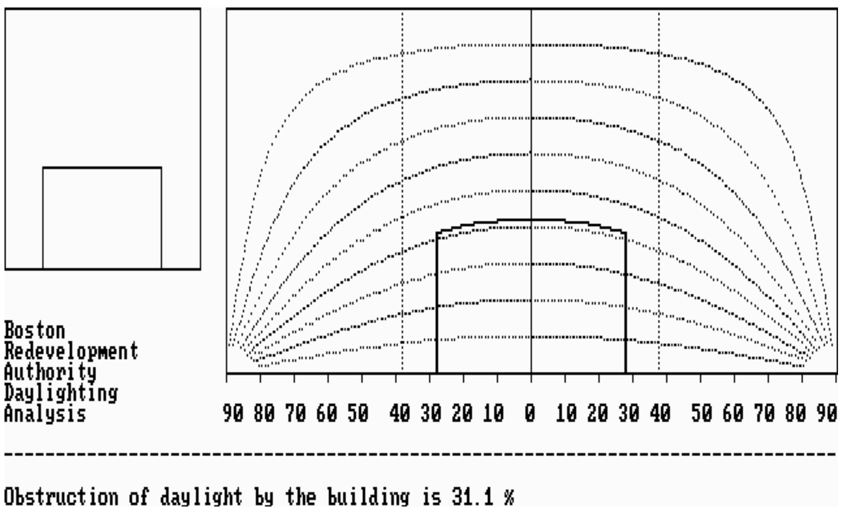


Figure 3.4-4

Daylight Analysis – Area Context Viewpoints

Area Context Views

The Project area is an area in transition with residential areas, a commercial thoroughfare, and institutional uses. Barry's Corner is less dense than many other areas of Allston. The buildings in the surrounding area vary in height and distance from the street. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for three Area Context Viewpoints described above and shown on Figure 3.3-1. The daylight obstruction values ranged from 28.3% (AC1) on North Harvard Street to 54.3% (AC2) on Western Avenue.

3.4.4 Results

The results for each viewpoint are described in Table 3.4-1. Figures 3.4-2 to 3.4-3 illustrate the BRADA results for each analysis.

Table 3.4-1 Daylight Obstruction Values

Viewpoint Locations		**Existing Conditions**	**Proposed Conditions**
Viewpoint 1	Project Site from Western Avenue	2.8%	57.7%
Viewpoint 2	Project Site from North Harvard Street	0%	30.4%
Viewpoint 3	Project Site from "Grove Street"	0%	86.4%
Viewpoint 4	Project Site from Smith Field	44.6%	45.9%
Area Context Points			
AC1	Charlesview Apartments from North Harvard Street	28.3%	N/A
AC2	Teele Hall from Western Avenue	54.3%	N/A
AC3	178 Western Avenue from Western Avenue	31.1%	N/A

3.4.5 Conclusions

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and in the surrounding area. The results of the BRADA analysis indicate that while the development of the Project will result in increased daylight obstruction over existing conditions, the resulting conditions will in most locations be similar to that found in the surrounding area, and typical of other areas of Allston.

3.5 Solar Glare

At this time, it is anticipated that the facades of the Project will not be primarily of highly reflective materials that would result in adverse impacts from reflected solar glare.

3.6 Air Quality

3.6.1 Summary of Impacts

The air quality analysis was conducted to determine the impact of pollutant emissions from mobile source emissions generated by the Project. The analysis looks at intersections studied for the transportation analysis that meet the criteria outlined in the BRA Development Review Guidelines for a microscale analysis. The air quality analysis results show that the carbon monoxide (CO) concentrations at all receptors will be well under applicable Federal National Ambient Air Quality Standards (NAAQS) thresholds.

3.6.2 Air Quality Analyses

A microscale analysis is typically performed to evaluate the potential air quality impacts of CO due to traffic flow around the Project area. The impacts were added to monitored background values and compared to the NAAQS. The standards were developed by the United States Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety.

The modeling methodology was developed in accordance with the latest Massachusetts Department of Environmental Protection (MassDEP) modeling policies and Federal modeling guidelines.[2] The air quality analysis results show that CO concentrations at all receptors studied are well under NAAQS thresholds.

Modeling assumptions and backup data for results presented in this section are provided in the Appendix D.

It is expected that the majority of stationary sources of air emissions (boilers, engines, etc) would be subject to the MassDEP Environmental Results Program. Thus, any air quality impacts would be mitigated by this program and air impact analyses would be done at the time of permitting.

3.6.3 Microscale Analysis

A microscale analysis is used to determine the effect on air quality of the increase in traffic generated by a project. A microscale analysis is typically required for a project at intersections where: 1) project traffic would impact intersections or roadway links currently operating at Level of Service (LOS) D, E, or F or would cause LOS to decline to D, E, or F; 2) project traffic would

2 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005.

increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or 3) project will generate 3,000 or more new average daily trips on roadways providing access to a single location.[3] The microscale analysis involves modeling of carbon monoxide (CO) emissions from vehicles idling at and traveling through signalized intersections. Predicted ambient concentrations of CO for the Build and No-Build cases are compared with federal and state ambient air quality standards for CO.

The microscale analysis typically examines breathing-level (1.8 meter) CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. NAAQS have been established by the EPA for CO to protect the public health (known as primary standards). These standards do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period and 9 ppm for an eight-hour averaging period, more than once per year at any location. The widespread use of CO catalysts on late-model vehicles has reduced the occurrences of CO hotspots. Air quality modeling techniques (computer simulation programs) are typically used to predict CO levels for both existing and future conditions to evaluate compliance of the roadways with the standards. The analysis followed the procedure outlined in EPA's intersection modeling guidance.[4]

The microscale analysis has been conducted using the latest versions of EPA MOBILE6.2 and CAL3QHC to estimate CO concentrations at sidewalk receptor locations.

Baseline (2012) and future year (2017) emission factor data calculated from the MOBILE6.2 model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections.

Existing background values of CO at the nearest monitor location in Kenmore Square were obtained from the MassDEP. CAL3QHC and AERMOD results were then added to background CO values of 1.9 ppm (one-hour) and 1.5 ppm (eight-hour), as provided by the MassDEP, to determine total air quality impacts due to the Project. This value was compared to the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

3.6.3.1 Intersection Selection

An analysis of the five intersections that were studied in the traffic study presented in Chapter 2 found that three intersections met the aforementioned criteria for microscale analyses:

- Western Avenue and Everett Street;

3 BRA, Development Review Guidelines, 2006.

4 U.S. EPA, Guideline for Modeling Carbon Monoxide from Roadway Intersections; EPA-454/R-92-005, November 1992.

- Western Avenue, Batten Way, and Hague Street; and,
- Western Avenue and North Harvard Street.

The traffic volumes and LOS calculations provided in Chapter 2 form the basis of evaluating the traffic data related the microscale thresholds.

3.6.3.2 Emissions Calculations (MOBILE6.2)

The EPA MOBILE6.2 computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOBILE6.2 model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the state specific vehicle age registration distribution. The input files for MOBILE6.2 for the baseline (2012) and build year (2017) were provided by MassDEP. As is typical, minor edits to the files were necessary to allow the program to output emission factors for the various speeds used in the analysis.

The current version of MOBILE6.2 does not explicitly calculate idle emissions. However, idle emissions can be obtained from a vehicle speed of 2.5 mph (the lowest speed MOBILE6 will model). The resulting emission rate (given in grams/mile) is then multiplied by 2.5 mph to estimate idle emissions (in grams/hour). Moving emissions are calculated based on actual speeds at which free-flowing vehicles travel through the intersections. A speed of 30 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively.

Winter CO emission factors are typically higher than summer CO emissions. Therefore, winter vehicular emission factors were conservatively used in the microscale analysis.

3.6.3.3 Receptors and Meteorology Inputs

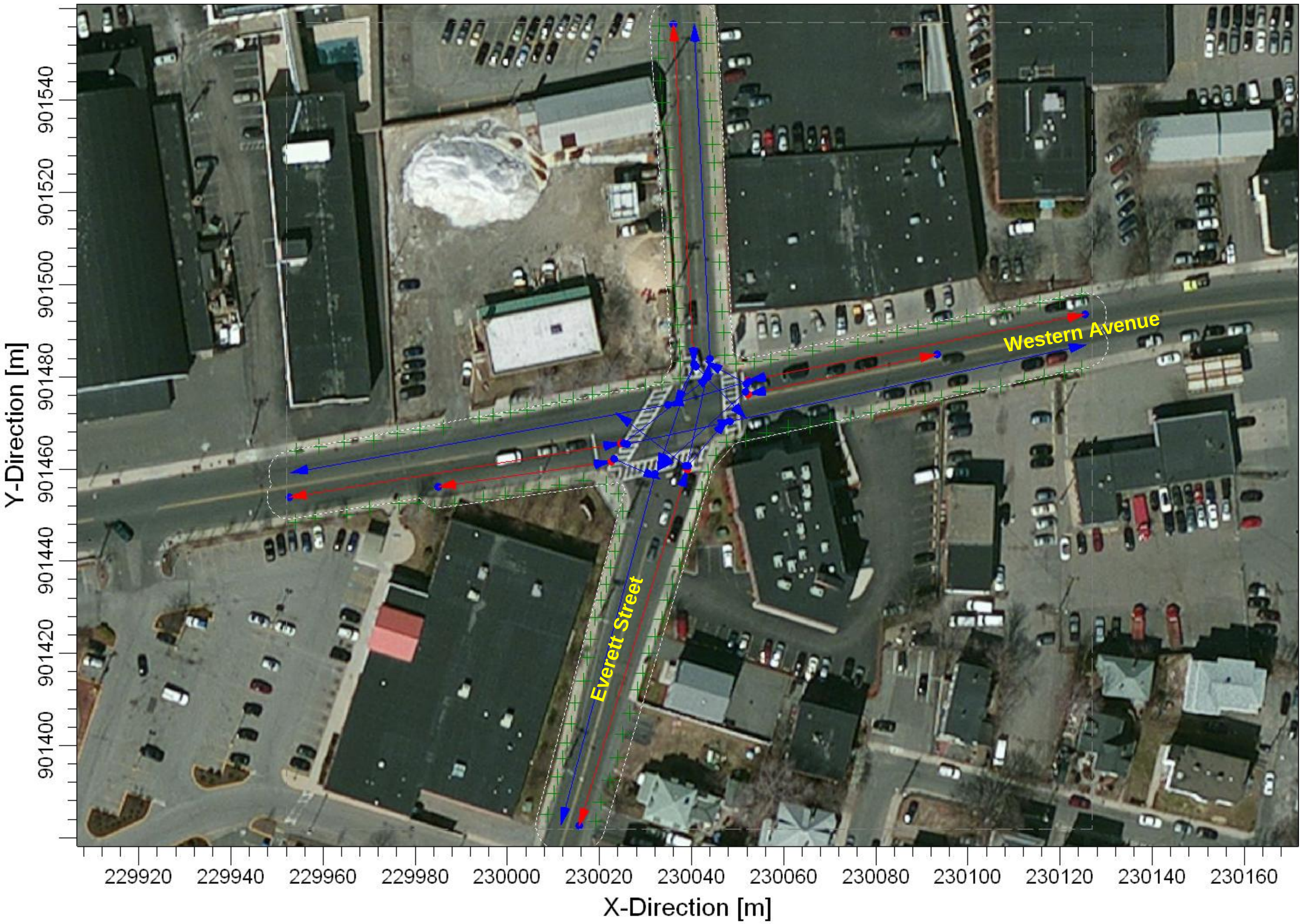
Sets of up to 200 receptors were placed in the vicinity of each of the modeled intersections. Receptors extended approximately 500 feet on the sidewalks along the roadways approaching the intersection. The roadway links and receptor locations of the modeled intersections are presented in Figures 3.6-1 through 3.6-3.

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[5], a wind speed of one m/s, stability class D (4), and a mixing height of 1,000 meters was used. To account for the intersection geometry, wind directions from 0° to 350°, every 10°, were selected. A surface roughness length of 321 cm was selected.[6]

---

[5] U.S. EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections.* EPA-454/R-92-005, November 1992.

[6] U.S. EPA, *User's Guide for CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. EPA –454/R-92-006 (Revised), September 1995.

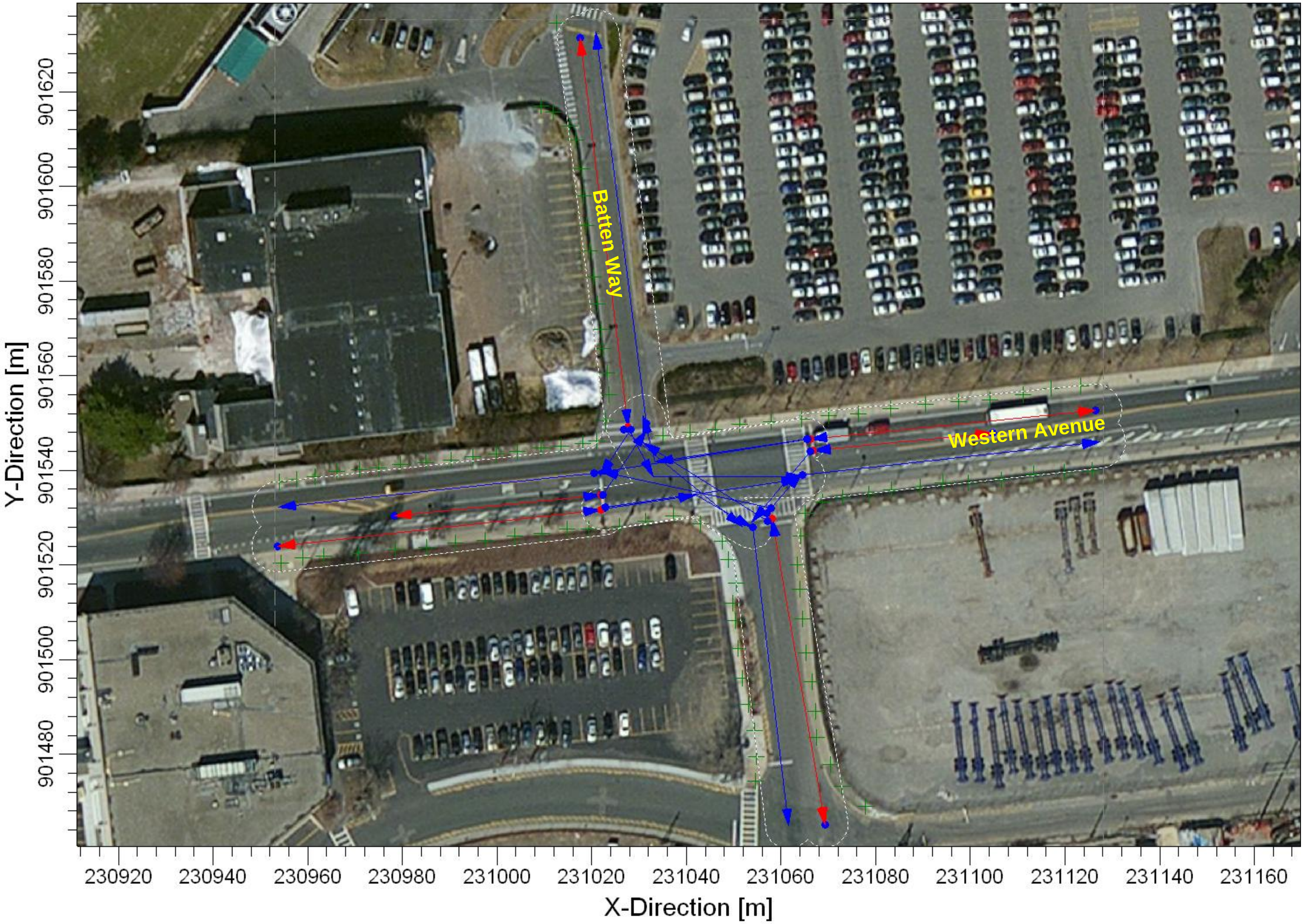


Epsilon ASSOCIATES INC.

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.6-1

Link and Receptor Locations for CAL3QHC modeling of Intersection 1: Western Ave. & Everett St.



Epsilon ASSOCIATES INC.

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 3.6-2

Link and Receptor Locations for CAL3QHC modeling of Intersection 2: Western Ave. & Batten Way

Figure 3.6-3

Link and Receptor Locations for CAL3QHC modeling of Intersection 3: Western Ave. & N. Harvard St.

3.6.3.4 Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue links at intersections, worst-case meteorological conditions, and traffic input data. The one-hour concentrations were scaled by a factor of 0.7 to estimate eight-hour concentrations.[7] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling runs. The CAL3QHC input parameters are also described in Appendix D.

3.6.3.5 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP in their Annual Air Quality Reports was obtained for 2007 to 2011. MassDEP guidance specifies the use of the latest three years of available monitoring data from within 10 km of the Project site. Since some pollutants are no longer monitored, data prior to the most recent three years is used.

The closest monitor is located at Kenmore Square, in Boston. A summary of the background air quality concentrations are presented in Table 3.6-1. All observed concentrations are currently in compliance with applicable NAAQS.

Background CO concentrations were determined from the closest available monitoring stations to the proposed Project. For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 1.9 ppm for one-hour and 1.5 ppm for eight-hour CO.

Table 3.6-1 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Time	2009	2010	2011	Background Concentration (µg/m³)	NAAQS	Location
SO_2 [1,7,8]	1-Hour	65.0	69.9	127.4	127.4	195	KEN
	3-Hour	88.4	62.4	49.4	88.4	365	KEN
	24-Hour	23.4	21.8	31.5	31.5	1,300	KEN
	Annual	6.5	5.8	6.1	6.5	80	KEN
PM-10	24-Hour	69.0	40.0	38.0	44.0	150	KEN
	Annual	20.6	15.5	16.8	17.9	50	KEN
PM-2.5	24-Hour [4]	19.1	21.9	21.2	24.3	35	KEN
	Annual [5]	9.0	9.3	9.4	10.2	15	KEN
NO_2 [3]	1-Hour [6]	112.8	119.4	140.8	140.8	188	KEN
	Annual	37.8	35.9	38.3	38.3	100	KEN

7 U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992.

Table 3.6-1 Observed Ambient Air Quality Concentrations and Selected Background Levels (Continued)

Pollutant	Averaging Time	2009	2010	2011	Background Concentration ($\mu g/m^3$)	NAAQS	Location
CO [2]	1-Hour	1596.0	2166.0	1710.0	2166	40,000	KEN
	8-Hour	1254.0	1710.0	1482.0	1710	10,000	KEN

From 2007-2011 MassDEP Annual Data Summaries

KEN = Kenmore Sq. Boston

[1] SO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2600 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1880 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Maximum annual 1-hr concentrations.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2010 & 2011 SO_2 3-hr value is not reported. Years 2007-2009 used instead.

3.6.4 Results

3.6.4.1 Microscale Analysis

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3.6-2 through 3.6-5 for the 2012 and 2017 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.7.[8]

The results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the area of the Project, for the modeled conditions (1.3 ppm) plus background (1.9 ppm) is 3.2 ppm. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.9 ppm) plus background (1.5 ppm) is 2.4 ppm. Both concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

Traffic mitigation measures were developed for the proposed Project and analyzed as part of the microscale analysis. The sole modeled intersection affected by traffic mitigation proposed in Chapter 2 is the intersection of Western Avenue and North Harvard Street. Modeling shows

8 U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992.

slight changes (±0.1 ppm) from the 2017 Build case, primarily due to the configuration of the site driveways and North Harvard Street, as well as signalization changes. Results of the modeling of the mitigated case remain well below the one-hour and eight-hour NAAQS.

3.6.5 Conclusions

Using conservative estimates, the CO concentrations at the nearest receptors for impacts from the intersection, plus monitored background values, are well under the CO NAAQS thresholds.

Table 3.6-2 Summary of Microscale Modeling Analysis (Existing 2012)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
One-Hour					
Western Avenue & Everett Street	AM	1.1	1.9	3.0	35
	PM	1.0	1.9	2.9	35
Western Avenue & North Harvard Street	AM	1.3	1.9	3.2	35
	PM	1.3	1.9	3.2	35
Western Avenue, Batten Way & Hague Street	AM	0.7	1.9	2.6	35
	PM	0.7	1.9	2.6	35
Eight-Hour					
Western Avenue & Everett Street	AM	0.8	1.5	2.3	9
	PM	0.7	1.5	2.2	9
Western Avenue & North Harvard Street	AM	0.9	1.5	2.4	9
	PM	0.9	1.5	2.4	9
Western Avenue, Batten Way & Hague Street	AM	0.5	1.5	2.0	9
	PM	0.5	1.5	2.0	9

Notes:
CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 3.6-3 Summary of Microscale Modeling Analysis (No-Build 2017)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
One-Hour					
Western Avenue & Everett Street	AM	0.9	1.9	2.8	35
	PM	1.0	1.9	2.9	35
Western Avenue & North Harvard Street	AM	1.1	1.9	3.0	35
	PM	1.2	1.9	3.1	35
Western Avenue, Batten Way & Hague Street	AM	0.8	1.9	2.7	35
	PM	0.8	1.9	2.7	35
Eight-Hour					
Western Avenue & Everett Street	AM	0.6	1.5	2.1	9
	PM	0.7	1.5	2.2	9
Western Avenue & North Harvard Street	AM	0.8	1.5	2.3	9
	PM	0.8	1.5	2.3	9
Western Avenue, Batten Way & Hague Street	AM	0.6	1.5	2.1	9
	PM	0.6	1.5	2.1	9

Notes:
CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 3.6-4 Summary of Microscale Modeling Analysis (Build 2017)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
One-Hour					
Western Avenue & Everett Street	AM	0.9	1.9	2.8	35
	PM	1.1	1.9	3.0	35
Western Avenue & North Harvard Street	AM	1.2	1.9	3.1	35
	PM	1.2	1.9	3.1	35
Western Avenue, Batten Way & Hague Street	AM	0.8	1.9	2.7	35
	PM	0.8	1.9	2.7	35
Eight-Hour					
Western Avenue & Everett Street	AM	0.6	1.5	2.1	9
	PM	0.8	1.5	2.3	9
Western Avenue & North Harvard Street	AM	0.8	1.5	2.3	9
	PM	0.8	1.5	2.3	9
Western Avenue, Batten Way & Hague Street	AM	0.6	1.5	2.1	9
	PM	0.6	1.5	2.1	9

Notes:
CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 3.6-5 Summary of Microscale Modeling Analysis (Build with Mitigation 2017)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
One-Hour					
Western Avenue & Everett Street	AM	0.9	1.9	2.8	35
	PM	1.1	1.9	3.0	35
Western Avenue & North Harvard Street	AM	1.1	1.9	3.0	35
	PM	1.3	1.9	3.2	35
Western Avenue, Batten Way & Hague Street	AM	0.8	1.9	2.7	35
	PM	0.8	1.9	2.7	35
Eight-Hour					
Western Avenue & Everett Street	AM	0.6	1.5	2.1	9
	PM	0.8	1.5	2.3	9
Western Avenue & North Harvard Street	AM	0.8	1.5	2.3	9
	PM	0.9	1.5	2.4	9
Western Avenue, Batten Way & Hague Street	AM	0.6	1.5	2.1	9
	PM	0.6	1.5	2.1	9

Notes:
CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

3.7 Stormwater/Water Quality

Please see Chapter 6 for more information on stormwater and water quality.

3.8 Flood Hazard Zones/Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map indicates the FEMA Flood Zone Designations for the site (City of Boston, Community Panel Number 25025C0058G). The Project site is located outside of the 500-year floor zone.

The site is developed and does not contain wetlands.

3.9 Geotechnical/Groundwater

3.9.1 Summary of Impacts

Construction of the proposed development is not expected to have adverse short or long-term impacts on soil or groundwater conditions. It is anticipated that a lateral earth support system will be required to support the excavation adjacent to the existing public roadways. Excavation for the building foundations will require dewatering of the excavation. Excavation and below-grade construction will be conducted in accordance with applicable local, state and federal regulations.

3.9.2 Soil Conditions

Available subsurface information indicates that the site is covered by a miscellaneous urban fill material containing ash and cinders extending to depths of approximately 4 to 12.5 feet below existing ground surface, overlying a 2.5 to 13-foot thick natural sand and gravel deposit that extends to depths varying from about 13 to 21.5 feet below existing ground surface. Beneath the sand deposit is a deposit of marine clay extending to depths of 96 to 104 feet below ground surface overlying a very dense deposit of glacial till and bedrock. Groundwater was encountered at depths of 7.2 feet and 10.2 feet in groundwater monitoring wells installed at the site, corresponding to Elevations +6.9 and +7.1, respectively (elevations are based on the Boston City Base datum).

3.9.3 Proposed Foundation Construction

Based upon the proposed scope of development and the anticipated subsurface conditions, foundation design of the proposed structure is anticipated to consist of spread footings bearing within the natural sand and gravel deposit. The lowest-level parking garage slab is anticipated to consist of slab-on-grade construction with a perimeter and underslab drainage system to provide hydrostatic pressure relief. Construction of the proposed below-grade parking garage and building foundations will require an excavation of approximately 11 to 15 feet deep across the proposed building footprint. It is anticipated that a lateral earth support system will be required to support the excavation adjacent to the existing public roadways. The lateral earth support system is anticipated to consist of cantilevered steel soldier piles and wood lagging. It is anticipated that excavation for the building foundations will require dewatering of the excavation. Dewatering by means of localized use of sump pumps is anticipated. Groundwater will be recharged on-site, if feasible. Otherwise, off-site discharge of pumped groundwater into the Boston Water and Sewer Commission (BWSC) storm drain lines will be performed under a EPA Construction General Permit or Remediation General Permit that will be procured prior to the start of construction. Construction of the proposed development is not expected to have adverse short or long-term impacts on groundwater conditions.

3.10 Solid and Hazardous Waste

3.10.1 Summary of Impacts

The Project will require demolition of an existing building and associated site improvements along with excavation of the site for future underground parking. Solid waste and demolition debris will be characterized at the site to determine if there is any need for special handling and disposal. The Project team will require the contractor to transport and dispose of all construction debris and materials in accordance with applicable laws. The site is in a previously developed urban environment. The Project team will undertake an exploration program to characterize the site and soils to determine the appropriate management of soils during construction.

Operational solid waste from the Project will be collected within a trash room on-site. Recycling by both retail and residential tenants will be encouraged and coordinated to limit the amount of waste sent to landfills. To encourage recycling, the Project team will implement a recycling program throughout the Project. Trash and recycling will be collected on a regular basis.

3.10.2 Hazardous Waste

Demolition of the existing one-story building on the Project site will result in soil and building materials requiring off-site transport and disposal. The construction of the foundation and below-grade parking garage for the Project also will result in soil requiring off-site transport and disposal. Chemical testing of these materials will be required by receiving facilities to identify chemical constituents and any contaminants present. Any materials leaving the Project site will be legally transported in accordance with applicable local, state and federal requirements.

An American Society for Testing and Materials (ASTM) Phase I Environmental Site Assessment (ESA) was conducted in 2012 by Harvard. This Phase I ESA identified no Known Recognized Environmental Conditions at the Project site. Any regulated soil and/or groundwater conditions related to oil and hazardous materials that are identified on the Project site will be managed in accordance with all applicable MassDEP regulatory requirements, including the Massachusetts Contingency Plans.

A Phase II ESA of the Barry's Corner Project site will be conducted to understand the soil characteristics of the material on-site. Representative samples of the site soils will be submitted to a laboratory for analysis to assess for the possible presence of contamination and to determine appropriate options for the handling, reuse, recycling, disposal, or treatment of site soils. Groundwater testing also will be conducted. It is anticipated that excavation for the Project's building foundations will require dewatering and a temporary groundwater dewatering discharge permit will be obtained prior to excavation, in accordance with EPA, DEP and BWSC requirements. If feasible, groundwater will be recharged on-site.

3.10.3 Solid Waste

The Project will generate solid waste typical of residential and retail uses. The Project will generate approximately 580 tons of solid waste per year. Each floor of the residential portion will include a trash room for solid waste and recycling with chutes to solid waste collection rooms. From these rooms, both solid waste and recycling will be transported to the loading dock. The retail areas will also dispose of their trash and recycling in the appropriate receptacles adjacent to the loading dock. Solid waste will include wastepaper, cardboard, glass, bottles, and food waste. A portion of the waste will be recycled as described below. The remainder of the waste will be compacted and removed by a waste hauler contracted by building management.

With the exception of household hazardous wastes typical of residential developments (e.g., cleaning fluids and paint), the Project will not involve the generation, use, transportation, storage, release, or disposal of potentially hazardous materials.

Recycling by both retail and residential tenants will be encouraged and coordinated. To encourage recycling, the Project team will implement a recycling program throughout the Project. The Project will include space for recycling in the building, and the loading and receiving areas will include space for the storage and pick-up of recyclable materials. Recyclable materials are expected to include newspaper, cardboard, cans, bottles, and plastics. Recycling will be collected in a central location and picked up on a regular basis.

3.11 Noise

3.11.1 Summary of Impacts

Baseline noise levels were measured in the vicinity of the proposed Project and were compared to predicted noise levels based on reference sound data for mechanical equipment identified by the Project team. These predicted noise levels were compared to the City of Boston Zoning District Noise Standards and the MassDEP Noise Policy. The noise analysis indicates that predicted noise levels from Project mechanical equipment with appropriate noise attenuation measures will comply with applicable state and local regulations at all modeled locations.

3.11.2 Overview and Noise Terminology

This section describes a noise analysis conducted for the Project, including a noise-monitoring program to determine existing background levels and an estimate of future sound levels when the Project is in operation. The scope of the analysis is consistent with BRA requirements for noise studies.

There are several ways sound (noise) levels are measured and quantified, all of which use the logarithmic decibel (dB) scale. The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment.

One property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-decibel increase (to 53 dB), not a doubling to 100 dB. Thus, every 3dB change in sound level represents a doubling or halving of sound energy. Generally, less than a doubling of sound energy, *i.e.*, a change in sound levels of less than 3dB, is imperceptible to the human ear.

A second property of decibels is that if one source of noise is 10 dB (or more) louder than another source, then the total sound level is simply the sound level of the higher source. For example, a source of sound at 60 dB plus another source of sound at 47 dB is 60 dB.

The sound level meter used to measure noise is a standardized instrument. It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. The A-weighted scale (dBA) most closely approximates how the human ear responds to sound at various frequencies (there are also B- and C-weighting networks). A-weighted sound levels emphasize the middle frequency (i.e., middle pitched – around 1,000 Hertz sounds), and de-emphasize lower and higher frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA."

Because sounds in the environment vary with time, they cannot be described simply with a single number. Two methods are used for describing variable sounds, both of which are derived from a large number of moment-to-moment A-weighted sound level measurements. They are exceedance levels and the equivalent level. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value of 0 to 100 percent. For example:

- L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources.

- L_{50} is the median sound level: the sound level in dBA exceeded 50 percent of the time during the measurement period.

- L_{10} is the sound level in dBA exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises such as those from passing motor vehicles.

The equivalent level, L_{eq}, is the level of a hypothetical steady sound that would have the same energy (i.e., the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by occasional loud, intrusive noises. Day-night average sound level, abbreviated as DNL and symbolized as $L_{dn,}$ is the 24-hour average sound level, in decibels, obtained after addition of 10 decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.. The hourly L_{eq} sound level metric is used to calculate the L_{dn}.

By using various noise metrics, it is possible to separate prevailing, steady sounds (the L_{90}) from occasional, louder sounds (L_{10}) in the noise environment or combined average levels (L_{eq}). The analysis of sounds expected from the proposed Project treats all noises as though they will be steady and continuous and hence the L_{90} exceedance level was used. In the design of noise control treatments, it is essential to know something about the frequency spectrum of the noise of interest. Noise control treatments do not function like the human ear, so simple A-weighted levels are not useful for noise-control design. The spectra of noises are usually stated in terms of octave band sound pressure levels, in dB, with the octave frequency bands being those established by standard. To facilitate the noise-control design process, the estimates of noise levels in this analysis are also presented in terms of octave band sound pressure levels.

Baseline noise levels were measured in the vicinity of the proposed Project and were compared to predicted noise levels that were derived based on information provided by the manufacturers of representative mechanical equipment expected to be installed as part of the Project. The predicted noise levels were compared to the City of Boston Zoning District Noise Standards, as well as the MassDEP Noise Policy.

3.11.3 Noise Regulations and Criteria

The primary set of regulations relating to the potential increase in noise levels is the City of Boston Zoning District Noise Standards (City of Boston Code – Ordinances: Section 16–26 Unreasonable Noise and City of Boston Air Pollution Control Commission Regulations for the Control of Noise in the City of Boston). Results of the baseline ambient noise level survey and the modeled noise levels were compared to the City of Boston Zoning District Noise Standards. Separate regulations within the Standards provide criteria to control different types of noise. Regulation 2 is applicable to the effects of the proposed buildings, as completed, and was considered in this noise study. Table 3.11-1 includes the Zoning District Standards.

Additionally, MassDEP regulates community noise by its Noise Policy: DAQC policy 90-001. The MassDEP policy limits source sound levels to a 10-dBA increase in the ambient measured noise level (L_{90}) at the Project property line and at the nearest residences. The policy further prohibits pure tone conditions—when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by three decibels or more.

Table 3.11-1 City of Boston Zoning District Noise Standards, Maximum Allowable Sound Pressure Levels

Octave Band Center Frequency (Hz)	Residential Zoning District Daytime (dB)	Residential Zoning District All Other Times (dB)	Residential-Industrial Zoning District Daytime (dB)	Residential-Industrial Zoning District All Other Times (dB)	Business Zoning District Anytime (dB)	Industrial Zoning District Anytime (dB)
32	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	**60**	**50**	**65**	**55**	**65**	**70**

Notes: Noise standards are extracted from Regulation 2.5, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.

All standards apply at the property line of the receiving property.

dB and dBA based on a reference pressure of 20 micropascals.

Daytime refers to the period between 7:00 am and 6:00 pm daily except Sunday.

The United States Department of Housing and Urban Development (HUD) Environmental Criteria and Standards (24 CFR Part 51), Subpart B – "Noise Abatement and Control" specifies noise criteria for HUD-funded housing developments. This Project is not a HUD-funded development, therefore, the HUD noise criteria do not apply. However, the HUD criteria are presented for informational purposes. The HUD exterior noise goal for residential construction is a day-night average sound level (L_{dn}) of 65 dBA or less. This is considered Acceptable. L_{dn} sound levels above 65 dBA but not exceeding 75 dBA are considered Normally Unacceptable, and L_{dn} levels above 75 dBA are considered Unacceptable. Funding for HUD approvals in Normally Unacceptable areas require a minimum of 10 dB of additional sound attenuation for buildings having noise-sensitive uses. The HUD interior noise goal is an L_{dn} of 45 dBA.

3.11.4 Existing Noise Conditions

3.11.4.1 Baseline Noise Environment

An ambient noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of the Project. Existing noise sources include: vehicular traffic (including trucks) on the local roadways; pedestrian traffic; rooftop mechanical equipment; residential A/C units; birds and insect noise; light leaf rustle; construction/lawn maintenance activities; and the general din of the city.

3.11.4.2 Noise Measurement Locations

The selection of the sound monitoring locations was based upon a review of the current land use near the Project site. Four representative noise-monitoring locations were selected to obtain a sampling of the baseline ambient noise environment. The monitoring locations are depicted on Figure 3.11-1 and are described below:

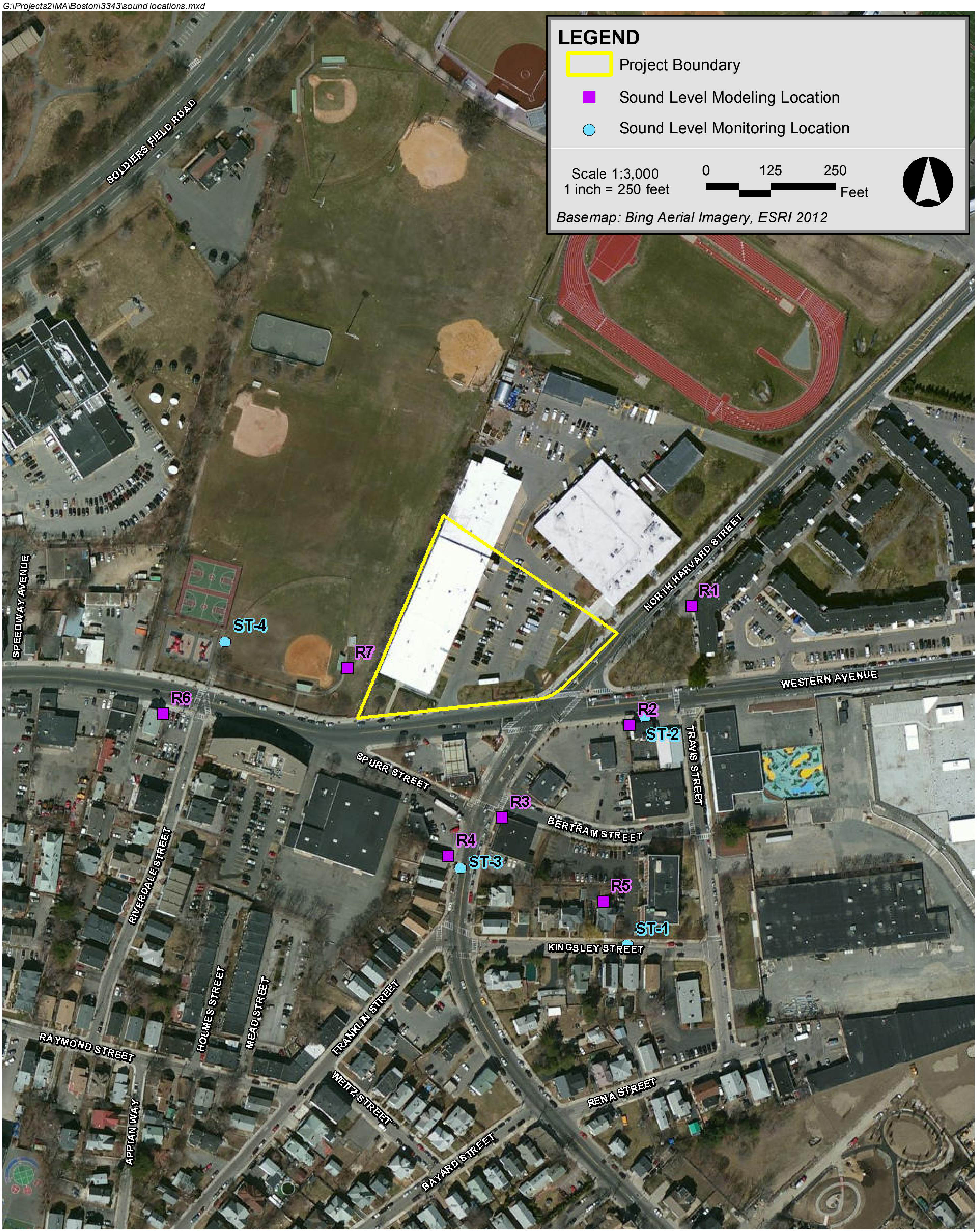
- Location 1 is at the edge of the northern sidewalk along Kingsley Street just south of the Harvard Business School building at 25 Travis Street;
- Location 2 is on the front sidewalk outside of #176 Western Avenue;
- Location 3 is on the front sidewalk outside of #215/217 North Harvard Street; and
- Location 4 is at the northeast corner of the playground immediately west of the Project site, just outside the baseball fence.

3.11.4.3 Noise Measurement Methodology

Sound level measurements were made for 20 minutes per location during daytime (11:00 a.m. to 2:00 p.m.) on August 30, 2012, and nighttime hours (12:00 a.m. to 2:00 a.m.) on August 31, 2012. Since noise impacts are generally greatest at night when background noise levels are lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to include peak traffic conditions.

The sound levels were measured at publicly accessible locations at a height of approximately five feet (1.5 meters) above the ground and at locations where there were no large reflective surfaces to affect the measured levels. The measurements were made under low wind conditions and with dry roadway surfaces. Wind speed measurements were made with a Davis Instruments TurboMeter electronic wind speed indicator, and temperature and humidity measurements were made using a General Tools digital psychrometer. Unofficial observations about meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the proposed Project.

G:\Projects2\MA\Boston\3343\sound locations.mxd



Epsilon ASSOCIATES INC.

HARVARD UNIVERSITY

SAMUELS & ASSOCIATES

Figure 3.11-1

Sound Level Monitoring and Modeling Locations

3.11.4.4 Measurement Equipment

A Larson Davis LD831 Sound Level Meter equipped with a PRM831Type 1 Preamplifier, a 377B20 ½" random-incidence microphone and the manufacturer-provided foam windscreen was used to collect broadband and 1/3 octave band ambient sound pressure level data. This Larson Davis instrumentation meets the "Type 1 - Precision" requirements set forth in American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. The meter, equipped with an internal octave band filter set along with data logging capabilities, processed one sample per second using the "fast" response setting.

Statistical levels were calculated from the sound levels collected during each 20-minute measurement period. Octave band levels for this study correspond to the same data set processed for the broadband levels. The measurement equipment was calibrated in the field before and after the surveys with a CAL200 acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1997.

3.11.4.5 Baseline Ambient Noise Levels

The existing ambient noise environment is most affected by traffic on local roads and pedestrian activity. During the nighttime, traffic on Western Avenue and North Harvard Street was still significant.

The baseline noise monitoring results are summarized below.

- The daytime residual background (L_{90} dBA) measurements ranged from 49 to 59 dBA;
- The nighttime residual background (L_{90} dBA) measurements ranged from 44 to 49 dBA;
- The daytime equivalent level (L_{eq} dBA) measurements ranged from 56 to 72 dBA;
- The nighttime equivalent level (L_{eq} dBA) measurements ranged from 51 to 64 dBA;

Based on the measured short-term daytime and nighttime L_{eq} values, the calculated L_{dn} values for the four locations are summarized below. The L_{dn} value at Location 4 is based on short-term daytime L_{eq} levels only. No nighttime data was collected at this location due to its daytime-only use.

Location 1: L_{dn} = 59 dBA
Location 2: L_{dn} = 73 dBA
Location 3: L_{dn} = 69 dBA
Location 4: L_{dn} = 62 dBA

Table 3.11-2 on the following page presents the detailed noise monitoring results.

Table 3.11-2 Baseline Ambient Noise Measurements

							Octave Band Center Frequency (Hz)								
Receptor I.D	**Start**	**L_{10}**	**L_{50}**	**L_{90}**	**L_{eq}**	**L_{max}**	**32**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
	Time	**dBA**	**dBA**	**dBA**	**dBA**	**dBA**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**	**L_{90} dB**
Loc 1 Day	11:51	51	50	49	56	80	57	56	52	48	46	44	39	33	27
Loc 1 Night	0:26	46	46	45	51	74	49	53	50	44	41	41	35	29	20
Loc 2 Day	12:19	66	60	59	72	93	62	64	61	58	56	55	51	46	37
Loc 2 Night	0:50	56	51	49	64	91	53	55	52	48	45	45	42	37	26
Loc 3 Day	13:00	64	55	54	69	89	61	62	58	52	50	51	47	41	31
Loc 3 Night	1:16	51	45	44	58	77	50	**53**	49	43	41	40	35	28	21
Loc 4 Day	11:20	54	52	52	56	69	58	60	56	51	47	47	43	36	27
Loc 4 Night	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1. Daytime weather: Temperature = 86 ^{0}F, RH = 24%, clear skies, winds 0-7 mph from the south.
   Nighttime weather: Temperature = 72^0 F, RH = 47%, clear skies, winds 0-6 mph from the west.
2. Road surfaces were dry during all periods.
3. All sampling periods were 20 minutes duration.
4. Daytime measurements were collected on August 30, 2012.
   Nighttime measurements were collected on August 31, 2012.

3.11.5 Overview of Potential Project Noise Sources

The primary sources of exterior sound to the Project consist of four energy recovery units (ERUs), eight garage supply/exhaust fans, a 750-ton cooling tower and two kitchen exhaust fans located on the upper and lower roofs at elevations of approximately 100 feet and 70 feet above ground level (AGL), respectively. Other secondary noise sources, including boilers, pumps, and heat exchangers will be housed in an enclosed rooftop penthouse and are not expected to contribute significantly to the overall sound level. Smaller exhaust fans (i.e., loading dock dryer, trash, dishwasher) are expected to have much lower sound levels (10 dBA or more) than the other, larger pieces of equipment and are not considered in this analysis. Rooftop stair pressurization fans would only run in an emergency and are not anticipated to be a steady or significant source of noise.

One 600 kW emergency diesel generator will be located on the upper roof in a dedicated sound-attenuating enclosure, exhausted vertically. It is assumed that this generator will only operate during the day for brief, routine testing when the background sound levels are higher, or during an interruption of the electrical grid, in which case the rooftop mechanical equipment will not be operating.

Attenuation measures will be applied to multiple sources as needed, to ensure compliance with the noise regulations. The noise control features assumed for this analysis were cooling tower attenuation (included in the sound level specification), an enclosure and exhaust silencer for the emergency generator, and noise reduction for the garage supply/exhaust fans and rooftop ERUs.

A summary of the major mechanical equipment and noise attenuation measures proposed for the Project are presented below in Tables 3.11-3 and 3.11-4, respectively. The approximate locations of the mechanical equipment were provided in a preliminary roof plan provided by the Project architect.

Table 3.11-3 Reference Equipment Noise Levels – Per Unit

Noise Source	Form of Data	Ref. Distance	Overall Level	Sound Levels (dB) per Octave Band Center Frequency (Hz)									No.	Location
			dBA	32	63	125	250	500	1000	2000	4000	8000		
Emergency Generator - 600kW (Enclosed) – Mechanical[1]	Sound Pressure	15m	71	85	85	79	75	66	60	57	55	49	1	High Roof
Emergency Generator - 600kW (Unsilenced) – Exhaust[2]	Sound Pressure	1m	117	108	108	108	111	110	113	109	109	97	1	High Roof
Energy Recovery Unit (ERU) - 30" Plenum[3]	Sound Power	-	101	93	93	93	95	98	97	93	89	83	2	High Roof
Energy Recovery Unit (ERU) - 27" Plenum[4]	Sound Power	-	90	83	83	83	88	86	84	84	81	77	2	Low Roof
Garage Supply Fan - 50,000 CFM[5]	Sound Power	-	90	77	77	86	91	88	84	81	78	69	8	Garage
Garage Exhaust Fan - 50,000 CFM[6]	Sound Power	-	92	84	84	84	87	89	88	84	80	69	8	Garage
Cooling Tower - 750 Ton (40 HP Fan)[7]	Sound Power	-	88	100	100	97	90	83	82	79	76	68	1	High Roof
Kitchen Exhaust Fan - 12000 CFM[8]	Sound Power	-	92	99	99	98	96	88	84	80	77	74	2	Roof

Notes:

1. Caterpillar C18DE97 Standby Diesel Generator Set, 600 kW Model C18 PGS600, SA Canopy
2. Caterpillar C18DE97 Standby Diesel Generator Set, 600 kW Model C18 PGS600, Open Exhaust
3. AAON 30" STAR Plenum RTU (13,000 CFM), Fan Outlet
4. AAON 27" STAR Plenum RTU (10,200 CFM), Fan Outlet
5. Greenheck QEI-22-I Mixed Flow Fan (12,000 CFM), Fan Inlet
6. Greenheck QEI-22-I Mixed Flow Fan (12,000 CFM), Fan Outlet
7. BAC CT-1 750 GPM Low Profile Series Cooling Tower w/ Attenuation
8. Assumed Greenheck 33-BISW-21 Fan Outlet

Table 3.11-4 Attenuation Values Used for Sound Level Modeling (dB)

Noise Source	Attenuation Measure	Octave Band Center Frequency (Hz)								
		32	63	125	250	500	1000	2000	4000	8000
Emergency Diesel Generator Exhaust[1]	Exhaust Silencer	10	20	35	35	27	25	25	27	22
Energy Recovery Units	Noise Reduction	0	0	0	0	5	10	15	10	0
Garage Supply/Exhaust Fans	Noise Reduction	0	0	0	0	0	10	10	10	0

Notes:

1. Levels presented assume Silex JB-18 Critical Grade Silencer with 5 decibels of additional attenuation in the 1k, 2k, and 4kHz octave-bands.

3.11.6 Modeling Methodology

Anticipated noise impacts associated with the Project were predicted at the nearest noise-sensitive receptors surrounding the Project using the CadnaA noise calculation software. This software uses the ISO 9613-2 industrial noise calculation methodology. CadnaA allows for octave band calculation of noise from multiple noise sources, as well as for computation of diffraction around building edges and multiple reflections off parallel buildings and solid ground areas. In this manner, all significant noise sources and geometric propagation effects are accounted for in the noise modeling.

3.11.7 Future Sound Level of Project

An initial analysis considered all of the mechanical equipment without the emergency generator running, to simulate typical nighttime operating conditions at nearby receptors. A second analysis combined the mechanical equipment and the emergency generators, to reflect worse-case conditions during brief, routine testing of the generators. The results with and without the emergency generators as compared to existing ambient levels and the MassDEP criteria are shown in Tables 3.11-5 and 3.11-6, respectively, for receptors located 1.5 meters above-grade. Figure 3.11-1 shows the locations of each modeled receptor as well as the monitoring locations selected for background measurements. Predicted mechanical equipment noise levels from the Project at each receptor location, taking into account attenuation due to distance, structures and noise control measures listed in Section 3.11-5, are all well below the MassDEP criteria of 10 dBA over the quietest nighttime sound levels measured in 2012. Additionally, no “pure-tone” conditions as defined by the MassDEP are present in the combined future levels.

The predicted Project-generated exterior sound levels with appropriate attenuation measures are expected to remain below 50 dBA with and without the emergency generator running, within the most stringent nighttime zoning limits, for the City of Boston at the nearest residential locations. Sound levels at the baseball park (receptor R7) are expected to remain below the daytime residential limit of 60 dBA. It should also be noted that the existing nighttime background levels measured in 2012 already approach the nighttime residential limit of 50 dBA due to existing sources unrelated to the Project at some locations. Octave-band sound levels at each of these modeling receptors presented in Tables 3.11-7 and 3.11-8 are at or below applicable city limits described in Table 3.11-1.

All L_{dn} sound levels from the Project will be less than 60 dBA and will not increase the existing L_{dn} in the Project area. Therefore, the Project will not affect the area's compliance with the HUD Residential Site Acceptability Standards after the Project is completed. With regard to the future residents of the Project itself, receptor locations R1 and R7 represent analysis points close to the Project with existing L_{dn} levels of 55 and 60 dBA respectively. Assuming an indoor to outdoor sound level reduction of 20 dBA from typical construction materials yields an interior L_{dn} of 35 and 40 dBA. The HUD goal for interior noise levels is 45 dBA. Careful attention to noise reduction from outside to inside will be needed to ensure an interior sound level of 45 dBA which will be considered in the building design details.

3.11.8 Conclusions

Baseline noise levels measured in the vicinity of the proposed Project were compared to predicted noise levels derived from information provided by the manufacturers of representative mechanical equipment or estimated from the equipment's capacity. The proposed Project, with appropriate attenuation measures, will not introduce significant outdoor mechanical equipment noise into the surrounding community. The noise analysis indicates that noise levels attributable to the Project at the nearest residential receptors will be equal to or below the City of Boston Noise Zoning requirements, and will comply with all MassDEP A-weighted and tonal noise limits. It should be noted that the existing ambient levels immediately surrounding the Project site already approach 50 dBA without any contribution from the Project at some locations. The results in Section 3.11.7 indicate that the proposed Project can operate without significant impact on the existing acoustical environment.

The analysis includes a number of attenuation measures, as shown in Table 3.11-4. At this time, the mechanical equipment and noise controls are conceptual in nature. During the final design phase of the Project, mechanical equipment and noise controls will be specified and designed to meet the applicable City of Boston broadband noise limit and the corresponding octave band limits, as well as the MassDEP noise criteria and HUD noise goals. Additional attenuation measures may include the selection of quieter units, acoustical louvers, screening walls, absorptive paneling, mufflers, or equipment enclosures, as needed.

Table 3.11-5 Comparison of Future Predicted Sound Levels with Existing Background – Without Emergency Generator

Modeling Location ID	Representative Background Location ID	Representative Background Period	Project Only Sound Level (dBA)	Compliance With Boston Noise Policy	L_{90} Background (dBA)	Total: Project + L_{90} Background (dBA)	Increase Over Background (dBA)[1]	Compliance with MassDEP Noise Policy
R1	ST-3	Night	44	YES	44	47	3	YES
R2	ST-2	Night	40	YES	49	50	0	YES
R3	ST-3	Night	44	YES	44	47	3	YES
R4	ST-3	Night	46	YES	44	48	4	YES
R5	ST-1	Night	45	YES	45	48	3	YES
R6	ST-2	Night	45	YES	49	51	2	YES
R7	ST-4	Day	54	YES	52	56	4	YES

1. Calculation performed using data rounded to nearest whole decibel

Table 3.11-6 Comparison of Future Predicted Sound Levels with Existing Background –With Emergency Generator

Modeling Location ID	Representative Background Location ID	Representative Background Period	Project Only Sound Level (dBA)	Compliance with Boston Noise Policy	L_{90} Background (dBA)	Total: Project + L_{90} Background (dBA)	Increase Over Background (dBA)[1]	Compliance with MassDEP Noise Policy
R1	ST-3	Day	55	YES	54	57	3	YES
R2	ST-2	Day	46	YES	59	59	0	YES
R3	ST-3	Day	54	YES	54	57	3	YES
R4	ST-3	Day	52	YES	54	56	2	YES
R5	ST-1	Day	52	YES	49	54	5	YES
R6	ST-2	Day	50	YES	59	59	1	YES
R7	ST-4	Day	54	YES	52	56	4	YES

1. Calculation performed using data rounded to nearest whole decibel

Table 3.11-7 Modeling Results – Without Emergency Generator

Project Only		Octave-Band Sound Pressure Level, L90									
Modeling Receptor	**Land Use**	**LA90**	**31.5**	**63.0**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
		(dBA)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
R1	Residential/Night	44	54	54	51	47	43	36	32	26	13
R2	Residential/Night	40	53	51	48	44	37	29	22	16	9
R3	Residential/Night	44	53	53	51	49	42	37	30	25	19
R4	Residential/Night	46	52	52	50	49	44	38	31	27	21
R5	Residential/Night	45	50	50	49	48	44	38	32	26	14
R6	Residential/Night	45	49	49	48	49	45	37	29	24	11
R7	Residential/Day	54	52	50	54	58	55	41	38	34	31
City of Boston Limits	**Residential/Day**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Residential/Night	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

Combined Levels		Octave-Band Sound Pressure Level, L90									
Modeling Receptor	**Land Use**	**LA90**	**31.5**	**63.0**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
		(dBA)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
R1	Residential/Night	47	56	56	53	48	45	42	37	30	22
R2	Residential/Night	50	56	56	54	50	46	45	42	37	26
R3	Residential/Night	47	55	56	53	50	45	42	37	30	23
R4	Residential/Night	48	54	55	53	50	46	42	37	31	24
R5	Residential/Night	48	53	55	52	49	46	43	37	31	21
R6	Residential/Night	51	54	56	54	51	48	46	42	37	26
R7	Residential/Day	56	59	60	58	59	55	48	44	38	33
City of Boston Limits	**Residential/Day**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Residential/Night	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

Table 3.11-8 Modeling Results – With Emergency Generator

Project Only		Octave-Band Sound Pressure Level, L90									
Modeling Receptor	**Land Use**	**LA90** (dBA)	**31.5** (dB)	**63.0** (dB)	**125** (dB)	**250** (dB)	**500** (dB)	**1000** (dB)	**2000** (dB)	**4000** (dB)	**8000** (dB)
R1	Residential/Day	55	68	67	61	57	50	49	45	40	25
R2	Residential/Day	46	66	63	55	50	40	35	28	23	11
R3	Residential/Day	54	67	67	61	57	49	47	43	38	22
R4	Residential/Day	52	65	65	59	56	48	46	41	35	22
R5	Residential/Day	52	64	64	58	55	49	47	42	36	17
R6	Residential/Day	50	62	61	56	53	47	43	37	30	12
R7	Residential/Day	54	62	60	56	58	55	42	38	34	31
City of Boston Limits	**Residential/Day**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Residential/Night	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

Combined Levels		Octave-Band Sound Pressure Level, L90									
Modeling Receptor	**Land Use**	**LA90** (dBA)	**31.5** (dB)	**63.0** (dB)	**125** (dB)	**250** (dB)	**500** (dB)	**1000** (dB)	**2000** (dB)	**4000** (dB)	**8000** (dB)
R1	Residential/Day	57	69	68	63	58	53	53	49	43	32
R2	Residential/Day	59	67	66	62	58	56	55	51	46	37
R3	Residential/Day	57	68	68	63	58	53	52	48	42	32
R4	Residential/Day	56	67	67	62	57	52	52	47	42	32
R5	Residential/Day	54	65	64	59	55	51	49	44	37	27
R6	Residential/Day	59	65	66	62	59	56	55	52	46	37
R7	Residential/Day	56	63	63	59	59	55	48	44	38	33
City of Boston Limits	**Residential/Day**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Residential/Night	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

3.12 Construction

3.12.1 Summary of Impacts

The Project team will require its contractors to develop construction protocols to control any impacts that might occur during the construction period. These protocols will be included in a Construction Management Plan (CMP) for the Project that will be prepared and submitted to the BTD for review and approval prior to issuance of a building permit. Truck routing and efforts to minimize the impacts on the surrounding area will be identified in the CMP. Measures will be implemented on-site and on construction equipment to minimize airborne dust from the site and air quality impacts associated with emissions from construction equipment. Measures, such as sound attenuation equipment and the timing of noise generating activities, will be implemented to minimize the noise impact on the surrounding area.

Construction methodologies that ensure public safety and protect nearby businesses will be employed. Techniques such as barricades, walkways, painted lines, and signage will be used as necessary. Construction management and scheduling—including plans for construction worker commuting and parking, routing plans and scheduling for trucking and deliveries, protection of existing utilities, maintenance of fire access, and control of noise and dust—will minimize impacts on the surrounding environment.

3.12.2 Overview

Construction impacts are temporary in nature and are typically related to air (dust), noise, and runoff. The following sections describe the potential temporary impacts due to construction activities and proposed mitigation measures to reduce these impacts. Construction of the Project will be sequenced. Demolition is anticipated to begin in the fall of 2013. Construction is anticipated to be complete in 24-28 months.

A Construction Management Plan (CMP) in compliance with the City's Construction Management Program will be submitted to the Boston Transportation Department (BTD) once final plans are developed and the construction schedule is fixed. The construction contractor will be required to comply with the details and conditions of the approved CMP.

Due to the location of the Project at a major intersection in Allston, proper pre-planning with the City will be essential to the successful construction of the Project. Construction methodologies, which ensure public safety and protect nearby activities, will be employed. The CMP will include information regarding methods to protect the public, routing plans for trucking and deliveries, plans for the protection of existing utilities, and control of noise and dust.

In an effort to have clear, open and up-to-date communications with the neighborhood, the Project will develop a communications plan consistent with Harvard projects in Allston. A 24-hour hotline will be established upon commencement of construction activity. In addition, when construction commences, a website will provide updates on construction as well as allow the public the ability to provide feedback through the website. A protocol will be established and staff will be available to address all Project issues. Emergency contacts will be maintained for immediate follow-up on emergency situations. Additionally, the Project team's construction manager will install community bulletin boards around the perimeter of the site. These bulletin boards will be maintained with current activity and schedule information.

The Project team intends to follow the guidelines of the City of Boston and MassDEP, which direct the evaluation and mitigation of construction impacts.

3.12.3 Construction Methodology

Construction methodologies that ensure public safety and protect individuals in the area will be employed. Techniques such as barricades and signage will be used. Construction management and scheduling will minimize impacts on the surrounding environment and will include plans for construction worker commuting and parking, routing plans for trucking and deliveries, and the control of noise and dust.

As the design of the Project progresses, the Project team will meet with BTD to discuss the specific location of barricades, the need for lane closures, pedestrian walkways, and truck queuing areas. This will be incorporated into the CMP which will be submitted to BTD for approval prior to the commencement of construction work.

3.12.4 Construction Schedule

Site work is anticipated to commence in the fall of 2013 and be completed within approximately 24 to 28 months.

Typical construction hours will be from 7:00 a.m. to 6:00 p.m., Monday through Friday, with most shifts ordinarily ending at 3:30 p.m. No substantial sound-generating activity is anticipated to occur before 7:00 a.m. If longer hours, additional shifts, or Saturday work is required, the construction manager will submit to and obtain approval in advance from ISD, who will coordinate with other agencies as deemed necessary such as Boston Air Pollution Control Commission and BTD. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 p.m. to ensure the structural integrity of the finished product; certain components must be completed in a single pour, and placement of concrete cannot be interrupted.

3.12.5 Construction Staging/Public Safety/Access

Access to the site and construction staging areas will be provided in the CMP. Construction staging and material laydown will occur on-site.

Secure fencing and signage will be employed to ensure the safety and efficiency of all pedestrian and vehicular traffic flows. The entire perimeter of the construction site will be protected with a six-foot high temporary chain link construction fence. Vehicular gates will be provided for construction traffic to allow safe entrance and egress for construction vehicles and personnel. Additionally, signage will be posted on fencing and construction trailers to alert all personnel to the safety requirements.

Larger deliveries of construction materials may require the use of police details to assist in managing vehicular and pedestrian traffic. Coordination with the Boston Police Department will be essential in providing safe travel routes for pedestrians during peak construction periods.

Although specific construction and staging details have not been finalized, the Project team and its construction management consultant will work to ensure that staging areas will be located in areas that minimize impacts to pedestrian and vehicular flow in the surrounding area. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

3.12.6 Construction Mitigation

The Project team will follow applicable City and MassDEP guidelines. As part of this process, the Project team and construction team will evaluate the Commonwealth's Clean Air Construction Initiative.

A CMP will be submitted to BTD for review and approval prior to issuance of a Building Permit. As mentioned above, the CMP will include detailed information on construction activities, specific construction mitigation measures, and construction materials access and staging area plans to minimize impacts to the campus and the surrounding community. The CMP will also define truck routes which will help in minimizing the impact of trucks on City and neighborhood streets.

"Don't Dump - Drains to Charles River" plaques will be installed at any new storm drains that are replaced or installed by the Project.

3.12.7 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 500 construction jobs will be created during the peak period of construction. The Project team will make reasonable good-faith efforts to have at least 50% of the total employee work hours be for Boston residents, at least 25% of total employee work hours be for minorities and at least 10% of the total employee work hours be for women. The Project team will enter into a Boston Residents Construction Employment Plan with the City of Boston.

To reduce vehicle trips to and from the construction site, construction workers will be encouraged to use non-auto modes, but recognizing that many workers will choose to drive to the site, the Project team anticipates that the Soldiers Field Park Garage will be used to accommodate worker parking which will discourage parking on neighborhood streets. The general contractor will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area.

3.12.8 Construction Truck Routes and Deliveries

At peak periods, it is projected that 80 trucks will arrive and depart the site each day, and during average periods it is projected that 35 trucks will arrive and depart each day. Construction truck trips are not anticipated to impact the critical evening peak hour. These trucks will be prohibited from using local neighborhood streets to arrive at or depart from the site. The construction team will manage deliveries to the site during morning and afternoon peak hours in a manner that minimizes disruption to traffic flow on adjacent streets. The construction team will provide subcontractors and vendors with Construction Vehicle & Delivery Truck Route Brochures in advance of construction activity. “No Idling” signs will be included at the loading, delivery, pick-up and drop-off areas.

3.12.9 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during demolition, excavation and the early phases of construction. Plans for controlling fugitive dust during demolition, excavation and construction include mechanical street sweeping, wetting portions of the site during periods of high wind, and careful removal of debris by covered trucks. The construction contract will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts.

3.12.10 Construction Noise

The construction activity associated with the Project may temporarily increase nearby sound levels due to the use of heavy machinery. Heavy machinery is expected to be used intermittently throughout the Project’s construction phases, typically during daytime period. The construction phases that will generate the highest sound level include demolition of the existing building, site excavation and foundation construction. The City of Boston noise control regulation considers construction sound levels to be an impact to residential land uses if the L_{10} sound level is in excess of 75 dBA or the L_{max} sound level is in excess of 86 dBA. A construction management program will be developed with the City of Boston to ensure that the noise regulation is met.

3.12.11 Construction Waste

The Project team will take an active role with regard to the reprocessing and recycling of construction waste. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00. This requirement will be specified in the disposal contract. Construction will be conducted so that materials that may be recycled are segregated from those materials not recyclable to enable disposal at an approved solid waste facility. The Project team will consider donating excess building materials to the Building Materials Resource Center.

3.12.12 Protection of Utilities

Existing site drainage and private infrastructure located within or adjacent to the site will be protected during construction. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its site plan review process.

3.12.13 Rodent Control

In order to address the issue of rodent infestation, the Project team will prepare a program for the extermination of rodents in accordance with the Massachusetts State Sanitary Code Chapter 2011, 105 CMR 410.550 and the State Building Code, Section 108/6 Policy Number 87-4 (City of Boston). The program will be required for the issuance of demolition, excavation and foundation permits. The Project team will prepare and adhere to a rodent construction program prior to the demolition and on a regular basis throughout the duration of construction.

3.13 Sustainable Design

3.13.1 Introduction

Every Project design decision will be informed by sustainability considerations. Enduring and efficient buildings conserve embodied energy and preserve natural resources. The Project is designed to satisfy market demand for urban residences with retail amenities and generous open space, while subscribing to planning and design strategies that ensure durability, conservation of resources and sustainability.

The Project embraces the opportunity to positively influence the built environment. Its urban location takes advantage of existing infrastructure while convenient access to mass transportation reduces dependence on single occupancy vehicle trips to minimize transportation impacts. Bicycle storage and Zipcar access are provided on-site and a Hubway bicycle sharing station is located adjacent to the site. These transportation alternatives provide residents with convenient, sustainable commuting options.

3.13.2 Article 37

To comply with Article 37 of the Boston Zoning Code, the Project team intends to measure the results of sustainability initiatives using the framework of the LEED (Leadership in Energy and Environmental Design) rating system. As a new residential building, the Project is categorized as a LEED BD&C– NC 2009 (New Construction) project. The LEED rating system tracks the sustainable features of the Project by achieving points in the following categories: Sustainable Sites; Water Efficiency; Energy & Atmosphere; Materials and Resources; Indoor Environmental Quality; and Innovation in Design.

The Project team seeks to achieve a minimum of Gold level certification under the LEED rating system, thus exceeding the requirements of Article 37. Below is a discussion of each credit that that is anticipated to be achieved. Credits that are still being studied are in italics. A LEED scorecard is included in Appendix E. The scorecard will be updated regularly as the design develops and engineering assumptions are substantiated.

Sustainable Sites

The Project site is in an urban neighborhood close to public transportation including multiple MBTA bus routes. The proposed site plan for the development includes some resident parking accommodated in a below grade parking garage on-site.

Prerequisite 1: Construction Activity Pollution Prevention

The Construction Manager shall submit and implement an Erosion and Sedimentation Control (ESC) Plan for construction activities specific to this Project related to the demolition of the existing building and parking lot and the construction of the new building. The ESC Plan will conform to the erosion and sedimentation requirements of the 2012 EPA Construction General Permit and specific municipal requirements for the City of Boston.

Credit 1: Site Selection

The Project site is located on a previously developed parcel in Allston near the Harvard University stadium and athletic facilities.

Credit 2: Development Density and Community Connectivity

The Project site is located in an urban area. The surrounding community includes housing, restaurants, shops, grocery stores, educational and religious institutions and other amenities within walking distance.

Credit 3: Brownfield Redevelopment

The Project site will be tested to determine if the site is eligible for this credit. If it is, a soils remediation plan will be established and implemented on site. Contaminated materials will be properly removed and disposed of following all local, state and federal guidelines and regulations.

Credit 4.1: Alternative Transportation, Public Transportation Access

There are several bus routes that stop adjacent to or within one-quarter mile of the Project site. Additionally, Harvard University Shuttle buses are anticipated to serve the area.

Credit 4.2: Alternative Transportation, Bicycle Storage

The Project includes space for approximately 325 bicycles. Exterior bike storage locations for visitors and employees will be incorporated into the site design. The residents will have access to covered and/or enclosed secure bike storage.

Credit 4.3: Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles

Resident parking is accommodated within the below grade parking garage and will include designated parking spaces for low-emitting fuel efficient vehicles.

Credit 4.4: Alternative Transportation, Parking Capacity

The quantity of available parking spaces in the new parking garage will not exceed the quantity required by the local zoning regulations. Additional parking for visitors will be provided on the streets adjacent to the Project site. The Project will provide the infrastructure for a ride share program and shared vehicle use, (ride boards, Zipcars, etc.).

Credit 5.1: Site Development, Protect or Restore Habitat

A combination of green roofs and landscaped open areas will contribute to improving the urban open space and the landscape design will incorporate native and adaptive plant materials which may result in the restoration of Habitat.

Credit 5.2: Site Development, Maximize Open Space

A combination of green roofs, landscaped open areas and pedestrian oriented hardscape will contribute to improving the urban open space. The amount of open space on the Project site will target 20% of the overall site square footage within the LEED Project Boundary, at a minimum.

Credit 6.1: Stormwater Design, Quantity Control

The City of Boston has requirements for collection and dispersal of stormwater. Improved absorptive landscaped areas and vegetated roofs will help mitigate stormwater runoff from the Project site.

Credit 6.2: Stormwater Design, Quality Control

A combination of natural and structural Best Management Practices (BMP) measures will be used to reduce the suspended solids and phosphorus content of the site stormwater runoff. BMP measures may include green roofs, rain gardens, water quality inlets, and grit chambers. Site stormwater run-off will be captured and treated to the extent possible prior to release into the municipal storm water drainage system.

Credit 7.1: Heat Island Effect, Non-Roof

More than 75% of the on-site parking is located under cover within the footprint of the proposed building.

Credit 7.2: Heat Island Effect, Roof

The roofs will be a high albedo membrane roof product with an SRI value of 78 minimum with some areas of planted, vegetated roofs. Together the vegetated roof and the high albedo roof will combine to cover a minimum of 75% of the total roof area.

Water Efficiency

The Project will specify low-flow and high efficiency plumbing fixtures within the residential units and public restrooms to reduce the amount of potable water used throughout the building. There will also be a high efficiency irrigation system.

Prerequisite 1: Water Use Reduction, 20% Reduction and Credit 3 Water Use Reduction

Through the specification of low-flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that use, at a minimum, 20% less potable water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements. The Project will target an overall potable water use savings of 35% above the calculated baseline.

Credit 1.1: Water Efficient Landscaping, Reduce by 50%

The Project will include an irrigation system for the majority of the landscaped areas on grade. The landscape design shall incorporate native and adaptive plant materials and the design of the irrigation system will target a 50% reduction in potable water use when compared to a mid-summer baseline. The vegetated roofs will incorporate drought tolerant plant materials that may require occasional watering by hand.

Credit 1.2: Water Efficient Landscaping, No Portable Water or No Irrigation

The Project will not include a permanent irrigation system or will not use potable water for irrigation.

Energy & Atmosphere

The building systems will be designed to optimize energy performance and will not use refrigerants that are harmful to the environment. The Project will incorporate a combination of mechanical and natural ventilation and include ERUs for the circulation spaces and common areas. Other building systems include central high efficiency condensing boilers and roof top cooling towers. The residential units will have heat pumps served by the gas-fired condensing boilers. Throughout the building, the targeted lighting power density will be below code minimums.

The building owner will engage a Commissioning Agent during the design phase to review the proposed design and ultimately confirm that the building systems are installed and function as intended and desired.

Prerequisite 1: Fundamental Commissioning of the Building Energy Systems

A third party Commissioning Agent, (CxA) will be engaged by the owner for purposes of providing basic commissioning services for the building energy related systems, including heating, ventilation, air conditioning and refrigeration (HVAC & R), lighting, and domestic hot water systems. The CxA will verify the building systems are installed, calibrated and perform to the building owners' Project requirements

Prerequisite 2: Minimum Energy Performance and Credit 1: Optimize Energy Performance

The building performance rating will demonstrate a minimum of a 20% improvement in energy use when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHREA/IESNA Standard 90.1-2007. This requirement will be met by selecting efficient mechanical equipment, an improved building envelope design and efficient lighting. The team will develop a whole building energy model to demonstrate the expected performance rating of the designed building systems. The Project may meet a higher level of performance, achieving more credits.

Prerequisite 3: Fundamental Refrigerant Management

The specifications for refrigerants used in the building HVAC & R systems will not permit the use of chlorofluorocarbon (CFC) based refrigerants. The proposed design of the HVAC systems will most likely achieve the prerequisite. Compliant selections of any walk-in freezers/coolers (installed by restaurant tenants), will also be required.

Credit 3: Enhanced Commissioning

The CxA will be engaged during the Design Development phase. The CxA's role will include reviewing the owner's Project requirements, creating, distributing and implementing a commissioning plan, and performing a design review of the Project documents.

Credit 4: Enhanced Refrigerant Management

Long life, high efficiency mechanical equipment will be specified for the HVAC systems, and the refrigerants specified for the systems will have low ozone-depletion and global warming potentials.

Credit 5: Measurement and Verification

The owner will establish an Energy Star Portfolio Manager account to enable the USGBC to review whole building energy and water use for five years after occupancy.

Credit 6: Green Power

The owner is exploring the purchase of 'green power' for a two-year renewable energy contract to provide a minimum of 35% of the building's electricity from renewable sources.

Materials & Resources

The design team will specify materials and products with recycled content, those made with certified wood and regionally procurable products to the extent possible. Throughout the construction phase of the Project, the construction management team will endeavor to divert construction and demolition waste from area landfills.

Prerequisite 1: Storage and Collection of Recyclables

Storage of collected recyclables will be accommodated within the individual residential units and within the building for the retail tenants. Residents will bring their recyclables to a centrally located trash and recycling storage room. The recyclables will be collected by a contracted waste management company on a regular basis.

Credit 2: Construction Waste Management

Prior to the start of construction, the construction management team will prepare and submit a Construction Waste Management plan which will be implemented on site. The construction manager will endeavor to divert as much demolition debris and construction waste from area landfills as possible with a goal to achieve 75% diversion overall.

Credit 4.1: Recycled Content 10% (post-consumer & ½ pre-consumer)

The Project specifications will require certain materials to include pre- and or post-consumer recycled content. During construction, materials and products submittals will include documentation of the percentage of pre/post consumer recycled content. The construction manager will track the recycled content with a Project goal to achieve at least 10% recycled-content materials based on overall Project materials costs.

Credit 4.2: Recycled Content 20% (post-consumer & ½ pre-consumer)

The construction manager will track the recycled content for each material with a Project target to achieve 20% recycled-content materials based on overall Project materials costs.

Credit 5.1: Regional Materials, 10% Extracted, Processed and Manufactured Regionally

The Project specifications will indicate materials to be extracted, harvested, recovered and manufactured within a 500 mile radius of the job site. The Project has established a target for at least 10% of the materials and products installed to be regional materials. The construction manager will track the submitted and installed materials and products with a goal to achieve the 10% threshold based on overall Project materials costs.

Credit 5.2 Regional Materials 20% Extracted, Processed and Manufactured Regionally

The Construction Manager will track the regional materials with a Project target to achieve 20% regional materials based on overall Project materials costs.

Indoor Environmental Quality

The interior air quality will be monitored during the construction phase of the Project and prior to occupancy. Low emitting materials, (low VOC), will be used throughout construction to maintain and improve air quality. The building occupants will be able to maintain a comfortable interior environment through access to thermal and lighting controls. The residential units are laid out to maximize exposure to views and daylight without a significant increase in heat gain.

Prerequisite 1: Minimum IAQ Performance

The building mechanical systems are designed to meet or exceed the requirements of ASHRAE Standard 62.1-2007 sections 4 through 7 and/or applicable building codes. Naturally ventilated spaces, such as the residential units, will comply with the applicable portions of ASHRAE 62.1.

Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

The building will be a non-smoking building.

Credit 3.1: Construction IAQ Management Plan (during construction)

The construction manager will develop an Indoor Air Quality Management Plan for the construction and pre-occupancy phases of the Pproject to meet/exceed the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied buildings Under Construction 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter3).

Credit 3.2: Construction IAQ Management Plan (before occupancy)

After the completion of construction and prior to occupancy, the owner will conduct baseline IAQ testing to demonstrate contaminant maximum concentrations are not exceeded.

Credits 4.1: Low-Emitting Materials, Adhesives & Sealants

The Project specifications will include requirements for adhesives and sealants to meet low VOC criteria for adhesives and sealants.

Credits 4.2: Low-Emitting Materials, Paints and Coatings

The specifications will include requirements for paints and coatings to meet low VOC criteria for paints and coatings.

Credits 4.3: Low-Emitting Materials, Flooring Systems

The specifications will include requirements for hard surface flooring materials to be Floor Score certified and carpet systems will endeavor to comply with the Carpet Institute Green Label program.

Credit 4.4: Low Emitting Materials, Composite Wood and Agrifiber Products

The Project will specify and install composite wood and agrifiber products that contain no added urea-formaldehyde. The construction manager will endeavor to use only compliant composite wood materials to the extent possible.

Credit 5: Indoor Chemical and Pollutant Source Control

The design team will design the Project and its ventilation system to minimize and control the entry of pollutants into the building and to contain chemical use areas.

Credit 6.1: Controllability of Systems, Lighting

It is the intent of the design to provide an appropriate level of individual lighting controls within the residential units. The controls in the amenity spaces and common areas may include vacancy/occupancy sensors and day light dimming controls. Multi-occupant user spaces will have multi-level lighting controls for modifying light levels as necessary for the various uses. The management offices will have lighting controls appropriate for the room use.

Credit 6.2: Controllability of Systems, Thermal Comfort

The intent of the design of the building is to include temperature controls for the residential units and regularly occupied amenity spaces. The management offices and tenant lease spaces will also have temperature controls.

Credit 7.1: Thermal Comfort, Design

The Project HVAC design will be in compliance with ASHRAE 55 for all applicable mechanically ventilated regularly occupied spaces. The residential units will include operable windows.

Credit 8.1: Daylight and Views, Daylight for 75% of the spaces

It is the intent of the design to locate regularly occupied residential unit spaces along the perimeter with ample glazing to achieve daylight within the residential units. The amount or type of glazing may be dependent on the orientation of the unit. Once the final layout of the units is established the daylight calculations will be confirmed.

Credit 8.2 Daylight and Views, Views for 90% of the spaces

It is the intent of the design to locate regularly occupied spaces along the perimeter with ample vision glass to achieve views for 90% of the areas.

Innovation in Design

The Project team has identified several possible ID credits which are listed below, (limited to five ID credits total):

Credit 1.1: Building as an Educational Tool

The Project plans to implement two public outreach programs to inform the public about the sustainable design features incorporated into the Project.

Credit 1.2: Exemplary Performance for SSc2.2

The Project site is located in a densely developed urban area.

Credit 1.3: Exemplary Performance for SSc4.1

The Project site is located on several bus routes with a frequency of service that may include over 200 transit rides per day.

Credit 1.4: Low Mercury Lighting

The building management will establish a lighting purchasing plan to limit the number of mercury containing lamps purchased for the building.

Credit 1.5: Green Housekeeping/Operations

The owner will use green cleaning products and equipment in the common areas and provide a package for residents explaining the 'green living' components of the Project.

Credit 2: LEED Accredited Professional

A LEED AP will provide administrative services to oversee the LEED credit documentation process.

Regional Priority Credits

Regional Priority Credits, (RPC) are established LEED credits designated by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, additional credit is awarded to the Project. RPCs applicable to the Boston area include: SSc3, SSc6.1, SScC7.1 EAc2 and MRc1.1. This Project anticipates three RPCs for SSc6.1-Stormwater Design, Quantity Control, SSc7.1-Heat Island Effect, Non-Roof and SSc7.2 Heat Island Effect, Roof.

Chapter 4.0

Urban Design

4.0 URBAN DESIGN

4.1 Vision

Barry’s Corner is poised to become a commercial and social center of the North Allston neighborhood, providing a concentration of shops and restaurants in a mixed-use setting that incorporates meaningful gathering spaces for community residents. It will help connect the residential neighborhoods to the south with Smith Field.

Key to the vision for North Allston is the creation of a walkable, neighborhood-oriented, mixed-use environment at Barry’s Corner. This reinvented “square” will include publicly accessible open spaces, wide sidewalks with trees and street furniture, ground floor uses that engage pedestrians, and shops and services selected to create a destination for residents, workers and visitors.

The Project site has been designated as the first development site in Barry’s Corner. The urban design opportunities for Barry’s Corner include the following:

- create a vibrant mix of uses that attracts a mix of users;
- provide meaningful open space that is a shared amenity;
- create a main street-like environment with community-oriented shops and services, and housing and other uses on upper floors;
- introduce additional connections from the existing North Allston residential neighborhood to Smith Field;
- transform Western Avenue into a pedestrian-friendly street by means of building orientation, careful attention to scale, and treatment of sidewalks and landscape, and the relationships of private development to public realm.

Design of the Project requires an architecture that defers to public realm—meaning the architecture calls attention to the image and identity of public spaces. Thus, strong, consistent, and defined streetwalls along public ways are important. The buildings are planned with prominent frontages on all orientations, and each orientation will play a different role in place-making. The Project buildings will respond specifically and appropriately to each orientation and contribute to the quality of the urban fabric.

On Western Avenue and North Harvard Street, continuous active edges will line the public streets and activate both widened sidewalks and new open space. Figures 4-1 to 4-3 show the continuous streetwall, new open space, and widened sidewalks along Western Avenue and North Harvard Street. Newly created “Smith Field Drive” will provide vehicular access and drop off for Smith Field, and “Grove Street” will evolve over time as an important pedestrian access from the existing grove of trees on the eastern side of North Harvard Street to Smith Field along a street with wide sidewalks, active edges and residential door knobs.

Figure 4-1

Perspective Looking West

ELKUS | MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 4-2

Perspective Looking East

ELKUS MANFREDI ARCHITECTS

HARVARD UNIVERSITY SAMUELS & ASSOCIATES

Figure 4-3

Perspective Looking West

4.2 Design Principles

The urban design strategy for Barry's Corner is organized by the following principles:

1) Provide continuous retail frontage along public streets;
2) Provide diversity of open space;
3) Provide visual permeability and physical pathways to Smith Field;
4) Plan an assemblage of building forms to foster diversity and appropriate scale;
5) Locate the greater building heights toward the north and away from the neighborhood.

***Principle One*:** Provide Continuous Retail Frontage Along Public Streets

The buildings are shaped to conform to the geometry of the site while providing a strong urban streetwall along Western Avenue and North Harvard Street. To achieve continuous retail frontage along the street, the ground floor is programmed with approximately 45,000 square feet of retail and other active uses. These active edges bring vitality to sidewalks and the public realm while engaging pedestrians.

The merchandising strategy for the retail space is focused on creating a lively mix of merchants that offer community-oriented products and services. The retail entrances will be marked with tenant graphics and signage programs, and the floor elevation of all retail uses will align with the adjacent sidewalk.

***Principle Two*:** Provide Diversity of Open Space

The Project enhances the public realm by creating publicly accessible open spaces within the parcel. The open spaces vary in their size and configuration but share a common goal to accommodate a diverse range of uses and users.

The Project provides a space along North Harvard Street formed by recessing a portion of the retail base. This open space expands the streetscape into the site and is lined with shops and restaurants that spill into the space and activate its edges. The expected uses include outdoor dining and merchandising, casual seating, and a weekly farmer's market.

A second open space, on the corner of Western Avenue and "Smith Field Drive" is formed where the building geometry creates a triangular-shaped space that becomes an overlook to Smith Field. By pushing the streetwall back from the roadway and expanding the public realm, the view corridor from the neighborhood to Smith Field is also expanded. The open space is programmed for uses that include outdoor dining and passive recreation. It will be furnished with benches, tables and chairs, and landscaped areas to create an inviting oasis in the city.

***Principle Three*:** Provide Visual Permeability and Physical Pathways to Smith Field

The massing approach is further guided by two objectives: preserve view corridors through the site and provide publicly accessible passageways along the northern and western edges of the site.

To provide visual permeability through the site, the massing is broken down into two distinct buildings connected by the ground level retail. This connection is covered by a landscaped rooftop terrace, a habitable amenity space for the residents accessible from the second floor.

The public passageways are composed of vehicular roadways with parallel parking and sidewalks. The passageways provide several enhancements to the public realm, including: providing a buffer to adjacent buildings and sites; improving neighborhood access to recreational amenities at Smith Field; creating publicly accessible on-street parking; and improving safety for drop-off and pedestrian connections to Smith Field.

The public sidewalks also extend the public realm around the site. They are finished in materials that are consistent with the streetscape design to be included in Harvard’s Institutional Master Plan. This coordinated streetscape design is focused on pedestrian-oriented materials and incorporates planted areas, outdoor seating, site furnishings, way-finding elements, and site lighting. The cumulative effect of these elements will be to provide identity for Barry’s Corner and enhance connections from the neighborhood to Barry’s Corner and from the neighborhood to Smith Field.

***Principle Four*:** Plan an Assemblage of Building Forms to Foster Diversity and Appropriate Scale

The building forms are configured to mediate between the larger institutional buildings to the north and the smaller residential buildings to the south. To achieve this, the building volume is broken down into component parts with footprints and volumes that resemble the pattern of surrounding land use, as shown in the elevations presented in Figures 4-4 and 4-5.

The diversity of materials used on each of the component parts reinforces the expression of building forms and provides scale.

***Principle Five*:** Locate the Greater Building Heights Toward the North and Away from the Neighborhood.

The massing approach locates taller building elements away from the residential neighborhoods to the south and closer to the larger institutional buildings to the north. The impact on pedestrians along public streets is reduced, and shadows are directed away from the public realm and the residential neighborhood.

South Elevation (Western Avenue)

0 32ft 64ft

East Elevation (North Harvard Street)

0 32ft 64ft

North Elevation ("Grove Street")

0 32ft 64ft

West Elevation ("Smith Field Drive")

0 32ft 64ft

The massing solution is composed of two buildings that are connected by a single-story retail base. The south building has its primary frontage along Western Avenue. It is six stories tall with ground level retail and five residential floors above.

The north building fronts on “Grove Street.” It is nine stories tall with ground level retail and eight residential levels above. The building volume steps down to seven stories at North Harvard Street to maintain a consistent streetwall.

4.3 Building Form and Articulation

The urban design principles result in a massing solution that articulates two distinct buildings which are connected by a single-level retail base. The distinct base allows the retail facades to address the public streets and engage pedestrians while providing visual separation from the building above.

Above the base, the dominant plane of the building facade is aligned to ensure continuity of the streetwall but with minor stepbacks. The minor stepbacks establish a pattern of architectural elements that create diversity along the frontage of the block. The minor stepbacks also work with integrated mechanical penthouses and roof screens to achieve visual resolution at the top of the building architecture.

4.4 Building Entrances, Service, and Parking

Building entrances activate the urban streetwall. Entrances for residential and retail spaces are distinctly expressed using architectural elements such as awnings, canopies, signage, and unique storefront designs. The commercial building entrances incorporate vision glass as the predominant material. Residential entrances also use clear glass to afford a visual connection to the lobby and reception spaces inside.

Service and parking entrances are located on “Grove Street” in the middle of the block with the openings for each integrated into the design of the building facade. Except for on-street parking, all parking will be covered and will be located below grade.

Chapter 5.0

Historic and Archaeological Resources

5.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

5.1 Summary of Impacts

The Project will not adversely impact historic resources. There are no inventoried or State-Register listed properties within the Project site. Removal of the existing buildings on the Project site will not have an adverse impact on a historic resource because the buildings are not included in the Inventory of Historic and Archaeological Assets.

There are certain properties listed on the State and National Registers of Historic Places and the Inventory of Historic and Archaeological Assets of the Commonwealth within the vicinity of the Project site, including Harvard Stadium; however, the Project will not adversely affect those resources.

5.2 Buildings on the Project Site

The Project site does not include any resources listed in the State and National Registers of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth.

The Project site includes two buildings constructed in 1956 and one building constructed in 1962. The buildings constructed in 1956 were constructed as a storage facility and garage. They are both steel and concrete structures with brick masonry piers set on concrete foundations and topped with flat roofs. The buildings were designed by the architectural firm of Bastille Halsey Associates. The buildings appear to lack architectural or engineering significance.

Designed by The Architects Collaborative, the 1962 building was constructed as the printing facilities and storage and shipping space for Harvard University. The one-story with basement cast in place concrete and concrete block building has a flat roof and horizontal and vertical ribbon windows. The building has a central pavilion which is slightly higher than the flanking wings. Loading docks are located on the north end of the building. Although designed by a well-known architectural firm of the period, the building appears to lack architectural or engineering significance.

5.3 Historic Resources in the Project Vicinity

The Project site is located in the vicinity of several properties listed in the State and National Registers of Historic Places and included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory).

Properties listed in the State and National Registers of Historic Places and properties included in the Inventory within or in the vicinity of the Project area are listed below in Table 5-1. Figure 5-1 depicts the locations of these properties.

Table 5-1 Historic Resources in the Vicinity of the Project

Map No.	Name	Address
Properties Listed in the State and National Registers of Historic Places		
A	Harvard Stadium	79 North Harvard Street
B	1767 Milestone	240 North Harvard Street
C	Charles River Reservation – Soldiers Field Road	Soldiers Field Road
Properties Included in the Inventory of Historic and Archaeological Assets of the Commonwealth		
1	Harvard Business School - Athletic Facilities Area	Soldiers Field Road, North Harvard Street
2	David L. Barrett School	25 Travis Street
3	Hill Memorial Baptist Church	279 North Harvard Street
4	Franklin Street Area	51-143 and 56-168 Franklin Street
5	John Mead Row Houses	150-168 Franklin Street and 86-98 Raymond Street
6	St. Anthony's Area	Bounded by Western Avenue, Everett, Adamson, and Franklin Streets
7	Raymond Street Area	1-45 and 18-98 Raymond Street
8	Patrick McDermott House	43-45 Raymond Street
9	Moses Tucker House	134 Franklin Street
10	Westford/Raymond Street Area	4,8, 10, 3, 7, 9 Westford Street and 9 Raymond Street
11	SB Cushing House	15-17 Athol Street
12	Ted's Diner	270 Western Avenue
13	Institute of Contemporary Art	1175 Soldiers Field Road

5.4 Impacts to Historic Resources

5.4.1 Visual Impacts

Given the size and scale of the proposed Project, its distance from historic resources and its architectural expression, it is not expected to substantively change the setting of nearby historic resources.

5.4.2 Shadow Impacts

The Project will result in no new shadow impacts to nearby historic resources.

5.5 Archaeological Resources

There are no known archaeological resources within the Project site. The Project site is located on previously developed urban land. No impacts to archaeological resources are anticipated.

G:\Projects2\MA\Boston\3343\historic_resources.mxd

HARVARD UNIVERSITY

SAMUELS & ASSOCIATES

Figure 5-1

Historic Resources

Chapter 6.0

Infrastructure

6.0 INFRASTRUCTURE

6.1 Summary of Findings

Based on initial investigations, the existing water, wastewater, stormwater, and energy infrastructure systems in the area have adequate capacity for the incremental increase in demand associated with the development and operation of the Project.

6.2 Introduction

This section describes the infrastructure systems that will support the Project. More specifically, this section describes the existing water, wastewater, stormwater, and energy infrastructure systems in the area, estimates the anticipated infrastructure demand from the Project, and discusses the capacity of these existing systems to accommodate the Project.

Subsequent design processes for the Project will include the required engineering analyses and will adhere to the applicable protocols and design standards, ensuring that the Project is properly supported by, and in turn, properly uses the City's infrastructure.

Energy conservation measures will be an integral part of the Project's infrastructure design. The buildings will employ energy-efficient and water-conservation features for mechanical, electrical, architectural, and structural systems, assemblies and materials where possible.

6.3 Domestic Water and Fire Protection

The systems discussed below include those owned by the Boston Water and Sewer Commission (BWSC), the Massachusetts Water Resources Authority (MWRA), and on–site infrastructure systems. There will be close coordination among these entities and with the Project team during subsequent reviews and the design process.

BWSC will provide local water service for the Project as they are the local service provider for the City of Boston. Potable water for this Project will be supplied by the MWRA to the BWSC water distribution system and conveyed to the Project site by BWSC mains.

6.3.1 Demand/Use

The Project will use approximately 81,125 gallons per day (gpd) of potable water. Water demand was estimated as 1.1 times wastewater generation as estimated below based on the Massachusetts State Environmental Code (Title 5). This estimate does not include cooling make-up water as these demands are not yet known at this stage of design development. In addition, water conservation savings as a result of LEED certification for the building have not been considered at this time.

The existing building on the Project site, 219 Western Avenue, will be demolished as part of the Project. Based on water use records, it is estimated that the existing building's water demand is about 1,500 gallons per day, on average. Therefore, the net new water demand is approximately 79,625 gpd.

6.3.2 Existing Water Distribution System

The existing building on the site is currently served by water service connections from BWSC's mains in both Western Avenue and North Harvard Street. BWSC has old 12-inch diameter cast iron water mains in both streets that are interconnected with each other. These mains have undergone cleaning and cement mortar lining rehabilitation to increase their capacity and improve water quality. In addition, the water delivery capability of the BWSC mains in the vicinity of the site is particularly robust because the primary MWRA meter, Meter No. 101, supplying the BWSC distribution network in Allston is located only a very short distance from the site on Spurr Street. From this meter, water is distributed to the BWSC mains in both North Harvard Street and Western Avenue. Therefore, because of this proximity to the MWRA supply source and the rehabilitated 12-inch diameter mains on the streets adjacent to the Project, the impact of the Project on water delivery capacity is anticipated to be minimal.

Field testing done in 2006 just east of the Project site at 148 Western Avenue revealed an available fire flow of over 6,000 gallons per minute (gpm) at 20 pounds per square inch (psi) residual pressure. The latter value was typical along Western Avenue and North Harvard Street near Barry's Corner based on hydraulic model simulations performed in 2007. The fire flow requirements of the proposed new building will typically be in the vicinity of 2,000 gallons per minute (gpm) at 20 psi or less since the new buildings will be equipped with sprinkler systems.

6.3.3 Proposed Connection

The Project will likely utilize, to the extent feasible, the existing domestic water and fire protection services currently extending into the Project site from Western Avenue and North Harvard Street.

Domestic water service connections required by the Project will meet applicable city and state codes and standards, including cross-connection backflow protection. Separate fires services will also be required.

Compliance with standards for domestic water service connections will be reviewed as part of BWSC's Site Plan Review Process. The review includes, but is not limited to, the sizing of the domestic water and fire protection services, calculation of meter sizing, backflow prevention design, and the location of hydrants and wall hydrants to conform to BWSC and Boston Fire Department requirements.

6.4 Wastewater

BWSC will provide the local sanitary sewer service for the Project as they are the local service provider for the City of Boston. Wastewater generated in the Project site is conveyed to the MWRA's treatment facility on Deer Island via the Charles River Valley Sewer, the South Charles Relief Sewer and the Boston Main Drainage Tunnel.

6.4.1 Demand/Use

The Project will generate approximately 73,750 gpd of wastewater. Generation rates from the Massachusetts State Environmental Code (Title 5) were used to support the development of these preliminary wastewater generation estimates as shown in Table 6-1.

Table 6-1 Project Wastewater Flow Estimate

Flow Source	*Title 5 Flow Unit*		*Flow (GPD)*
325 Units (2 bedrooms/unit)	110	GPD/bedroom	71,500
45,000 SF Retail	50	GPD/1,000 SF	2,250
		Total Wastewater Flow	73,750

Based on water use records, it is estimated that the existing building on the site generates approximately 1,360 gallons per day, on average, in wastewater flow. The net new wastewater generation from the site will be approximately 72,390 gpd.

6.4.2 Existing Wastewater Collection System

The Project is located at the corner of Western Avenue and North Harvard Street. The existing building on the site is currently served by the 24-inch diameter BWSC sewer in North Harvard Street. This sewer conveys flow along North Harvard Street from north to south and connects to the MWRA's Charles River Valley Sewer (CRVS), a 54-inch by 61.5-inch brick interceptor at the intersection of Spurr Street and North Harvard Street. There is also an existing 8-inch BWSC collector sewer, located on the north side of Western Avenue in the sidewalk adjacent to the site. This sewer, located along the southerly property line of the Project site, starts at a dead end manhole near the intersection of Western Avenue and North Harvard Street. It conveys wastewater in a westerly direction, then crosses Western Avenue, reverses direction and conveys flow to the 24-inch sewer in North Harvard Street and on to the CRVS. This sewer appears to have been constructed in the past to service the Project site, but it appears that is not currently being utilized.

The CRVS runs less than one-third full under normal dry weather circumstances; however, under large rainfall events it is known to surcharge to within a few feet of the street grade (approximately elevation 14.5 ft., Boston City Base). Although local sewers connected to the CRVS occasionally see a backup during significant wet weather events, wastewater flow is still able to be conveyed into the CRVS because the CRVS surcharge level is limited as a result of its ability to transfer flow to the MWRA's South Charles Relief Sewer (SCRS) via a control structure located very close to the Project site near the intersection of Spurr Street and Western Avenue. A low weir in the structure allows flow to enter the 30-inch diameter relief pipe that conveys flow away from Western Avenue along the westerly boundary (Smith Field) of the Project site to the SCRV located north of the Project site. The SCRV is an approximate horseshoe-shaped relief sewer, 84-inches by 112-inches in cross-section; the SCRV has ample capacity for the Project and the Allston service area. Accordingly, the contribution of wastewater flow from the Project is not anticipated to adversely impact the local BWSC or MWRA sewer capacity in the area.

In 2002, the MWRA rehabilitated over a mile of the CRVS along the entire length of Western Avenue, Spurr Street and along a portion of Bertram Street by the installation of a cured-in-place pipe to strengthen it and to improve its capacity. The relief control structure at Spurr Street and Western Avenue was also refurbished at that time. In 2008, Harvard continued the rehabilitation of the CRVS for another 1,100 feet from Bertram Street to a point on Seattle Street south of the Health and Life Science Center site.

6.4.3 Proposed Connection

The sewer service for the Project will likely tie into the 24-inch sewer in North Harvard Street, possibly utilizing all or part of the current connection pipes for the existing building on the site. Depending on the actual design of the Project, the 8-inch sewer on Western Avenue could also be utilized in addition to the North Harvard Street connection. Harvard will coordinate with BWSC on the design and capacity of the proposed connections to the sewer system. In addition, the Co-proponents will submit a General Service Application (GSA) to BWSC and Site Plan Review as the Project progresses.

The Project is expected to generate new wastewater flow exceeding 15,000 gallons per day; therefore, a Sewer Connection Permit (self-certification) from the MassDEP will be required.

6.5 Stormwater

The development of the Project site is an opportunity to reduce peak rates and volumes of runoff to the BWSC drainage system in North Harvard Street and improve the quality of stormwater runoff to the Charles River. Under existing conditions, the approximately 2.67-acre site is 85 percent impervious, with approximately 1.4 acres of pavement and 0.9 acres of buildings. After construction of the Project, the site will be improved to be 78 percent impervious, with only approximately 0.6 acres of pavement (a 57 percent reduction) and 1.5 acres of buildings. This significant reduction in pavement, which produces a greater pollutant load than rooftop runoff, will reduce pollutant loads to the Charles River.

Stormwater management controls will be established in compliance with BWSC standards and MassDEP's Stormwater Management Standards, as well as to meet LEED certification standards. They will also be designed to reduce phosphorus and bacteria loads to the Charles River, in accordance with Boston's anticipated EPA National Pollutant Discharge Elimination System (NPDES) permit.

6.5.1 BWSC Standards

Proposed connections from the site to the existing BWSC storm drainage system will comply with BWSC Site Plan Application regulations. Site plans will show in detail how drainage from building roofs and from other impervious areas will be managed. The Project is expected to improve stormwater runoff water quality through treatment and infiltration. The Project design will include methods for retaining stormwater on the site using green infrastructure described above. The flows reaching the stormwater management facilities will typically be pre-treated by routing through grassed swales, deep-sump hooded catch basins and/or particle separators that, combined with the stormwater management facilities, will achieve the goal of 80 percent or greater total suspended solids (TSS) removal.

The existing site drainage system connects to the 18-inch BWSC drain in North Harvard Street. The capacity of this drain is expected to be adequate to meet future Project demands due to the planned reduction in impervious areas and the installation of green infrastructure.

6.5.2 State Stormwater Standards

The proposed drainage facilities will be designed in accordance with MassDEP's Stormwater Management Standards to the maximum extent practicable. Since impervious areas will be reduced, the Project is a redevelopment project per the Massachusetts Stormwater regulations. For redevelopment, stormwater management standards addressing peak flow attenuation, groundwater recharge, and TSS removal must be met only to the maximum extent practicable; the remaining standards must be fully met. Peak flow attenuation will be achieved at the Project Site because impervious areas will be reduced. Infiltration and stormwater management systems will be required to provide groundwater recharge and TSS removal to the maximum extent practicable.

Following is a discussion of how the proposed improvements comply with the ten Stormwater Management Standards.

Standard 1: No New Conveyances of Stormwater

The design does not call for any new conveyance of stormwater discharges to wetlands or waters of the Commonwealth.

Standard 2: Pre- and Post-Construction Stormwater Flows

Stormwater management systems will be designed so that post-construction peak discharge rates do not exceed pre-developed peak discharge rates to the maximum extent practicable. Peak flow attenuation will be achieved at the Project site because impervious areas will be reduced and green infrastructure will be included in the design.

Standard 3: No Loss of Annual Recharge

Stormwater from the site will be allowed to percolate into the soils to allow groundwater recharge to the maximum extent practicable. Based on Natural Resources Conservation Service soils mapping, the site soils are classified as urban land (urban fill) with a wet substratum. The site borings indicate that the urban fill consists of silt, sand, gravel, ash and cinders, and groundwater elevations at the time of the borings was 7 to 12 feet below ground surface. Based on this data, the soils could be conservatively classified as Hydrologic Group C soils. The required recharge volume for Group C soils under the Stormwater Standards is 0.25 inch times the impervious area of the site, equivalent to 1,906 cubic feet. This standard can be met on the Project site with only approximately 2,300 square feet of porous pavement, or other green infrastructure described above.

Standard 4: TSS Removal

Stormwater management systems will be designed to remove 80 percent of the average annual load (post-construction conditions) of total suspended solids (TSS) to the maximum extent practicable. The vegetated bioretention areas/rain gardens and three types of porous pavements can achieve this standard. Green roofs and rainwater harvesting systems can reduce the water quality volume to be treated. The water quality volume is ½ inch times the impervious area of the site, equivalent to 3,812 cubic feet.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The Project site is not considered a land use with higher potential pollutant loads.

Standard 6: Discharge to Critical Areas

There is no direct discharge of untreated stormwater to any Outstanding Resource Water (ORW) or Area of Critical Environmental Concern (ACEC).

Standard 7: Redevelopment Areas

As discussed above, the Project is a redevelopment because there will be no net increase in impervious area. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges should comply with Standard 1 only to the maximum extent practicable. A redevelopment project should also comply with all other requirements of the Stormwater Management Standards and improve existing conditions. As discussed above, the project can meet these standards due to the decrease in impervious area and proposed green infrastructure.

Standard 8: Erosion and Sediment Controls

An erosion and sedimentation control plan with associated specifications and drawings showing details for control plan components will be prepared for the Project. The specified and detailed erosion controls, which will comply with the February 2012 EPA Construction General Permit requirements, will be implemented during construction by the Contractor to ensure protection of the BWSC drainage system and Charles River receiving water. The anticipated erosion and sediment controls to be implemented during construction include:

- ♦ Installation of filter rolls or other sediment control devices;
- ♦ Installation of catch basin filters; and
- ♦ Installation of a stabilized construction entrance and staging area.

All sediment controls will be established prior to the contractor commencing site preparation activities.

General controls, such as filter rolls will be installed at the downgradient edges of the site to provide sediment control. The filter barrier will be inspected regularly and those showing signs of deterioration will be replaced immediately. Material collected behind the filter rolls will be removed as needed.

During construction, monitoring of the stormwater and erosion control systems will require site inspections with a specific itinerary regarding required observations. Additional inspections will be conducted after each major storm event to confirm the integrity of the stormwater and erosion control system.

Standard 9: Long-Term Operation and Maintenance Plan

The stormwater management improvements will be inspected and maintained in accordance with an Operation and Maintenance Plan for the site. The stormwater and erosion control systems need to be maintained such that the controls operate properly. The Co-proponents will be responsible for both routine and long-term maintenance of the site. The program for the site will require inspection and maintenance of drain pipes, catch basins, manholes and green infrastructure facilities.

Standard 10: Illicit Discharges

No illicit discharges to the stormwater management system will be permitted.

6.5.3 EPA NPDES Permit Requirements

Since Barry's Corner stormwater runoff is tributary to the Charles River, it will be subject to Total Maximum Daily Load (TMDL) requirements for phosphorus and bacteria under Boston's anticipated NPDES permit. BWSC expects that, in the long run, the City will be required to reduce phosphorus to the Charles River by 65 percent. Parking lot runoff generally produces three times the phosphorus load compared to rooftop runoff (*Pennsylvania Stormwater Best Management Practices Manual*, 2006). Hence, the substantial reduction in pavement at the Project site will significantly reduce the phosphorus load from the site to the Charles River. In addition, by treating the water quality volume, defined as ½ inch of runoff times the impervious area of the site, with stormwater management controls such as bioretention and infiltration, phosphorus loads will be further reduced.

6.6 Gas and Electricity

6.6.1 Natural Gas Service

National Grid has natural gas lines in Western Avenue and North Harvard Street adjacent to the Project site. The Project's anticipated gas demand for heating and kitchen use has not been determined. The Project team will coordinate with National Grid on connections to the gas system and capacity of the system as the design of the Project moves forward.

6.6.2 Electric Service

NSTAR owns underground electric systems in Western Avenue and North Harvard Street. NSTAR will be contacted to coordinate providing electric service to the proposed Project. As the design progresses, the Project team and NSTAR will coordinate the final design and installation of electrical service. The peak electric load is estimated to be 3,500 kW.

6.6.3 Telecommunications

The Project team will coordinate with local telephone and cable providers regarding service to the Project as the design of the Project moves forward.

Chapter 7.0

Zoning, Permits, and Coordination with Other Governmental Agencies

7.0 ZONING, PERMITS, AND COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

7.1 City of Boston

7.1.1 Zoning

The Project site is currently part of the Harvard University Institutional Subdistrict of the Allston Neighborhood District. The existing uses on the site are being relocated to other University owned properties and, other than the Harvard ceramics studio that will be relocated to 224 Western Avenue, those relocations are the subject of a separate filing with the BRA. An Institutional Master Plan Notification Form to start the process for an IMP Amendment for the relocations was submitted to the BRA in October 2012.

The Project site will be rezoned to remove it from the Harvard University Institutional Subdistrict and will be added to the Western Avenue/Soldiers Field Road Community Commercial Subdistrict in which Planned Development Areas (PDAs) are allowed. As a result, the Project site will become eligible to be designated a Planned Development Area (PDA), under Section 80C of the Boston Zoning Code. The PDA Development Plan will set forth the use, bulk, dimensional, parking, loading, and design requirements applicable to the Project and will, if approved, supersede underlying zoning requirements. Under Section 80C of the Code, both the zoning amendment process and the PDA Development Plan and map amendment require approval by the BRA and Zoning Commission.

7.1.2 Article 80 Review – Large Project Review

Because the proposed building exceeds 50,000 square feet of gross floor area, the Project is subject to the requirements of Large Project Review pursuant to Article 80 of the Code.

Based on a comprehensive approach to addressing potential impacts and mitigation equivalent to the level of information normally presented in a Draft Project Impact Report (DPIR), it is the desire of the Project team that the BRA, after reviewing public and agency comments on this expanded PNF and any further responses to comments made by the Project team, issue a Scoping Determination Waiving Further Review pursuant to the Article 80B process.

7.1.3 Boston Civic Design Commission

The Project will be reviewed by the Boston Civic Design Commission (BCDC) under the provisions of Article 28 of the Code. The BRA will submit this PNF to the BCDC to initiate review.

7.1.4 Boston Landmarks Commission

Given that the Project involves the demolition of structures over 50 years old, the Project is subject to review by the Boston Landmarks Commission (BLC) under Article 85 of the Code. Applications for Article 85 review will be submitted to the BLC prior to the commencement of demolition.

7.1.5 Boston Parks and Recreation Commission

Given that the Project involves construction within 100 feet of a City park (Smith Field), the Project requires review and approval by the Boston Parks and Recreation Commission.

7.2 Commonwealth of Massachusetts

7.2.1 Massachusetts Environmental Policy Act (MEPA)

The Project, in and of itself, does not exceed any of the review thresholds for the filing of an Environmental Notification Form under the Massachusetts Environmental Policy Act (MEPA).

7.2.2 Massachusetts Historical Commission

As described in Chapter 5, Historic Resources, the Project will not adversely impact any historic resources. The Project may be subject to State Register Review (950 CMR 71) as it may require a state permit. If State Register Review is required, a Project Notification Form will be filed with the Massachusetts Historical Commission (MHC) to initiate the State Register Review process.

7.2.3 Architectural Access Board Requirements

The Project will comply with the requirements of the Massachusetts Architectural Access Board and will be designed to comply with the standards of the Americans with Disabilities Act.

7.3 Other Anticipated Permits and Approvals

Table 7-1 lists the anticipated permits and approvals from federal, state and local governmental agencies which are presently expected to be required for the Project, based on information currently available. It is possible that not all of these permits or actions will be required, or that additional permits or actions may be needed.

Table 7-1 List of Anticipated Permits and Approvals

Agency	Approval
City of Boston	
Boston Civic Design Commission	Design Review
Boston Employment Commission	Construction Employment Plan
Boston Fire Department	Flammable Storage Permit
Boston Inspectional Services Department	Building Permits; Other Construction-related Permits; Certificate of Occupancy

Table 7-1 List of Anticipated Permits and Approvals (Continued)

Agency	Approval
Boston Landmarks Commission	Article 85 (Demolition Delay)
Boston Parks and Recreation Department	Approval of Demolition and Construction within 100 feet of a park
Boston Public Works Department	Curb Cut Permit(s); Street Opening Permit (as required); Street/Sidewalk Occupancy Permit (as required)
Boston Redevelopment Authority	Article 80B Large Project Review; PDA Development Plan; Cooperation Agreement; Affordable Housing Agreement; Zoning Text and Map Amendments
Boston Transportation Department	Construction Management Plan; Transportation Access Plan Agreement
Boston Water and Sewer Commission	Site Plan Review; Water and Sewer Connection Permits; Cross Connection Backflow Prevention Approval (as required); Temporary Construction Dewatering Permit
Boston Zoning Commission	PDA Development Plan Zoning Text and Map Amendments
Office of Jobs and Community Service	Memorandum of Understanding (as required); First Source Agreement (as required)
Public Improvement Commission	Review and Approval of Streets; Permit/Agreement for Temporary Earth Retention Systems, Tie-Back Systems and Temporary Support of Subsurface Construction (as required); Permit for sign, awning, hood, canopy or marquee, etc. (as required)
Public Safety Commission Committee on Licenses	Permit to Erect and Maintain Garage; Flammable Storage License
Commonwealth of Massachusetts	
Department of Environmental Protection	Sewer connection self-certification; Notice of Commencement of Demolition and Construction;
Massachusetts Water Resources Authority	Temporary Construction Dewatering Permit (as required)
Federal	
Environmental Protection Agency	NPDES Construction General Permit

7.4 Legal Information

7.4.1 Legal Judgments Adverse to the Proposed Project

There are no legal judgments adverse to the proposed Project.

7.4.2 History of Tax Arrears on Property

Harvard does not have a history of tax arrears on property that it owns in the City of Boston.

7.4.3 Site Control / Public Easements

The Project site is owned by President and Fellows of Harvard College (see deed recorded in Suffolk County Registry of Deeds at Book 5184, Page 266).

Appendix A

Site Survey and Floor Plans


WESTERN
AVENUE
NORTH
HARVARD
STREET
CHARLES RIVER
STORROW DRIVE
SOLDIERS FIELD RD
HARVARD WAY
SITE
N HARVARD ST
WESTERN AVE
EVERETT ST


Parking Entry
Residential Entry
"Grove Street"
Residences
Trash
Loading
"Smith Field Drive"
Residential Amenities
Trash
Retail
Retail
Retail
Retail
Retail
North Harvard Street
Western Avenue
Residential Entry
Ground Level Plan
0
32ft
64ft
Project Site
Development Site

Second Level Plan

0 32ft 64ft

Project Site

Development Site

ELKUS | MANFREDI ARCHITECTS

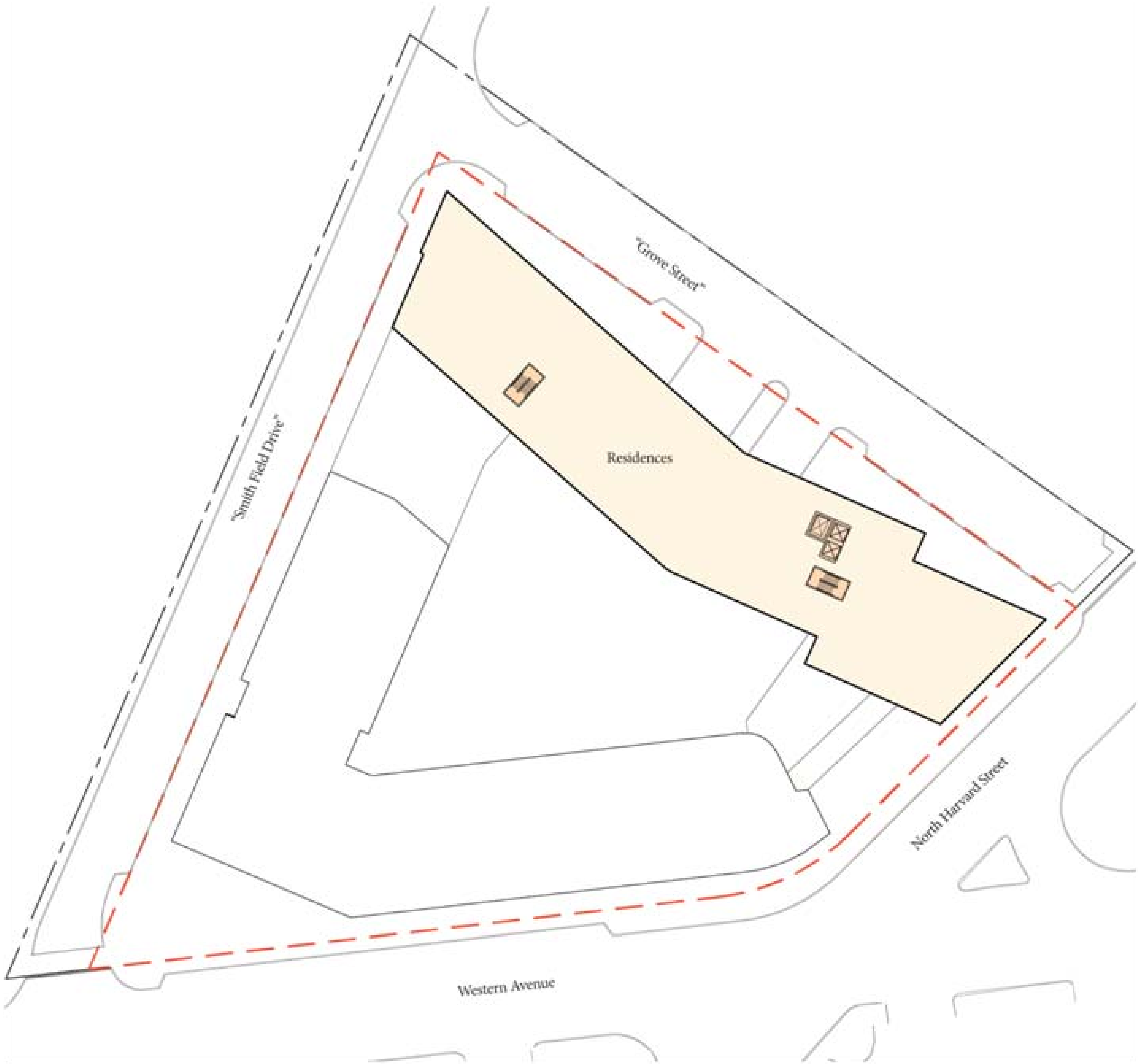
ELKUS | MANFREDI ARCHITECTS

Level 4-6 Plan

0 32ft 64ft

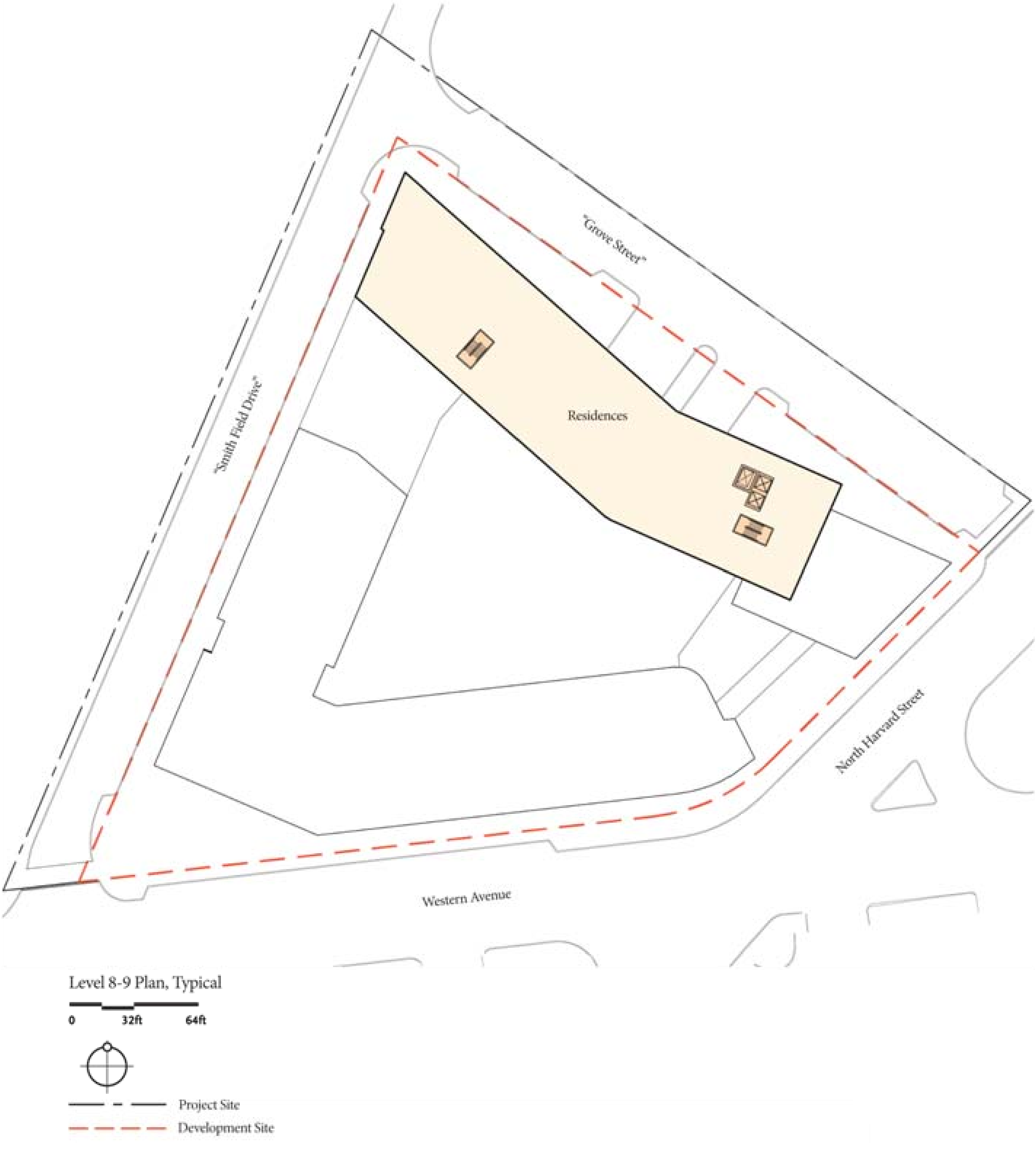
Project Site

Development Site


"Grove Street"
"Smith Field Drive"
Residences
North Harvard Street
Western Avenue

Level 7 Plan

0
32ft
64ft
Project Site
Development Site



ELKUS | MANFREDI ARCHITECTS

Appendix B

Transportation

Appendix B- Transportation Study

Expanded Project Notification Form

Barry's Corner Residential and Retail Commons

Prepared for **Samuels & Associates and Harvard University**

Prepared by **Vanasse Hangen Brustlin, Inc.**
Transportation, Land Development, Environmental Services
101 Walnut Street
P.O. Box 9151
Watertown, Massachusetts 02472
617 924 1770

December 2012

Table of Contents

List of Tables

List of Figures

1

Introduction

This transportation study has been prepared for the Barry's Corner Residential and Retail Commons Project ("the Project"), a proposed residential and retail development located at the corner of North Harvard Street and Western Avenue ("Barry's Corner") in the Allston neighborhood of Boston, Massachusetts. The study has been prepared for the Expanded Project Notification Form (EPNF).

Project Description

The Project site is located in the northwest quadrant of Barry's Corner at 219 Western Avenue. The site is generally bound by North Harvard Street to the east, Western Avenue to the south, Smith Playground to the west, and Harvard University property to the north.

The site is currently occupied by approximately 47,500 gross square feet of Harvard University uses (219 Western Avenue). The adjacent site shares parking and access with the Project site and consists of approximately 13,500 gross square feet of Harvard University uses in three separate buildings (i.e., 141, 155 and 175 North Harvard Street). Staff and employees from both these sites will be relocated to several other sites in Allston prior to the construction of the Project.

The Project involves the redevelopment of the 219 Western Avenue site including the demolition of the existing building and the construction of an approximately 350,000 square foot (sf) mixed-use project, which will include approximately 325 residential apartment units and 45,000 square feet of retail space. Approximately 180 parking spaces and 325 bicycle parking spaces in an underground garage and 41 on-street parking spaces within the site will be provided to support the building program.

The site will be served by two primary driveways – one located along Western Avenue ("Smith Field Drive") which will replace the existing driveway and one driveway along North Harvard Street ("Grove Street"). A third driveway ("Smith Field Drive Extension") for the site will be provided through the adjacent 175 North

Harvard Street site to provided a second, northern driveway to North Harvard Street controlled by Harvard University.

Study Area

The study area is comprised of the following 13 existing intersections, shown graphically in Figure 1:

- Western Avenue at Telford Street/Telford Street Extension - *signalized*
- Western Avenue at Everett Street - *signalized*
- Western Avenue at Riverdale Street - *signalized*
- Western Avenue at Spurr Street - *unsignalized*
- Western Avenue at existing site driveway - *unsignalized*
- Western Avenue at North Harvard Street - *signalized*
- Western Avenue at Travis Street - *unsignalized*
- Western Avenue at Batten Way/Hague Street - *signalized*
- North Harvard Street at Gordon Road - *unsignalized*
- North Harvard Street at existing site driveway - *unsignalized*
- North Harvard Street at Bertram Street/Spurr Street - *unsignalized*
- North Harvard Street at Franklin Street/Kingsley Street - *signalized*
- North Harvard Street at Bayard Street/Rena Street - *unsignalized*

The existing conditions evaluation consisted of an inventory of the traffic control; roadway, driveway, and intersection geometry; the collection of peak period traffic volumes; and a review of recent vehicular crash history at each of these intersections.

Methodology

The transportation analysis was conducted in three stages and in accordance with the Boston Transportation Department's (BTD's) Transportation Access Plan Guidelines (2001) and the BRA Development Review Guidelines (2006). Although a formal Transportation Access Plan Scope has not been issued for the Project, this report adheres to the general format requested by BTD.

The first stage, Existing Conditions, involved collecting pedestrian, bicycle, and vehicular volume data and quantifying and describing existing transportation conditions in the vicinity of the site. The transportation conditions studied included the transportation infrastructure, pedestrian and bicycle facilities, transit operations, traffic operations, parking availability, crash data, and existing loading facilities.

The second stage of the study established the framework for evaluating the transportation impacts of the Project. Specific travel demand forecasts for the Project were assessed along with future traffic demands on the study area roadways due to projected background traffic growth and other proposed area development that will occur, independent of the Project. The year 2017, a five-year time horizon, was selected as the design year for analysis.

The final stage of the study, presents mitigation measures to address the Project-related pedestrian and bicycle, transit, traffic, parking, and loading impacts. The proposed mitigation measures include a transportation demand management program, designed to reduce vehicular travel to the site; and implementing infrastructure enhancements to improve vehicular and non-vehicular operations.

2

2012 Existing Conditions

Existing transportation conditions in the study area include roadway geometry, traffic controls, daily and peak period traffic flow, vehicular crash information data, traffic operations, parking, public transportation, pedestrian and bicycle facilities, and loading/service. Each of these elements is described in detail below.

Roadway Conditions

The major roadways within the proposed Project study area are described below. Descriptions include characteristics such as roadway classification and jurisdiction, typical lane cross-sections, and surrounding land uses. Detailed descriptions of transit routes, pedestrian and bicycle accommodations, and parking supply and regulations along study area roadways are discussed in subsequent sections. Figure 2 graphically depicts the traffic control and observed lane use at the study area intersections.

Western Avenue

Western Avenue is an urban minor arterial that is under City of Boston jurisdiction. The roadway runs in an east-west direction between the Charles River to the east and to the west. To the west in Watertown, Western Avenue becomes Arsenal Street at the Charles River and provides access to points west. To the east in Cambridge, Western Avenue becomes one-way westbound, providing access from Central Square.

Within the study area, Western Avenue provides one lane of travel in each direction, with additional turning lanes at key intersections. Roadway widths range from approximately 45 - 47 feet east of North Harvard Street and from 42 - 47 feet west of North Harvard Street. Land uses along Western Avenue in the vicinity of the site primarily include residential, commercial and Harvard related uses.

North Harvard Street

North Harvard Street is an urban minor arterial that is under City of Boston jurisdiction. The roadway runs in a north-south direction from Cambridge Street in the south to the Charles River in the north. At the Charles River, North Harvard Street becomes JFK Street and terminates at Massachusetts Avenue (Route 2A) in Harvard Square. North Harvard Street provides a critical connection between Cambridge Street and Western Avenue.

Within the study area, North Harvard Street has one travel lane in each direction, with turning lanes provided at key intersections. Roadway widths vary along North Harvard Street from approximately 40 - 44 feet. Land uses along North Harvard Street consist primarily of commercial and residential uses south of Western Avenue and Harvard associated uses north of Western Avenue.

Traffic Volumes

To identify current traffic flow characteristics along the major roadways serving the project study area, peak-hour and daily traffic volumes were collected on roadways and intersections in and around the study area during April 2012. It should be noted that traffic volumes were collected prior to construction activities began on the Anderson Memorial Bridge.

Weekday daily volumes along roadways were collected using automated traffic recorders (ATRs). Table 1 summarizes the daily and peak hour traffic volumes along the study area roadways.

Table 1 Observed Traffic Volume Summary

Location	Weekday Daily[1]	Weekday Morning Peak Hour Vol[2]	Weekday Morning Peak Hour K Factor[3]	Weekday Morning Peak Hour Dir. Dist.[4]	Weekday Evening Peak Hour Vol	Weekday Evening Peak Hour K Factor	Weekday Evening Peak Hour Dir. Dist.
Western Avenue east of Everett St	20,200	1,485	7.4%	51% WB	1,560	7.7%	56% WB
Western Avenue west of Hague Street	12,500	895	7.2%	54% WB	955	7.7%	63% WB
North Harvard St north of Hefferan Street	13,400	890	6.7%	59% NB	1,020	7.6%	55% NB

Source: Vanasse Hangen Brustlin, Inc.; based on automatic traffic recorder counts conducted in April 2012.
1 average daily traffic volume expressed in vehicles per day
2 expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak hour
4 directional distribution of peak hour traffic

Weekday morning (7:00 AM – 9:00 AM) and evening peak hour (4:00 PM - 6:00 PM) volumes were collected in April 2012 at study area intersections using turning movement/ classification counts (TMCs) to identify current traffic volumes traveling through the key intersections in the study area. The data was used to establish the existing traffic conditions for the peak hour traffic analysis of study area intersections.

To evaluate the potential for seasonal fluctuation of traffic volumes on roadways near the Project site, the MassDOT 2008 Weekday Seasonal Factors, based on MassDOT's statewide traffic data inventory, indicates that traffic volumes in April are approximately seven percent *higher* than the yearly average conditions. To remain conservative, the April existing traffic counts were not adjusted. Figures 3 and 4 reflect the 2012 Existing weekday morning and weekday evening peak hour traffic volumes, respectively.

Crash Data

To identify potential vehicle crash trends and/or roadway deficiencies in the Project study area, the most current vehicle crash data for the study area intersections was obtained from MassDOT for the years 2008 to 2010.

Crash rates are calculated based on the number of reported crashes at an intersection and the volume of traffic traveling through that intersection on a daily basis. Rates that exceed MassDOT's average for crashes at an intersection in the district in which the town or city is located (District 6 for Boston) could indicate safety or geometric issues for a particular intersection. The latest published crash rates by MassDOT in District 6 are 0.77 for signalized intersection and 0.57 for unsignalized intersections. These rates imply that, on average, 0.77 crashes occurred per million vehicles entering signalized intersections throughout District 6, and 0.57 crashes occurred per million vehicles entering unsignalized intersections in the District. A summary of the study intersections' vehicle crash history is presented in Table 2.

As shown in Table 2, none of the study area intersections exceed the MassDOT District 6 average crash rate values. This means that all the intersections in the study area operate as safely as – or safer than – other similar intersections in the same district. Furthermore, there were no recorded fatalities at any of the study area intersections for the years 2008 through 2010.

Table 2 Vehicular Crash Summary (2008-2010)

	Western Avenue at								North Harvard Street at			
	Telford Street	Everett Street	Riverdale Street	Spurr Street	North Harvard Street	Travis Street	Batten Way	Hague Street	Gordon Road	Bertram Street/ Spurr Street	Franklin Street/ Kingsley Street	Bayard Street/ Rena Street
Currently Signalized?	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	No	Yes	No
MassDOT District Crash Rate	0.77	0.77	0.77	0.57	0.77	0.57	0.77	0.77	0.57	0.57	0.77	0.57
MassDOT Calculated Crash Rate	0.09	0.40	0.00	0.00	0.47	0.00	0.00	0.00	0.08	0.00	0.07	0.23
Exceeds?	No	No	No	No	No	No	No	No	No	No	No	No
Year												
2008	0	6	0	0	6	0	0	0	0	0	0	2
2009	1	3	0	0	0	0	0	0	0	0	0	1
2010	1	1	0	0	5	0	0	0	1	0	1	0
Total	2	10	0	0	11	0	0	0	1	0	1	3
Collision Type												
Angle	0	0	0	0	4	0	0	0	0	0	0	1
Head-on	0	0	0	0	2	0	0	0	0	0	0	0
Rear-end	1	5	0	0	2	0	0	0	0	0	1	2
Rear-to-rear	0	0	0	0	0	0	0	0	0	0	0	0
Sideswipe, opposite direction	0	2	0	0	2	0	0	0	0	0	0	0
Sideswipe, same direction	0	2	0	0	1	0	0	0	0	0	0	0
Single-vehicle crash	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	1	1	0	0	0	0	0	0	1	0	0	0
Total	2	10	0	0	11	0	0	0	1	0	1	3
Severity												
Fatality	0	0	0	0	0	0	0	0	0	0	0	0
Injury	1	1	0	0	6	0	0	0	0	0	0	0
Property-related	0	7	0	0	3	0	0	0	0	0	0	2
Unknown	1	2	0	0	2	0	0	0	1	0	1	1
Total	2	10	0	0	11	0	0	0	1	0	1	3
Time of day												
Weekday, 7:00 AM - 9:00 AM	0	1	0	0	2	0	0	0	0	0	0	0
Weekday, 4:00 PM - 6:00 PM	0	1	0	0	2	0	0	0	0	0	0	0
Saturday, 11:00 AM - 2:00 PM	0	1	0	0	0	0	0	0	0	0	0	0
Weekday, other time	2	6	0	0	6	0	0	0	0	0	0	2
Weekend, other time	0	1	0	0	1	0	0	0	1	0	1	1
Total	2	10	0	0	11	0	0	0	1	0	1	3
Pavement Conditions												
Dry	1	7	0	0	10	0	0	0	1	0	1	3
Wet	0	3	0	0	1	0	0	0	0	0	0	0
Snow	1	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	10	0	0	11	0	0	0	1	0	1	3
Non Motorist (Bike, Pedestrian)												
Total	0	0	0	0	3	0	0	0	1	0	0	0

Source: MassDOT vehicle crash data

Parking

There are 120 institutional parking spaces, as well as parking for service vehicles, within the surface lot that is shared by the 219 Western Avenue and 175 North Harvard Street parcels

Limited on-street parking is available along North Harvard Street, Western Avenue, and Spurr Street adjacent to the site, totaling approximately 83 spaces. The parking supply and regulations along these streets were inventoried and are summarized in Table 3 below.

Table 3 On-Street Parking Supply and Regulations

Roadway	Direction	Approximate Supply	Regulation
North Harvard St	Northbound (Western Ave to Gordon Rd)	20 spaces	Unregulated
	Southbound (Gordon Rd to Western Ave)	0 spaces	n/a
Western Ave	Eastbound (Riverdale St to Batten Way)	31 spaces	Unregulated
	Westbound (Batten Way to Riverdale St)	22 spaces	2 hour limit
Spurr St	Eastbound (Western Ave to North Harvard St)	10 spaces	2 hour limit

Transit

■

Public Transit

There are four MBTA bus routes traveling near the site, shown graphically in Figure 5. Two of the four routes (86 and 66) operate along North Harvard Street and provide connections between the study area and Harvard Square. A North Harvard Street southbound bus stop with a shelter is provided adjacent to the site and a northbound stop with a shelter is provided directly across North Harvard Street from the site. The other two routes (70 and 70A) provide connections to Central Square and operate along Western Avenue. Bus stops for these two routes are provided along Western Avenue within ¼ of the site. Characteristics of the MBTA bus services are summarized in Table 4.

Table 4 MBTA Bus Service in Allston

Route #	Route Name	Study Area Service Via	Peak Period Headway (minutes)	Average Weekday Ridership
66	Harvard Square - Dudley Station	North Harvard Street	10	14,676
70	Cedarwood (Waltham) Central Square	Western Avenue	20	4,654
70A	North Waltham Central Square	Western Avenue	30	2,032
86	Sullivan (Somerville) Cleveland Circle	North Harvard Street & Western Avenue	15	5,139

Source: MBTA Ridership and Service Statistics (Thirteenth Edition, 2010).

Harvard Shuttle Service

Harvard University provides supplemental transit services to enhance connectivity between Allston and Cambridge. The Allston Campus Express shuttle provides students and staff transportation throughout the academic year. Buses depart from the Allston Campus approximately every 15 minutes on weekdays with connections at Harvard Square, Harvard Kennedy School, Harvard Stadium, Harvard Business School (HBS), and Soldiers Field Park Garage. This route is illustrated on Figure 5.

Pedestrian and Bicycle Facilities

Sidewalks are provided along the primary roadways within the study area and are under the jurisdiction of the City of Boston. Western Avenue and North Harvard Street have eight to ten foot wide sidewalks on both sides of the streets that are generally in good condition within the study area. Crosswalks are provided at all study area signalized intersections. The pedestrian signal at the Western Avenue and Riverdale Street intersection provides a controlled pedestrian connection to Smith Field.

Figure 6 illustrates the existing bicycle accommodations within the study area, which include bicycle lanes on North Harvard Street from Soldiers Field Road to Cambridge Street and a cycle track on Western Avenue east of North Harvard Street. Bicycle lanes are planned on the Anderson Memorial Bridge and a cycle track is planned on the Western Avenue Bridge by MassDOT as part of the Accelerated Bridge Program (ABP). Additionally, a 15-dock Hubway regional bike-share station is located on the project site, sponsored by Harvard University.

Loading and Service

Existing loading and service activities are accommodated on-site via loading docks which can be accessed from either the Western Avenue or North Harvard Street driveways.

3
2017 Future Conditions

To determine the impacts of the site-generated traffic volumes on the surrounding roadway network, future traffic conditions were developed. A 5-year horizon (2017) was evaluated, based on typical guidelines for preparing traffic studies. The future traffic projection includes regional background traffic growth and planned roadway improvements resulting in the 2017 No-Build conditions. Anticipated site-generated traffic volumes were overlaid upon the 2017 No-Build traffic volume networks to reflect the year 2017 Build conditions in the study area. Each of these elements is described in detail below.

2017 No-Build Conditions

This section discusses the 2017 No-Build condition, including the identification of planned roadway improvements in the study area, the projection of future traffic volumes, and future public transportation, pedestrian, and bicycle conditions without the Project.

Future Roadway Conditions

On October 18, 2012, Harvard University filed an Institutional Master Plan Notification Form for its campus in Allston. The IMPNF described proposed new streets that would be constructed as part of a Ten-Year Plan. For purposes of providing a conservative analysis, it is assumed that these streets would be constructed after the five-year planning horizon for the Barry's Corner Residential and Retail Commons Project. The analysis does assume the site access and circulation that is described in the October 18, 2012 Institutional Master Plan Notification Form/Project Notification Form for 28 Travis Street/38 Travis Street/90Seattle Street/Bright Hockey Center Renovation.

It should be noted that the proposed redevelopment of the Brighton Mills site includes reconfiguration of the existing driveways to accommodate the extension of

Telford Street through the site. A traffic signal has been installed at the new four-way intersection of Western Avenue/Telford Street/Telford Street Extension and upon completion, the signal will be phased and timed to run as a coordinated system with an upgraded signal system at Western Avenue and Everett Street. These improvements have been incorporated in the existing conditions analysis as they were substantially complete at the time of this study's filing.

No-Build Traffic Volumes

Traffic growth on area roadways is a function of the expected land development, economic activity, and changes in demographics. A frequently used procedure is to estimate an annual percentage increase and apply that increase to study-area traffic volumes. An alternative procedure is to identify estimated traffic generated by specific planned major developments that would be expected to affect the Project study area roadways. For the purpose of this assessment, *both* methods were utilized to provide a conservative estimate of future traffic conditions.

Historical Traffic Growth

Based on historical data, to remain consistent with previous traffic studies published in the area and to be in-line with the actual growth on area roadways, it was determined that a 0.5 percent annual growth rate would be an appropriate background rate of growth for this area. This annual growth rate was applied to existing traffic volumes. Based on the seasonally adjusted data, peak hour traffic volumes grew, on average, by approximately 0.4 percent per year on study area roadways between 2008 and 2012, confirming this assumption. The annual growth rate is attributed to regional traffic volume increases and the possibility of traffic growth resulting from currently unknown developments likely to occur in the next five years.

Site Specific Growth

In addition to accounting for historical background growth, traffic associated with the following four planned and/or approved developments near the site were considered. Trip generation information for the background projects is included in the Technical Appendix.

- **Health and Life Science Center (formally referred to as the Allston Science Complex)** – The Health and Life Science Center will include approximately 500,000 – 600,000 square feet (sf) of scientific research and educational space, occupied by 1,000 employees. The site is located south of Western Avenue and approximately 500 feet east of Travis Street. Trip generation estimates for this project are based on information presented in the *Science Complex Draft Project Impact Report (DPIR)*, completed in September 2006.

- **Charlesview Redevelopment** – The project consists of the redevelopment of vacant retail space at the existing Brighton Mills development into 240 apartments, 20 condominiums, and 19,000 sf of mixed use space (retail, office, and community space); and the redevelopment of office space along Telford Street into 80 condominiums. The majority of the apartment units (213 out of 240 new) will be relocated from the existing Charlesview complex, currently located north of Western Avenue and east of North Harvard Street. Trip generation estimates for this project are based on information presented in the *Charlesview Redevelopment Complete Streets Analysis* memorandum, a supplemental document to the *Charlesview Redevelopment DPIR*, submitted in July 2009. Traffic associated with the existing Charlesview complex was removed from the existing network, while trips associated with the relocation/ redevelopment project were added to the network.

- **New Brighton Landing (New Balance)** – This project consists of the redevelopment of existing office and industrial/warehouse space into a new world headquarters office building for New Balance, office, hotel, a sports complex, fitness club, medical office and supporting retail and restaurant space totaling approximately 1.4 million square feet. The site is located north and south of Guest Street, adjacent to the existing New Balance headquarters. Trip generation estimates for New Brighton Landing are based on information presented in the *New Brighton Landing Expanded PNF*, completed in May 2012.

- **Swiss Bakers** – This project consists of the redevelopment of 168 Western Avenue; the site was previously occupied by a car dealership. The proposed redevelopment includes a 14,000 sf commercial bakery, of which approximately 12,000 sf will be dedicated to bakery production activities and 2,000 sf will be a café/retail bakery with 90-100 seats. Trip generation estimates for the redevelopment are based on standard Institute of Transportation Engineer (ITE) rates for a warehouse (bakery production component) and a high-turnover sit-down restaurant (café component).

At this time, no specific trip generation related to Harvard University's Allston Campus Institutional Master Plan elements were included in the 2017 No-Build traffic volumes since the implementation any IMP redevelopment would occur beyond 2017. Site circulation and proposed infrastructure improvements for the Project have been coordinated with Harvard Allston Campus IMP effort. Coordination between the projects will continue as each proceeds through the permitting process and as the Project and IMP projects move into the development process phase.

The 2017 No-Build traffic volumes were developed by applying the 0.5 percent annual growth rate over the five-year study horizon to the 2012 Existing Conditions traffic volumes and adding the traffic volumes associated with the site-specific background projects. Figures 7 and 8 present the resulting 2017 No-Build peak hour traffic volumes.

Transit Conditions

No significant transit-related improvements are planned within the study area. The MBTA is in the process of relocating or consolidating bus stops in the vicinity of Barry's Corner in an effort to simplify pedestrian wayfinding and improve operations.

As part of the Health and Life Science Center, Harvard has committed to implement shuttle bus service between Health and Life Science Center and the Longwood Medical and Academic Area linking the Allston Campus with Harvard Medical School campus and affiliate partner hospitals. Details regarding implementation timeframe, shuttle routes, stop locations or schedule for the service are not available at this time.

Pedestrian and Bicycle Conditions

There are no significant pedestrian improvements planned within the study area.

Bicycle lanes are planned on the Anderson Memorial Bridge and a cycle track is planned on the Western Avenue Bridge by MassDOT as part of the Accelerated Bridge Program (ABP). While both improvements are planned outside of the immediate study area, they will facilitate bicycle connections from/to Cambridge.

2017 Build Traffic Conditions

The 2017 Build condition discussion includes the displacement of existing trips to the site; the proposed site access and circulation; the projection and distribution of site-generated traffic volumes associated with the development; and proposed parking, transit, pedestrian, bicycle, and loading/service conditions with the Project in place.

Displaced Uses

The site is currently occupied by approximately 47,500 gross square feet of Harvard University uses (219 Western Avenue). The adjacent site shares parking and access with the Project site and consists of approximately 13,500 gross square feet of Harvard University uses in three separate buildings (i.e., 141, 155 and 175 North Harvard Street). The vast majority of staff and employees from both sites will be relocated within the study area to 28 Travis Street. To account for this redistribution of traffic within the study area, peak hour site driveway counts and anticipated employment levels at 28 Travis Street were used to develop reasonable projections of potential traffic shifts that were applied to the 2017 No-Build condition traffic volumes.

It should be noted that smaller portions of staff/employees from the existing sites would be relocated to 224 Western Avenue or other facilities in Allston. Trips associated with these facilities would be minimal (less than 5 total peak hour trips) and therefore are not anticipated to impact peak hour traffic operations.

Project Trip Generation

To assess the traffic impacts of the Project, trip estimates were based on standard rates from the Institute of Transportation Engineers (ITE) *Trip Generation*[1]. The appropriate ITE land use codes are shown in Table 5 and discussed further below.

Table 5 Trip Generation Land Use Codes

Land Use	ITE Land Use Code (LUC)	Independent Variable	Component Size
Residential	220 - Apartments	Dwelling Units	325 units
Retail	820 – Shopping Center	Square Feet	45,000 sf

- **Apartments – ITE LUC 220 "Apartment."** This study was conducted using ITE rates for standard apartments. This approach was taken deemed appropriate given the anticipated unit size and resident population.

- **Retail shops – ITE LUC 820 "Shopping Center."** While the proposed street-oriented retail shops more closely match ITE's definition of a "Specialty Retail Center" there are only limited data available for that land use code (LUC 814). Accordingly, initial trip generation estimates for the 45,000 sf of general retail space were conducted using ITE's shopping center trip generation rates.

1 Trip Generation; Eighth Edition; Institute of Transportation Engineers; Washington, D.C.; 2008.

Mode Share and VOR

After the initial calculation of the base Project trip generation using ITE data, further adjustments were made to account for local mode share following guidelines by the Boston Transportation Department (BTD) for individual city zones. This mode-share calculation is critical to the evaluation of overall Project-related traffic impacts as there will be a mixture of automobile travel to the Project, along with residents and customers that utilize public transit or walk and/or bike. The Project lies within Zone 17 and mode share data for this zone was utilized as shown in Table 6 below.

Table 6 Mode Share Assumptions

	Residential			Retail		
Time Period/Direction	Vehicle	Transit	Walk/Bike	Vehicle	Transit	Walk/Bike
Weekday Daily	47%	22%	31%	52%	8%	40%
Weekday Morning Peak Hour						
Enter	37%	30%	33%	43%	11%	46%
Exit	43%	21%	36%	47%	7%	46%
Weekday Evening Peak Hour						
Enter	43%	21%	36%	47%	7%	46%
Exit	37%	30%	33%	43%	11%	46%

Source: Access Boston Mode Share by Purpose and Time of Day for Area 17: Allston

Transit and bike/pedestrian activity was further evaluated by considering local vehicle occupancy rates (VOR). The VOR were derived from the 2000 U.S. Census and the 2009 National Household Travel Survey, and are consistent with other recent studies in the area. A VOR of 1.1 was utilized for the residential component and a VOR of 1.8 was utilized for the retail component of the Project.

Pass-By Vehicle Trips

Not all of the traffic generated by the Project will be new to the area roadways. For example, a portion of the vehicle-trips generated by the retail land use will likely be drawn from those motorists already on the roadways adjacent to the site that are 'attracted' to the services being offered at the site as they are passing through the area. The primary origin and destination for these trips is elsewhere and the primary trip will be resumed following the visit to the retail center. For this evaluation a 25-percent pass-by rate was assumed, though ITE data indicate that a greater occurrence of pass-by traffic is possible for retail uses.

Trip Generation Summary

As shown in Table 7, the proposed mixed use development is estimated to generate approximately 2,555 new weekday daily trips. Of this total, it is estimated that approximately 95 new vehicle trips (30 entering/65 exiting) during the weekday morning peak hour; and 205 new trips (120 entering/85 exiting) during the weekday evening peak hour would be generated. This generation reflects the typical lack of activity for retail land uses during the weekday morning peak periods.

Table 7 Vehicle Trip Generation Summary

Time Period/Direction	Residential	Retail	Total (Gross)	Pass-By	Total (New)
Weekday Daily [1]	980	2,100	3,080	525	2,555
Weekday Morning Peak Hour [2]					
Enter	10	25	35	5	30
Exit	55	15	70	5	65
Total	65	40	105	10	95
Weekday Evening Peak Hour [2]					
Enter	55	85	140	20	120
Exit	25	80	105	20	85
Total	80	165	245	40	205

Source: ITE Trip Generation, 8th Edition.
1 expressed in vehicles per day
2 expressed in vehicles per hour
3 Pass-By = 25% of retail trips only
4 New trips = Total Gross Trips – Pass-by Trips

The vehicle trip totals shown in Table 7 do not account for the traffic currently generated by the existing facilities on the site that will be displaced by the Project. A discussion of the trip generation for the existing uses on site to be displaced is provided earlier in this chapter.

■

Trip Distribution and Assignment

BTD provides guidance regarding where area residents work and where area employees live to determine the directional distribution of the vehicular traffic approaching and departing the site. Using this data for Area 17, vehicle trips can then be assigned to the roadway network.

Due to the varying trip characteristics of the development uses – residential and retail – each use is expected to experience a different distribution pattern. Thus, regional trip distribution percentages were calculated separately for each of the Project's uses. The more localized trip distribution (i.e., site access) was developed based on the site access driveway locations. A summary of the results is presented in Table 8, and is shown graphically in Figure 9.

Table 8 Vehicle Trip Distribution

Roadway	Direction (From/To)	Residential Trip Distribution	Retail Trip Distribution
Western Avenue	west	14%	15%
	East	23%	17%
North Harvard Street	North	14%	10%
	South	37%	47%
Everett Street	South	12%	11%
		100%	100%

Source: Access Boston

The projected site-generated traffic volumes were added to and the traffic shifts associated with the displacement of existing uses (discussed in a previous section) were added to/subtracted from the 2017 No-Build peak hour traffic volumes to develop the 2017 Build peak hour traffic volumes. These 2017 Build traffic volumes are shown in Figures 10 and 11.

Site Access and Circulation

Figure 12 depicts the proposed site plan. The Project includes the construction of two new roadways: "Smith Field Drive" and "Grove Street". "Smith Field Drive" will be a one-way northbound street with a parking lane and a sidewalk on its eastern side. "Grove Street" will be a two-way street with parking and sidewalks on each side of the street. The design and operation of these roadways is consistent with the roadway network that is envisioned as part of Harvard University's Ten-Year Plan for its Campus in Allston and will accommodate both motorized and bicycle traffic. The Project will provide accessible pedestrian level amenities within the site that complement the existing pedestrian network, such as activated pedestrian plazas and a secondary pedestrian corridor to Smith Field via "Grove Street".

The evaluation of the site driveways as part of the Build conditions analysis found in Chapter 4 revealed that it would not be advisable to provide full access from "Smith Field Drive" to Western Avenue and "Grove Street" to North Harvard Street. Due to sight distance limitations and operational problems for exiting vehicles, "Smith Field Drive" is proposed to operate as a one-way northbound roadway between Western Avenue and "Grove Street". The intersection of "Grove Street" and North Harvard Street is close to Barry's Corner and queuing vehicles from the signal will necessitate that "Grove Street" operate as only right-turn in/right-turn out through regulatory left-turn restriction signage.

A secondary driveway to North Harvard Street will be required to provide full access to and from the north. This "Smith Field Drive Extension", which is shown in Figure 12, will be provided through the adjacent 175 North Harvard Street property controlled by Harvard University. The resultant driveway location is far enough away from the Barry's Corner intersection to safely allow unrestricted turn movements. Emergency access to the site will be available from all driveways and loading access will be from "Smith Field Drive" and "Smith Field Drive Extension" to the proposed loading dock location on "Grove Street". Figures 13 and 14 present the revised 2017 Build with Mitigation traffic volumes that reflect this modified site access.

Parking

Parking for the residential units will be provided in an off-street parking garage with approximately 180-space that will connect with "Grove Street." In addition to the garage parking spaces, the Project will also provide on-site parking spaces for community car-sharing services (e.g., Zipcar). The Project will provide secure bicycle storage for building residents and employees in accordance with the City's Bicycle Parking Guidelines, and install bicycle racks at grade for general public use.

The proposed residential parking ratio of approximately 0.55 parking spaces per unit is below the BTD-recommended parking ratio of 1.0 parking spaces per unit for Allston. The lower parking ratio reflects the anticipated lower level of auto use that is anticipated at the site due to its proximity to transit services, particularly the proposed enhancements to the Harvard shuttle services (as described later in this study) that will improve access to the Red Line at Harvard Square and to Harvard University as well as the alternate transportation options (Zipcar, Hubway, secure bike parking) that will be available to employees and residents.

Based on ITE rates, parking demand for the retail program will be approximately 52 spaces occurring during the midday hours. This parking demand will be met through a combination of the new on-street spaces within the site, shared parking[2] within the proposed garage and available on-street spaces along Western Avenue and North Harvard Street. The Project will create 41 new on-street spaces within the site, including 16 spaces on "Grove Street" that will be used by visitors and tenants of 175 North Harvard Street including the Educational Portal and Silk Road.

[2] Shared parking is when two land uses, such as residential and retail, share the same parking supply because their usage peak at different times, in this case midday and overnight.

Transit Conditions

Based on the transit mode shares presented in Table 6, the future transit trips for the Project are summarized in Table 9. The Project will generate approximately 1,090 new transit riders during an average weekday. Peak hour transit trip generation is estimated at between 110 and 115 person trips depending on the peak hour.

Table 9 Transit Trip Generation Summary

Time Period/Direction	Residential	Retail	Total
Weekday Daily [1]	510	580	1,090
Weekday Morning Peak Hour [2]			
Enter	20	10	55
Exit	20	5	55
Total	40	15	110
Weekday Evening Peak Hour [2]			
Enter	30	25	55
Exit	25	35	60
Total	55	60	115

1 expressed in person trips per day
2 expressed in person trips per hour

The projected increase in peak hour transit ridership can be absorbed by the existing Routes 70, 70A and 86, however Route 66currently has a daily ridership of about 14,700 and may not be able to accommodate the all new Project transit trips destined for this route. The Co-proponents are proposing to supplement this transit connection to Harvard Square by extending Harvard shuttle bus service into Barry's Corner and provide access to this service for neighborhood residents.

Pedestrian and Bicycle Conditions

As shown in Table 10, the Project is expected to generate approximately 140 and 380 walk and bicycle trips to and from the site during the morning and evening peak hours, respectively. In addition, approximately 110 and 115 pedestrian trips to and from the site will be generated by transit riders during the morning and evening peak hours, respectively.

Table 10 Walk / Bike Trip Generation Summary

Time Period/Direction	Residential	Retail	Total
Weekday Daily [1]	710	2,910	3,620
Weekday Morning Peak Hour [2]			
Enter	10	50	60
Exit	50	30	80
Total	60	80	140
Weekday Evening Peak Hour [2]			
Enter	50	150	200
Exit	25	155	180
Total	75	305	380

1 expressed in person trips per day
2 expressed in person trips per hour

As part of the Project, sidewalks will be reconstructed along Western Avenue and North Harvard Street adjacent to the site and new sidewalks provided along "Grove Street" and "Smith Field Drive" enhancing pedestrian connectivity between Western Avenue, North Harvard Street and Smith Field. This construction will include new street trees and lighting to provide for an enhanced pedestrian environment. The proposed consolidation of MBTA bus stops along North Harvard Street, discussed in Chapter 5, will simplify pedestrian access to transit.

In accordance with BTD guidelines, 325 secure bicycle racks will be installed in the proposed garage for residents and tenants. Additional short-term bicycle storage will also be provided at street level and the existing Hubway bikeshare station will be maintained within Barry's Corner.

Loading and Service

An off-street loading dock will be provided along the "Grove Street" driveway and will be accessed via the "Smith Field Drive" driveways from either Western Avenue or North Harvard Street. This loading area will accommodate two smaller tractor-trailer trucks (WB-40) and a trash compactor. Trucks will be restricted to left-turns out of the dock and will egress the site using "Smith Field Drive Extension" to North Harvard Street. Truck traffic will not be allowed on "Grove Street" beyond the loading dock, enabling the intersection of North Harvard Street and "Grove Street" to be designed using a more appropriate pedestrian scale.

Infrequent larger trucks will be directed to use the Western Avenue at "Smith Field Drive" intersection to access an on-street loading zone located along "Smith Field Drive". Egress from this zone will be via "Smith Field Drive Extension" to North Harvard Street

4

Traffic Operations

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic within the study area. To assess quality of flow, roadway capacity analyses were conducted with respect to the 2012 Existing conditions and projected 2017 No-Build and Build traffic volume conditions. Capacity analyses provide an indication of the adequacy of the roadway facilities to serve the anticipated traffic demands.

Level-of-Service and Delay Criteria

Consistent with BTD's guidelines, *Synchro 6* software, based on the 2000 Highway Capacity Manual [HCM][3], was used to model level of service (LOS) operations at the study area intersections. The term LOS is used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay, and freedom to maneuver.

- Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level-of-service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level-of-service is derived directly from the delay calculation.

3 Transportation Research Board, Highway Capacity Manual, Washington, D.C., 2000.

- Delay is a complex measure that depends upon a number of variables such as quality of signal progression, cycle length, allocation of green time, and volume-to-capacity (v/c) ratio. Of all the factors cited, v/c ratios have the least effect on delay. Thus, for any given v/c ratio, a range of delay values [and, therefore, levels of service] may result. Conversely, for a given level of service, the v/c ratio may lie anywhere within a broad range. Comparison of intersection capacity results therefore requires that *in addition to the LOS, the other measures of effectiveness [MOEs] must also be considered.*

Level-of-service for signalized intersections is based on average delay for all vehicles entering the intersection, including initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For unsignalized intersections, level-of-service is based on stopped delay for vehicles on the side street approaches since the main street traffic is not affected by side street traffic. The level-of-service criteria for signalized and unsignalized intersections are presented in Table 11.

Table 11 Level of Service Criteria

Level of Service	Signalized Intersection Stopped Delay (sec/veh)	Unsignalized Intersection Stopped Delay (sec/veh)
LOS A	≤ 10	0-10
LOS B	> 10-20	> 10-15
LOS C	> 20-35	> 15-25
LOS D	> 35-55	> 25-35
LOS E	> 55-80	> 35-50
LOS F	> 80	> 50

Source: 2000 HCM

Level-of-Service Analysis

Levels-of-service analyses were conducted for the 2012 Existing, 2017 No-Build, and 2017 Build Conditions for the signalized and unsignalized study-area intersections.

Signalized Intersection Capacity Analyses

Adjustments were made to the Synchro model to include characteristics of each intersection, such as heavy vehicles, bus operations, parking activity, and pedestrian crossings. The LOS results of the signalized intersection analyses are summarized in Table 12 for the Existing, No-Build, and Build Conditions. Detailed results including delay by approach, queuing and volume to capacity ratio are presented in the Technical Appendix along with the detailed Synchro results.

Table 12 Signalized Intersection Level of Service Summary

Intersection	Lane Group	2012 Existing Conditions Weekday Morning	2012 Existing Conditions Weekday Evening	2017 No-Build Conditions Weekday Morning	2017 No-Build Conditions Weekday Evening	2017 Build Conditions Weekday Morning	2017 Build Conditions Weekday Evening	2017 Build With Mitigation Conditions Weekday Morning	2017 Build With Mitigation Conditions Weekday Evening
Western Avenue at	Western Ave. EB Approach	A	A	A	B	A	B	A	B
Telford Street/	Western Ave. WB L	A	A	A	A	A	A	A	A
Telford Street	Western Ave. WB T/R	A	A	A	A	A	A	A	A
Extension	Telford St. Extension NB L/T	D	D	D	D	D	D	D	D
	Telford St. Extension NB R	C	D	C	C	C	C	C	C
	Telford St. SB Approach	C	D	C	C	C	C	C	C
	Overall	A	A	A	B	A	B	A	B
Western Avenue at	Western Ave. EB L/T	C	B	D	C	D	D	D	D
Everett Street	Western Ave. EB R	A	A	B	B	B	B	B	B
	Western Ave. WB L	C	B	F	C	F	D	F	D
	Western Ave. WB T/R	B	C	B	D	B	D	B	D
	Everett St. NB Approach	F	F	F	F	F	F	F	F
	Everett St. SB Approach	E	D	F	E	F	F	F	F
	Overall	E	D	F	E	F	F	F	F
Western Avenue at	Western Ave. EB Approach	A	A	A	A	A	A	A	A
Riverdale Street	Western Ave. WB Approach	A	A	A	A	A	A	A	A
	Overall	A	A	A	A	A	A	A	A
Western Avenue at	Western Ave. EB L	F	F	F	F	F	F	F	F
North Harvard Street	Western Ave. EB T/R	D	C	D	D	D	D	D	C
(Barry's Corner)	Western Ave. WB L	D	C	D	D	E	D	E	F
	Western Ave. WB T/R	D	D	E	E	E	F	E	F
	N. Harvard St. NB L	D	E	D	F	D	F	F	F
	N. Harvard St. NB T/R	D	D	D	D	D	D	C	C
	N. Harvard St. SB L/T	D	E	D	E	D	F	F	F
	N. Harvard St. SB R	C	D	C	D	C	D	C	C
	Overall	D	D	E	F	E	F	E	F
Western Avenue at	Western Ave. EB L	C	B	B	B	B	B	B	B
Hague Street/	Western Ave. EB T/R	C	B	B	B	B	B	B	B
Batten Way	Western Ave. WB L	B	B	A	A	A	A	A	A
	Western Ave. WB T/R	C	C	B	B	B	B	B	B
	Hague St. NB Approach	F	D	D	D	D	D	D	D
	Batten Way SB Approach	D	D	D	D	D	D	D	D
	Overall	D	C	B	B	B	B	B	B
North Harvard Street	Franklin St. EB Approach	D	D	E	D	E	D	E	D
at Franklin Street /	Kingsley WB Approach	D	D	D	D	D	D	D	D
Kingsley Street	N. Harvard NB Approach	B	A	B	B	B	B	B	B
	N. Harvard SB Approach	B	A	B	B	B	B	B	B
	Overall	B	B	B	B	B	B	B	B

Source: VHB, Inc. using Synchro 6 (Build 614) software.
Note: Shaded cells denote LOS E/F conditions.
LOS – Level-of-Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; L = Left-turn; T = Through; R = Right-turn

The Western Avenue and North Harvard Street corridors process heavy traffic and pedestrians volumes during the commuter peak hours. At times, long queue length and high vehicle delays can be observed. The traffic model includes a conservative approach to future traffic trends by forecasting an increase in background traffic and assigning specific known development projects to the study area as required by BTD. Two study area intersections operate with long delays either on some of their individual approaches or for the entire intersection, with or without the proposed Project.

At Barry's Corner, the intersection accommodates a combination of pedestrian, bicycle and vehicle traffic with mixed results. Bicycles enjoy almost full accommodation within dedicated lanes, with the exception for the westbound movement out of the intersection. Pedestrian crossings are accommodated with the current exclusive pedestrian phase but result in extended pedestrian wait times from the longer cycle length. That longer cycle length combined with large numbers of left-turning vehicles on the northbound and eastbound approaches results in poor LOS (LOS E or worse) and long queues during the No-build and Build peak hour conditions. Chapter 5 describes the proposed improvements to site access and the Barry's Corner intersection focused on improving vehicle delay, pedestrian delay and queuing at the intersection. Analysis indicates that the proposed improvements in the 2017 Build with Mitigation Condition will bring operations in the range of 2017 No-build vehicle delays and improve queuing and pedestrian delays.

The Western Avenue at Everett Street intersection is projected to operate at LOS E and F during both the No-build and Build conditions. Exclusive pedestrian phasing and the resultant long cycle lengths are projected to negatively impact queues and delay at this location. The signal controller, phasing and timing were upgraded in 2012 by the Charlesview Project in conjunction with BTD, so no further improvements are proposed by the Project.

■

Unsignalized Intersection Capacity Analyses

Table 13 presents a summary of the capacity analyses for the unsignalized intersections in the study area. The capacity analyses worksheets, detailing level of service, average delay, volume to capacity and 95th percentile queues, are included in the Technical Appendix.

As discussed in Chapter 3 and reflected in Table 13, "Smith Field Drive" is proposed as a one-way northbound driveway in the 2017 Build with Mitigation Condition to address operational issues and limited sight distance to the west from this intersection. The Western Avenue at Travis Street intersection exhibits a decrease in LOS from the No-Build to Build Conditions. This change is a result of both increased traffic on Western Avenue from background growth and the relocation of existing site uses to 28 Travis Street. This impact is limited to a slight increase of expected peak hour delay experienced on the Travis Street approach to the intersection which is typical of any unsignalized intersection along an urban arterial roadway. The nearby traffic signal at Barry's Corner will produce platooned Western Avenue traffic with larger available gaps to allow Travis Street movements.

Table 13 Unsignalized Intersection Level of Service Summary

Intersection	Lane Group	2012 Existing Conditions		2017 No-Build Conditions		2017 Build Conditions		2017 Build With Mitigation Conditions	
		Weekday Morning	Weekday Evening	Weekday Morning	Weekday Evening	Weekday Morning	Weekday Evening	Weekday Morning	Weekday Evening
Western Avenue at "Smith Field Drive"	Driveway SB L/R	D	C	E	D	F	F	n/a	n/a
Western Avenue at Travis Street	Travis St. NB L/R	B	B	C	C	D	E	D	E
North Harvard Street at Gordon Road	Gordon Road WB L/R	B	B	C	C	C	C	C	C
North Harvard Street at "Smith Field Drive Extension"	Driveway EB Approach	n/a	n/a	n/a	n/a	n/a	n/a	C	C
North Harvard Street at "Grove Street" Driveway	Driveway EB L/R	C	C	C	D	B	B	B	B
North Harvard Street at Bertram Street / Spurr Street	Bertram St. WB L/R	C	C	C	C	C	C	C	C
	Spurr St. EB L	C	C	C	C	C	C	C	C
	Spurr St. EB R	B	B	B	C	B	C	B	C
North Harvard Street at Bayard Street / Rena Street	Bayard St. EB Approach	B	B	C	B	C	B	C	B

Source: VHB, Inc. using Synchro 6 (Build 614) software.
Note: Shaded cells denote LOS E/F conditions.
LOS – Level-of-Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; L = Left-turn; T = Through; R = Right-turn

5

Proposed Improvements

Proposed improvements are focused on improving multimodal access to the site and at Barry's Corner. Specific roadway and intersection improvements have been identified that further this goal and are sufficient to reduce and manage the traffic impacts expected from the Project. The proposed improvements, which are identified in Figure 15, are consistent with the City's Complete Streets guidelines and emphasize accommodation of pedestrians and bicycles within the street environment. These measures will be formalized in the Transportation Access Plan Agreement that will be executed with BTD.

Site Access and Circulation

The Project includes two new streets, "Smith Field Drive" and "Grove Street," that provide attractive pedestrian connections along the site and to Smith Field. The pedestrian realm on North Harvard Street and Western Avenue will be improved in front of the site to enhance Barry's Corner. The proposed site access and circulation is designed to mitigate potential impacts at the site driveways by prohibiting traffic from making turns that could also affect the operation of Barry's Corner. These measures include:

- **One-way "Smith Field Drive"** – Operate Smith Field Drive" as a one-way street from Western Avenue to "Grove Street" to reduce potential conflicts caused by traffic that would otherwise use this driveway to exit the site onto Western Avenue.
- **"Grove Street" Turn Restrictions** – Restrict turns at the "Grove Street" intersection with North Harvard Street to right-in/right-out operation to reduce conflicts at this location.
- **"Smith Field Drive Extension"** – Provide a secondary driveway connection to North Harvard Street through the adjacent 175 North Harvard Street property to North Harvard Street

- **On-site Loading** – Provide on-site loading zone and docks accessible from "Smith Field Drive" or "Smith Field Drive Extension".

Improvements to Barry's Corner

Improvements at Barry's Corner are aimed at improving operations for all users, not only motorists but also pedestrians, bicyclists and transit riders. The proposed improvements will bring intersection operations in the range of No-build levels while improving the pedestrian and bike experience at Barry's Corner.

- Update the traffic signal timing, phasing and equipment.
  - Upgrade signal equipment and supports as needed.
  - Convert exclusive pedestrian phasing to concurrent pedestrian crossings.
  - Convert northbound left-turn phasing from permitted/protected to protected operation.
  - Restrict southbound right from turning on red.
  - Provide ADA-compliant pedestrian crossings.
  - Provide vehicle detection on North Harvard Street approaches.
  - Provide infrastructure for connection to BTD central system.

- Revise eastbound Western Avenue approach to Barry's Corner to accommodate:
  - Continuation of the westbound bicycle lane;
  - Delineation of on-street parking spaces (10 spaces) with a 2-hour parking restriction; and
  - Lengthen the left-turn lane to 250 feet.

- Restripe the southbound North Harvard Street approach to Barry's Corner in order to improve queue management and alignment through the intersection.
  - Shift on-street parking spaces from the northbound to southbound side of North Harvard Street.
  - Transition the southbound bicycle lane to shared bicycle lanes at the intersection.
  - Consolidate and relocate the southbound MBTA #66 and 88 bus stop to north of the Grove Street driveway.
  - Lengthen the right-turn lane storage to 150 feet.

- Implement peak hour on-street parking (5 spaces) restrictions on northbound North Harvard Street, south of Bertram Street, to improve traffic flow and queues.
- In order to improve parking availability for all Barry Corner businesses, change unrestricted Western Avenue on-street spaces into two-hour parking restricted spaces.

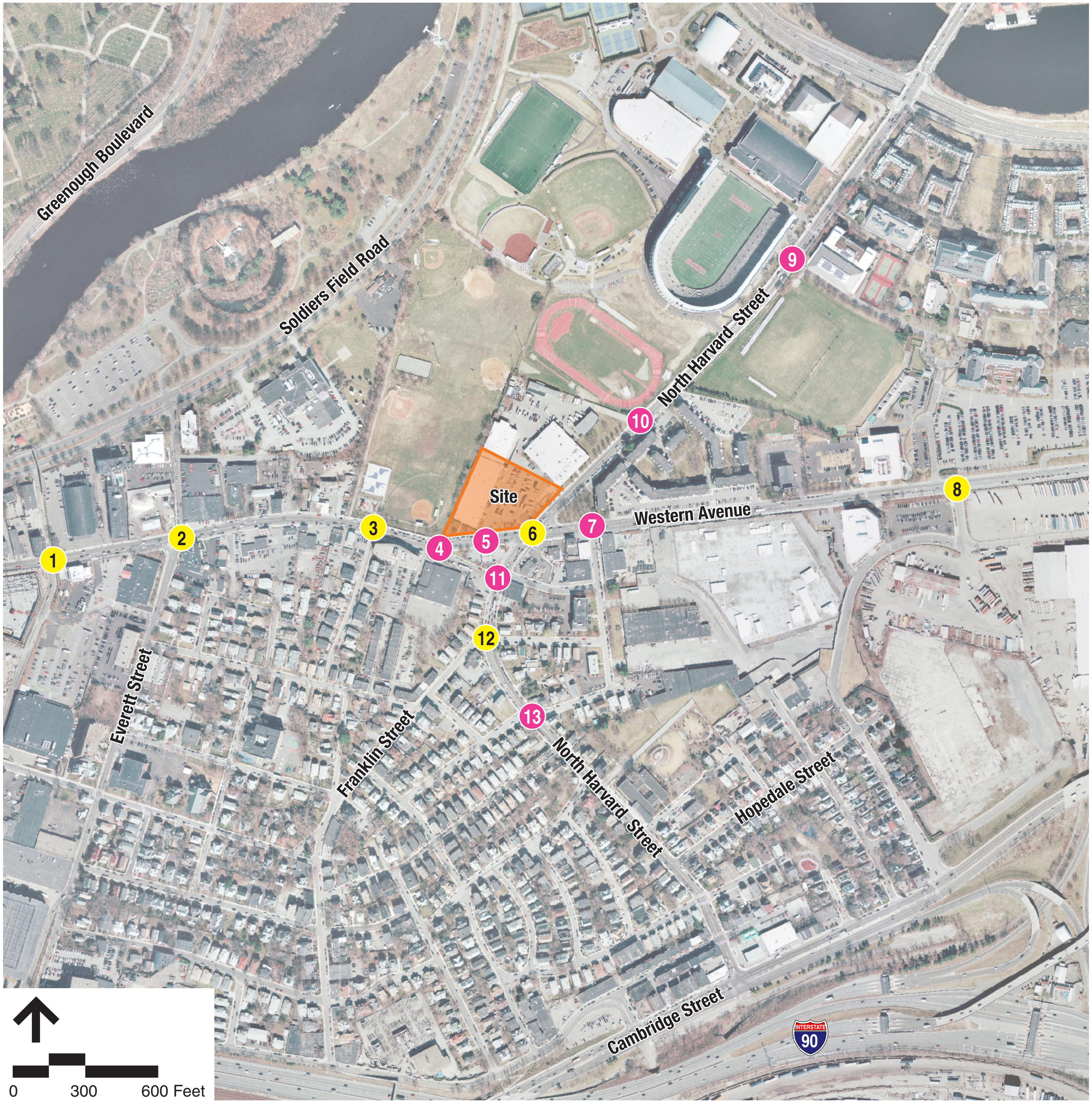
Transportation Demand Management

Consistent with the City's goals to reduce auto dependency, the Project will offer Transportation Demand Management (TDM) measures to encourage alternative modes of transportation. Measures being considered as part of the Project include:

- **Bike Storage** – Provide secure bicycle storage for building residents and employees in accordance with the City's Bicycle Parking Guidelines.
- **Public Bike Racks** – Install bicycle racks at grade for general public use.
- **Hubway Station** – Maintain the Hubway bike sharing station within Barry's Corner, possibly at a new location on the northeast quadrant of Barry's Corner.
- **Parking Fees in New Garage** – Charge market rates for parking.
- **ZipCar** – Provide two on-site parking spaces for a community car-sharing organization (e.g. Zipcar).
- **Harvard Shuttle Bus** – Extend the Harvard Shuttle bus service into Barry's Corner and provide access to this service for residents and employees of the Project and neighborhood residents with ID card issued by the Education Portal.
- **Transportation Coordinator** – Designate an on-site Transportation Coordinator to oversee parking and loading operations as well as promote alternative transportation measures.
- **Employee Transit Pass Sales** – Encourage commercial tenants to provide on-site transit pass sales to employees.
- **Employee Transit Pass Subsidies** – Encourage commercial tenants to provide a 50 percent transit subsidy.
- **Transit Pass Sales for Residents** – Encourage the residential property manager to provide on-site pass sales to residents.
- **Transit Information** – Provide transit information such as maps and schedules to new residents and tenants in an orientation package. Provide this information in the residential lobbies.

In addition, The Co-proponents will work with BTD to develop appropriate measures integrate these transportation elements into a cohesive a Barry's Corner "Transportation Hub" concept.

\\mawatr\ts\10463.00\graphics\FIGURES\Barry'sCornerPNF\Barrys_Corner_trans.indd



\# Signalized Intersection

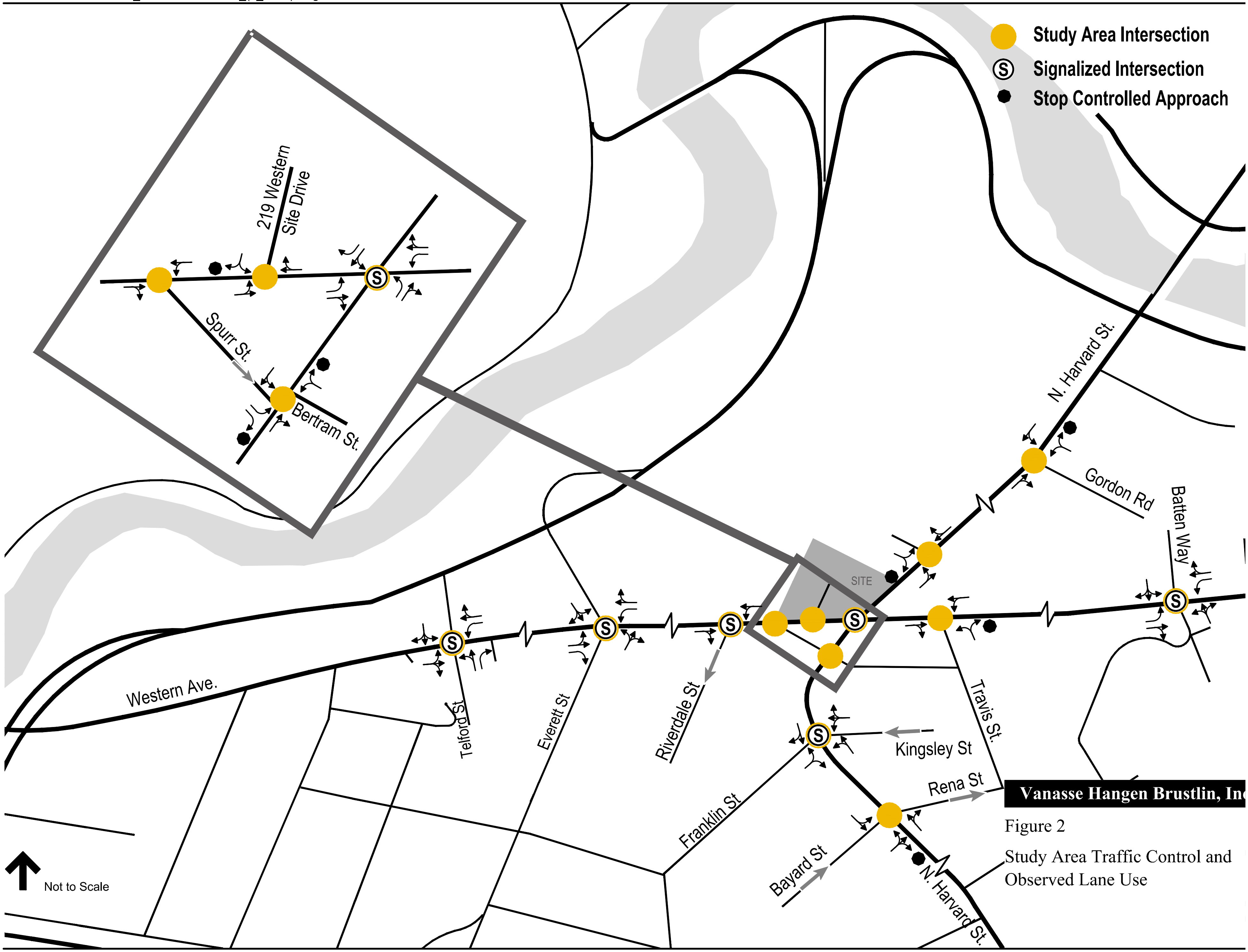
\# Unsignalized Intersection

Study Area Intersections

1 Western Avenue at Telford Street
2 Western Avenue at Everett Street
3 Western Avenue at Riverdale Street
4 Western Avenue at Spurr Street
5 Western Avenue at Existing Site Driveway
6 Western Avenue at North Harvard Street
7 Western Avenue at Travis Street
8 Western Avenue at Batten Way/Hague Street
9 North Harvard Street at Gordon Road
10 North Harvard Street at Existing Site Driveway
11 North Harvard Street at Spurr Street
12 North Harvard Street at Kingsley Street/ Franklin Street
13 North Harvard Street at Bayard Street/ Rena Street

Vanasse Hangen Brustlin, Inc.

Figure 1
Study Area Intersections

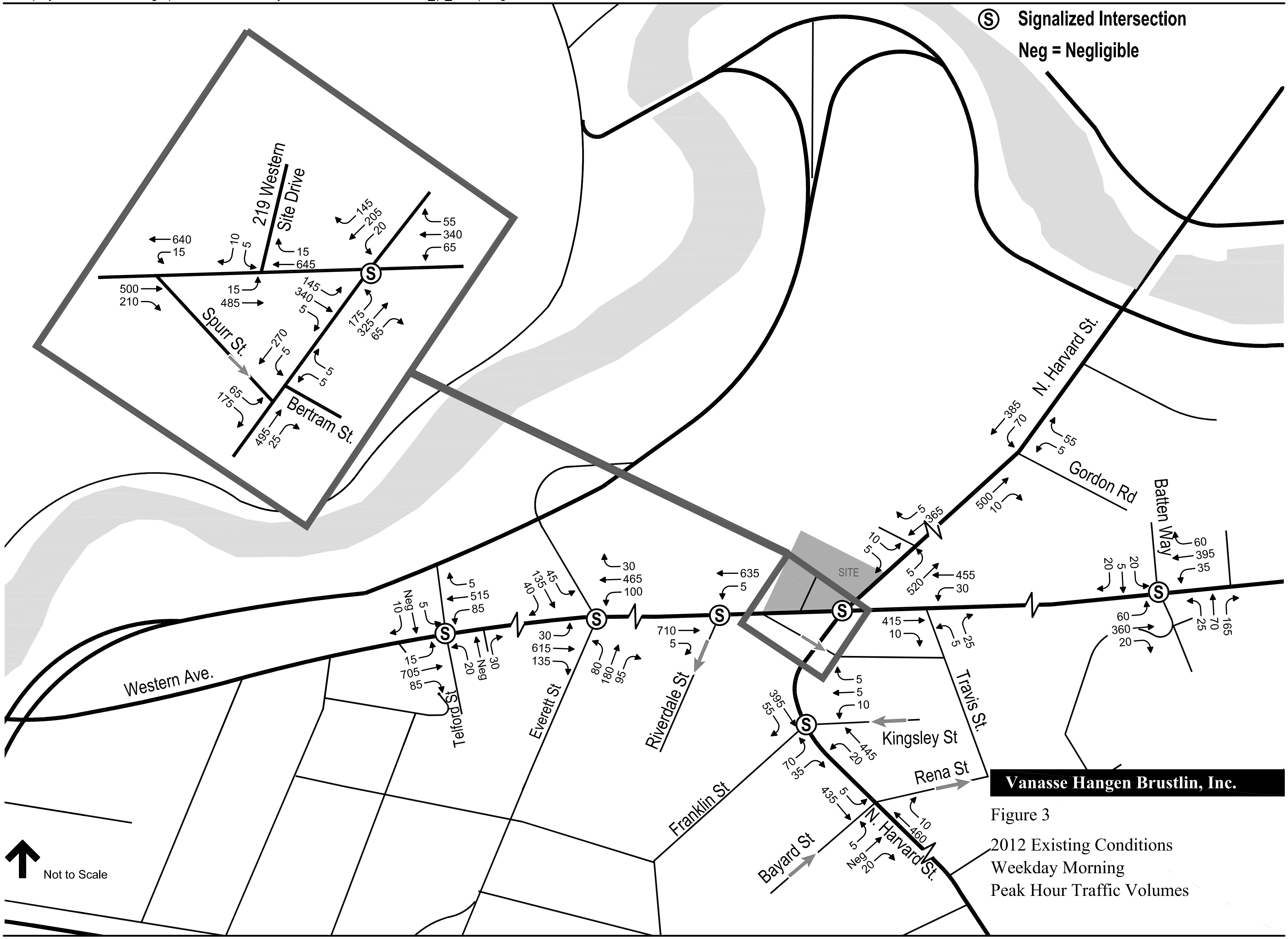


Vanasse Hangen Brustlin, Inc

Figure 2

Study Area Traffic Control and Observed Lane Use

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg

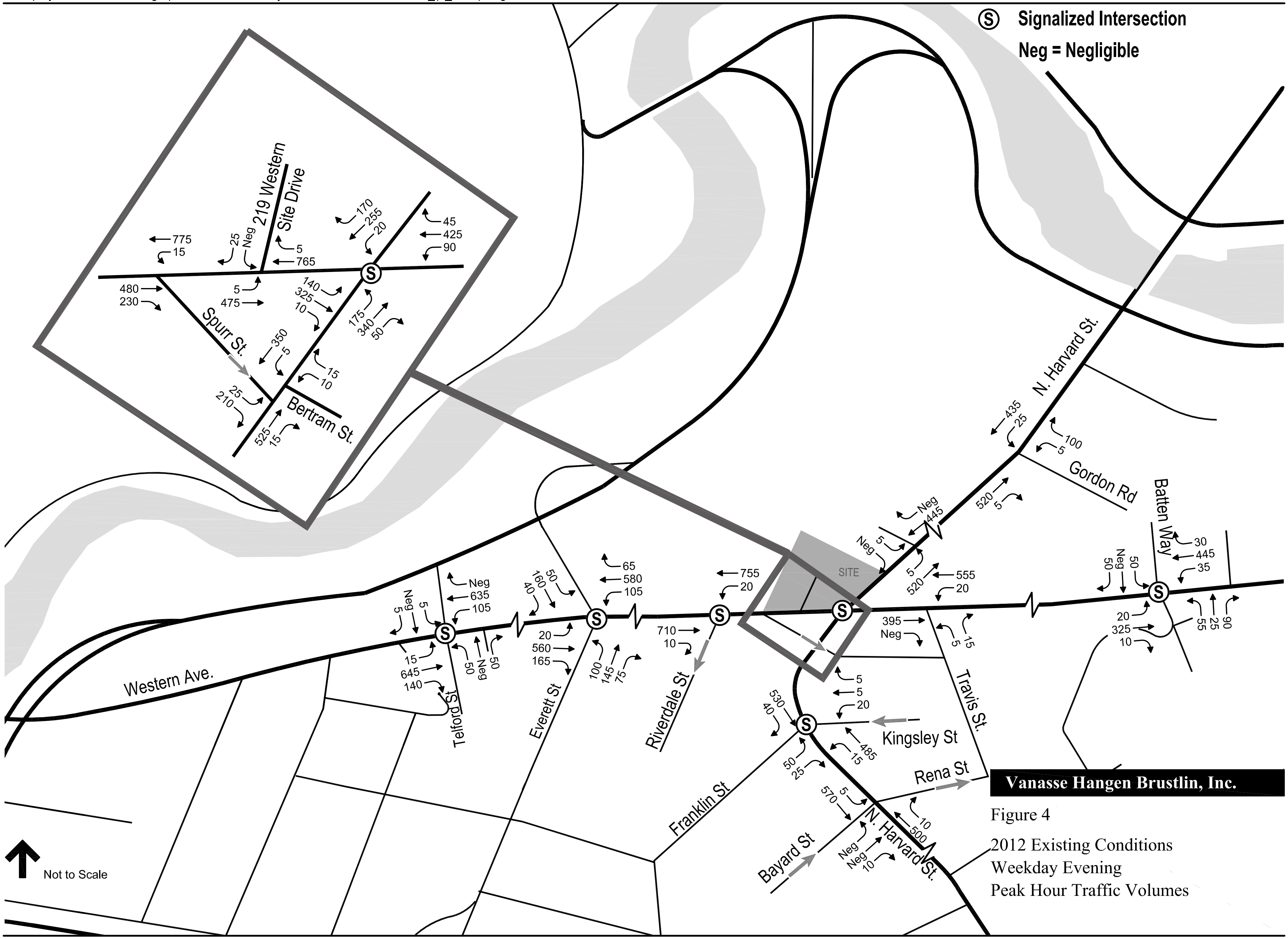


Vanasse Hangen Brustlin, Inc.

Figure 3

2012 Existing Conditions
Weekday Morning
Peak Hour Traffic Volumes

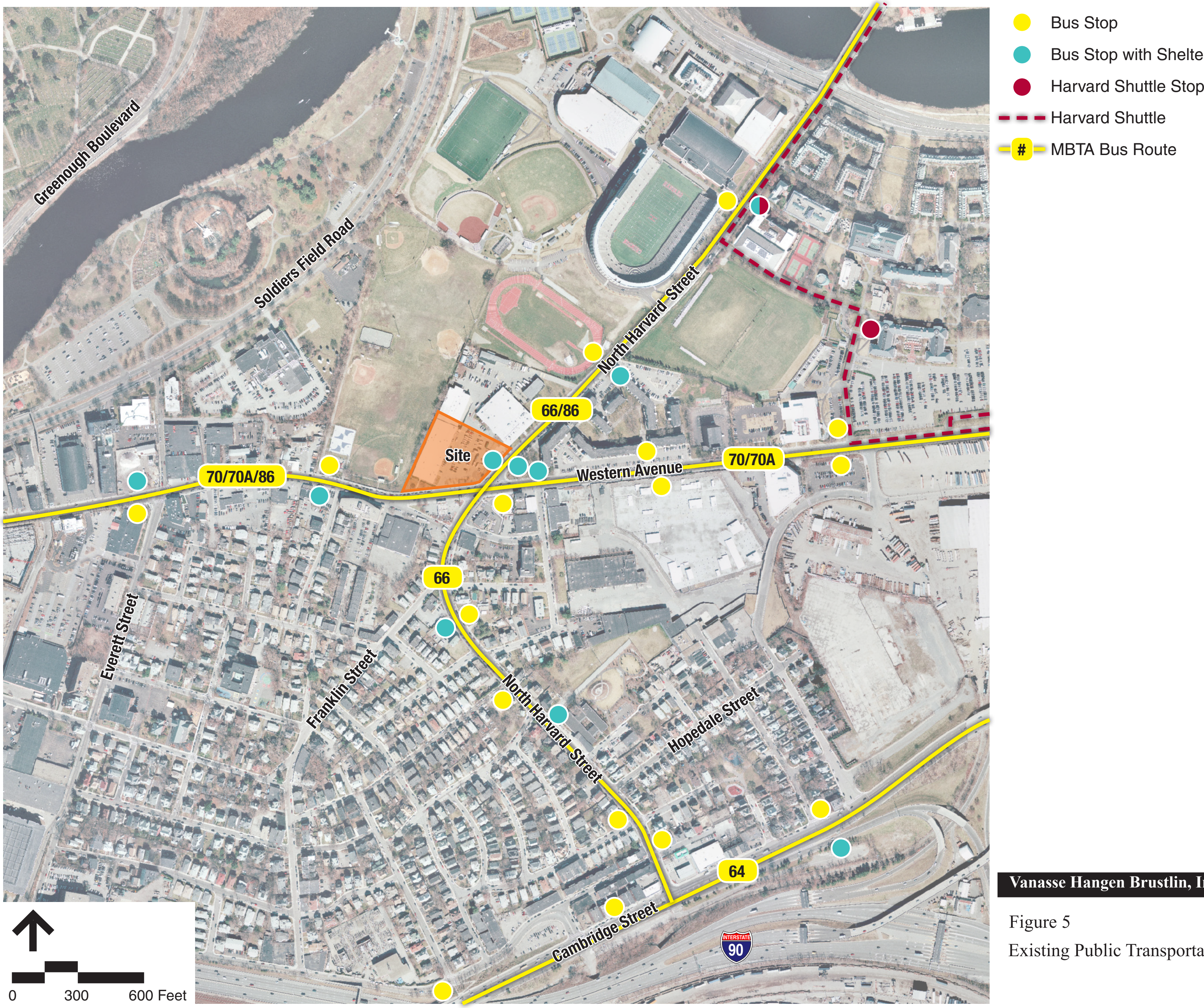
\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg



Vanasse Hangen Brustlin, Inc.

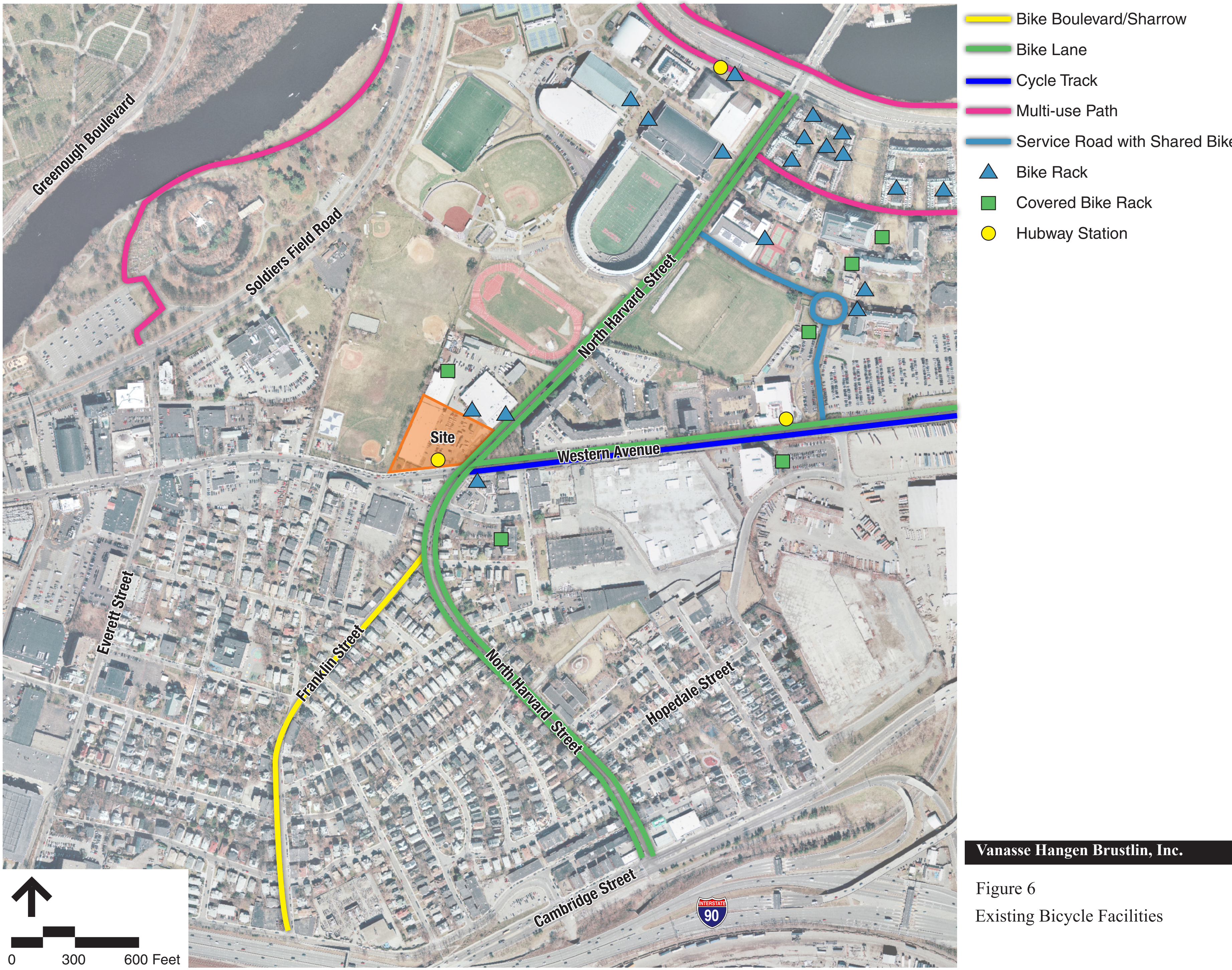
Figure 4

2012 Existing Conditions
Weekday Evening
Peak Hour Traffic Volumes



Vanasse Hangen Brustlin, Inc.

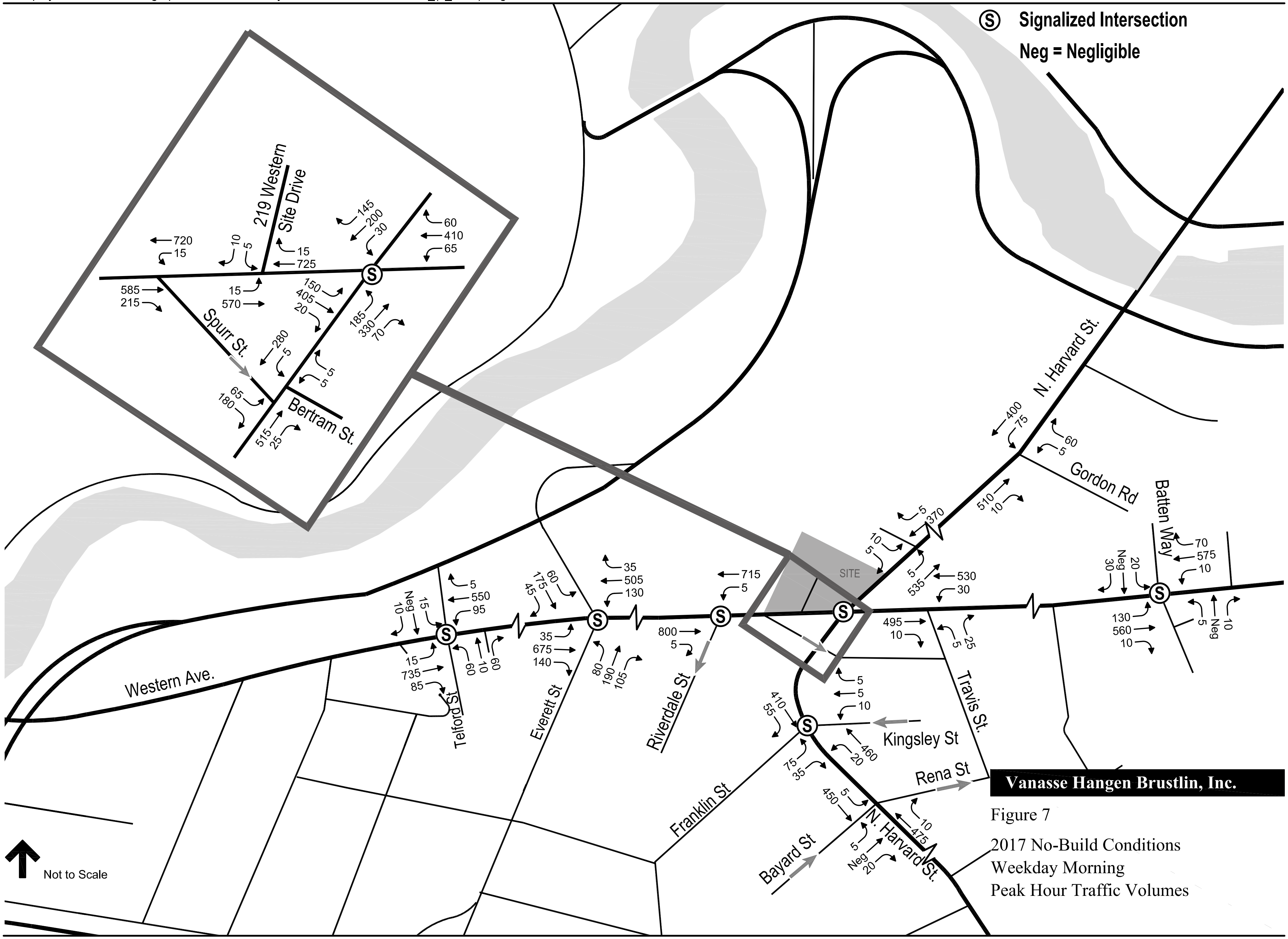
Figure 5
Existing Public Transportation



Vanasse Hangen Brustlin, Inc.

Figure 6
Existing Bicycle Facilities

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg

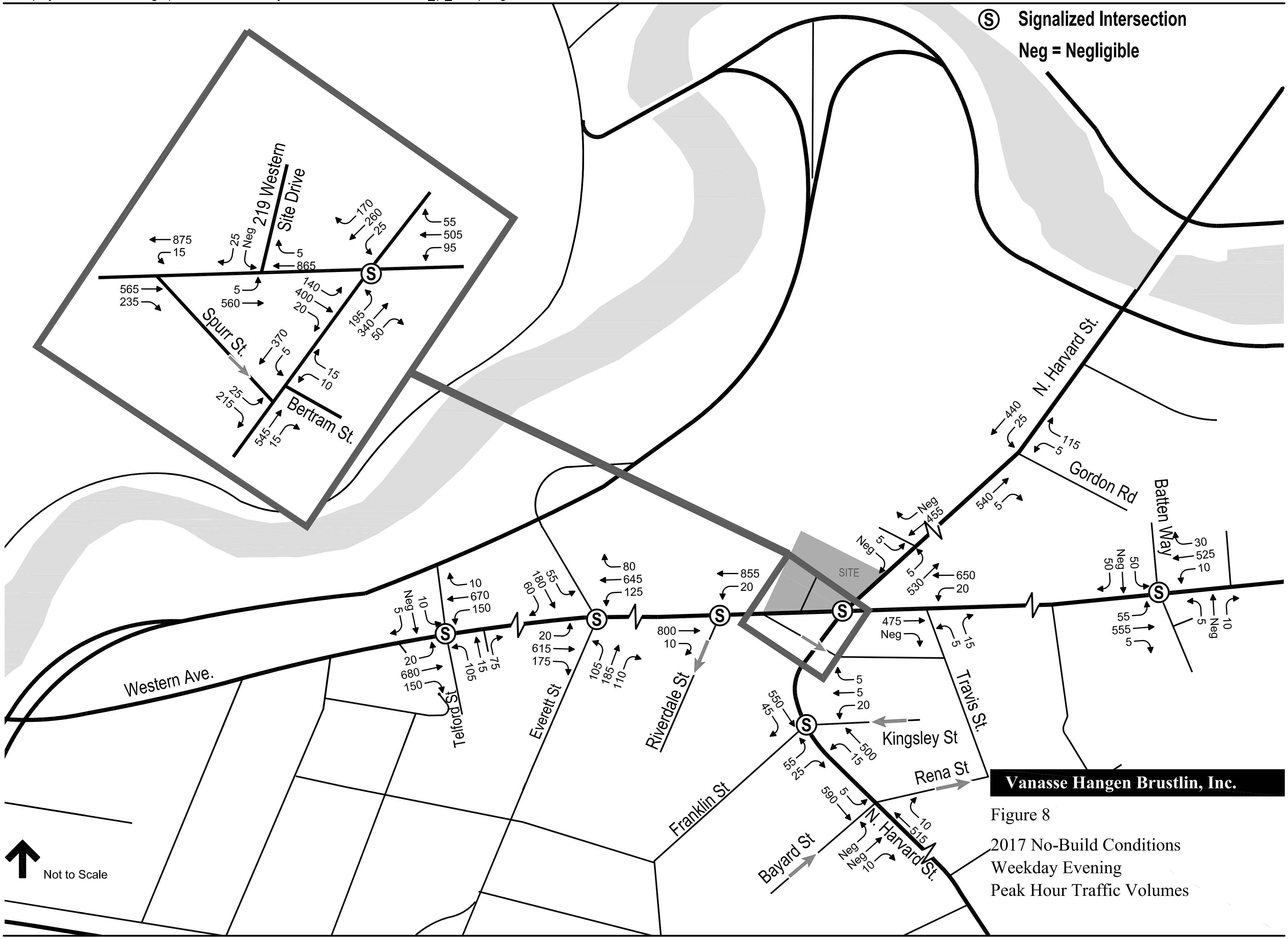


Vanasse Hangen Brustlin, Inc.

Figure 7

2017 No-Build Conditions
Weekday Morning
Peak Hour Traffic Volumes

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg

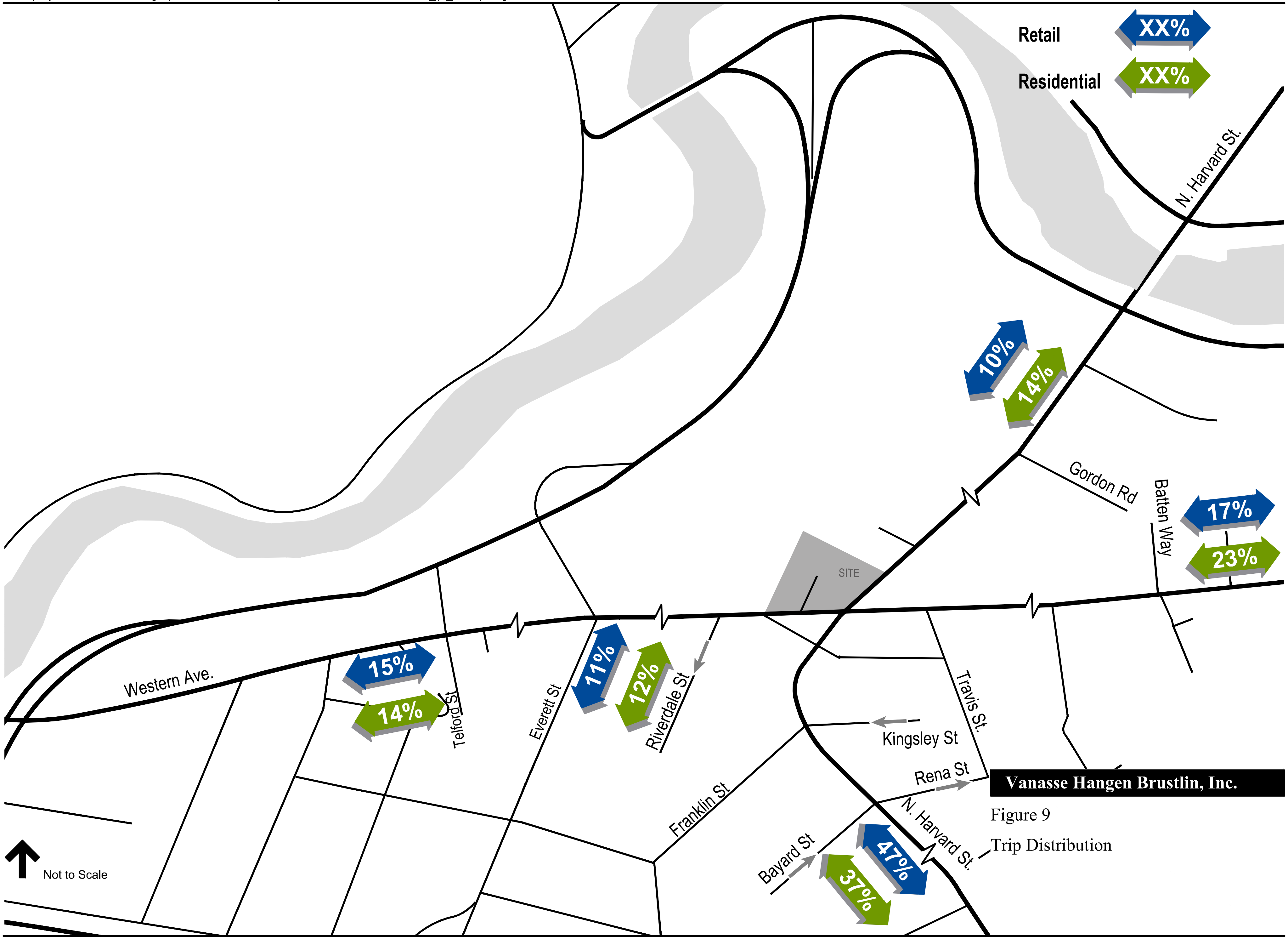


Vanasse Hangen Brustlin, Inc.

Figure 8

2017 No-Build Conditions
Weekday Evening
Peak Hour Traffic Volumes

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg

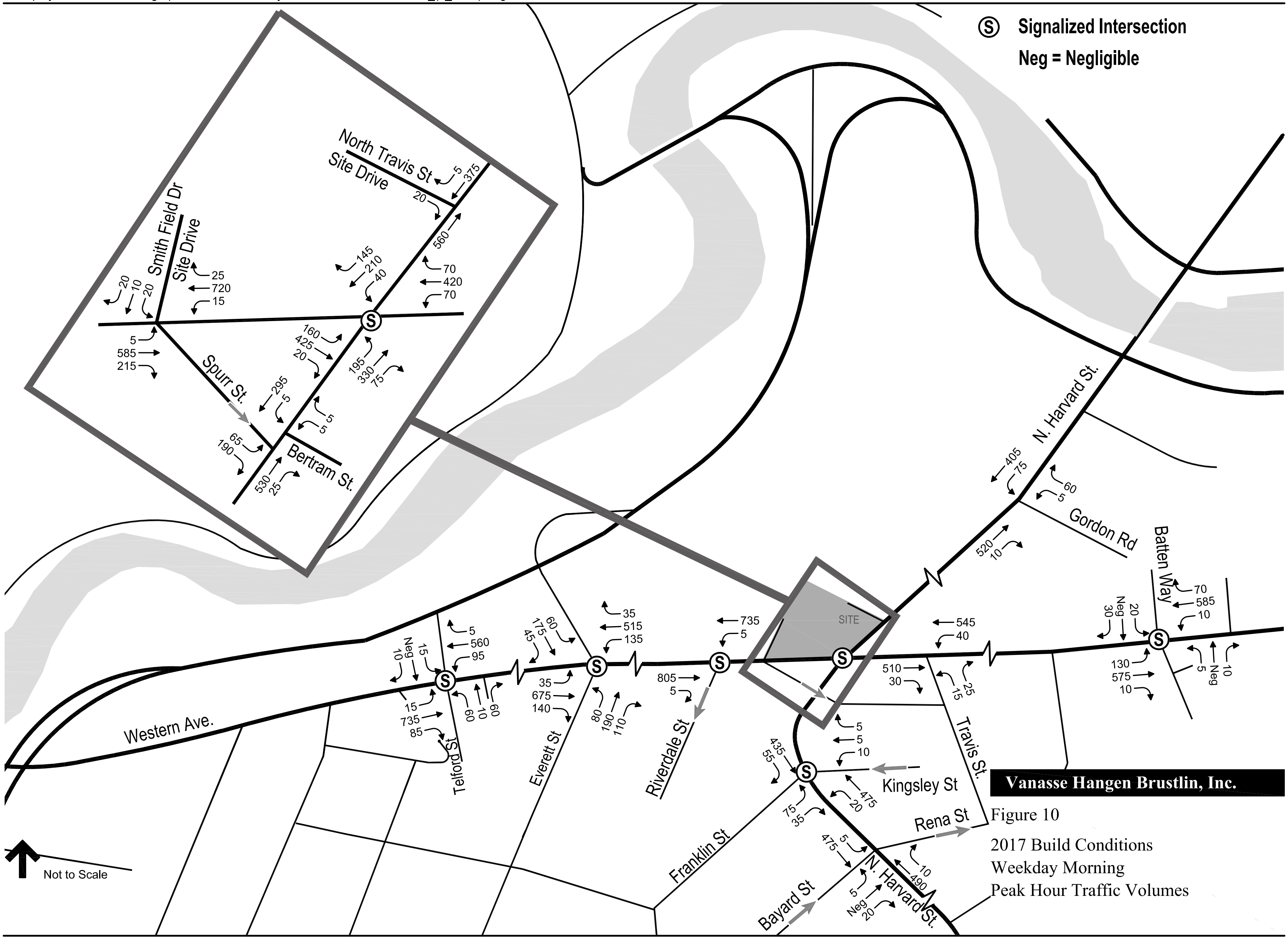


Vanasse Hangen Brustlin, Inc.

Figure 9

Trip Distribution

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg



Vanasse Hangen Brustlin, Inc.

Figure 10

2017 Build Conditions
Weekday Morning
Peak Hour Traffic Volumes

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg

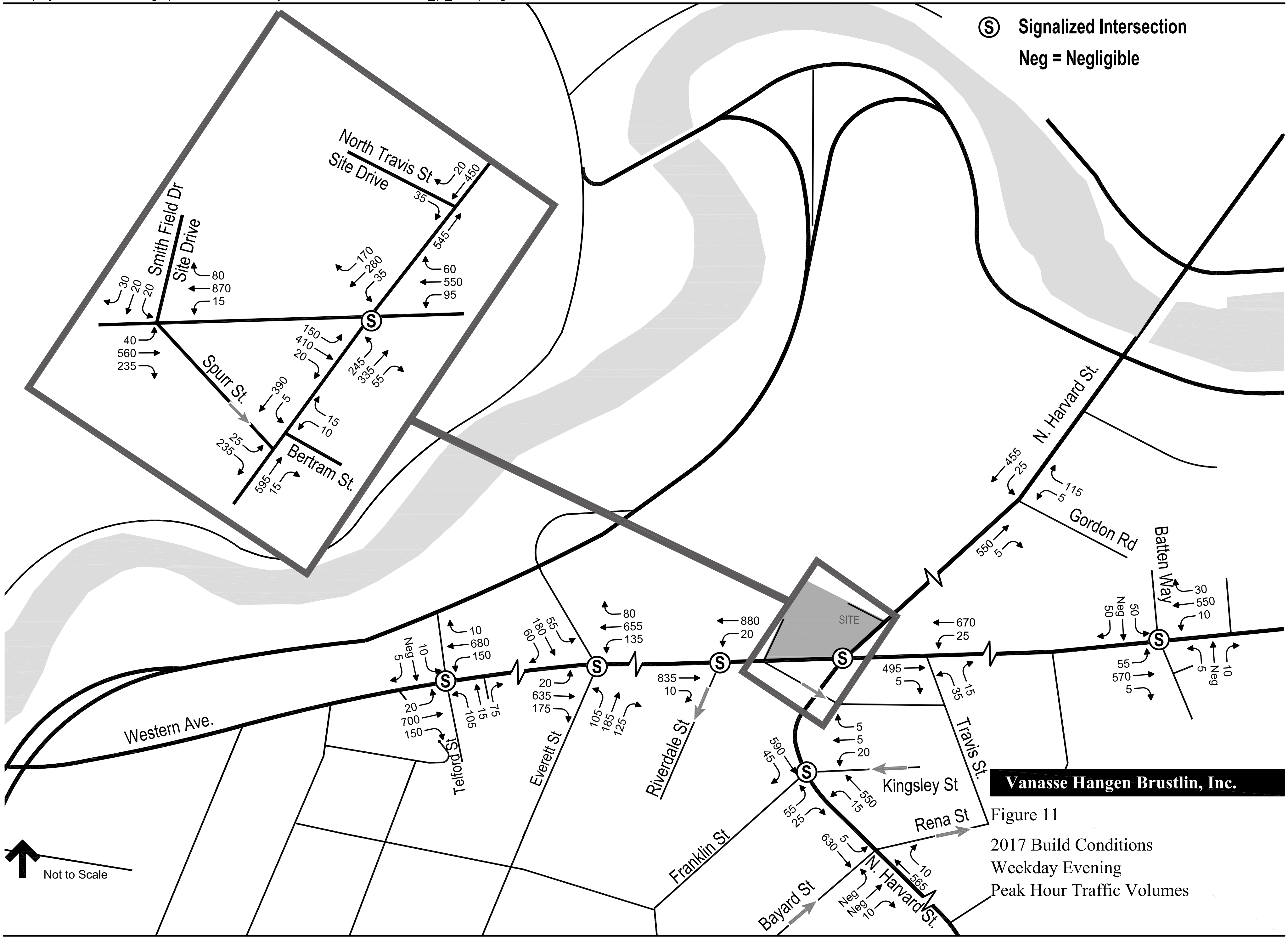
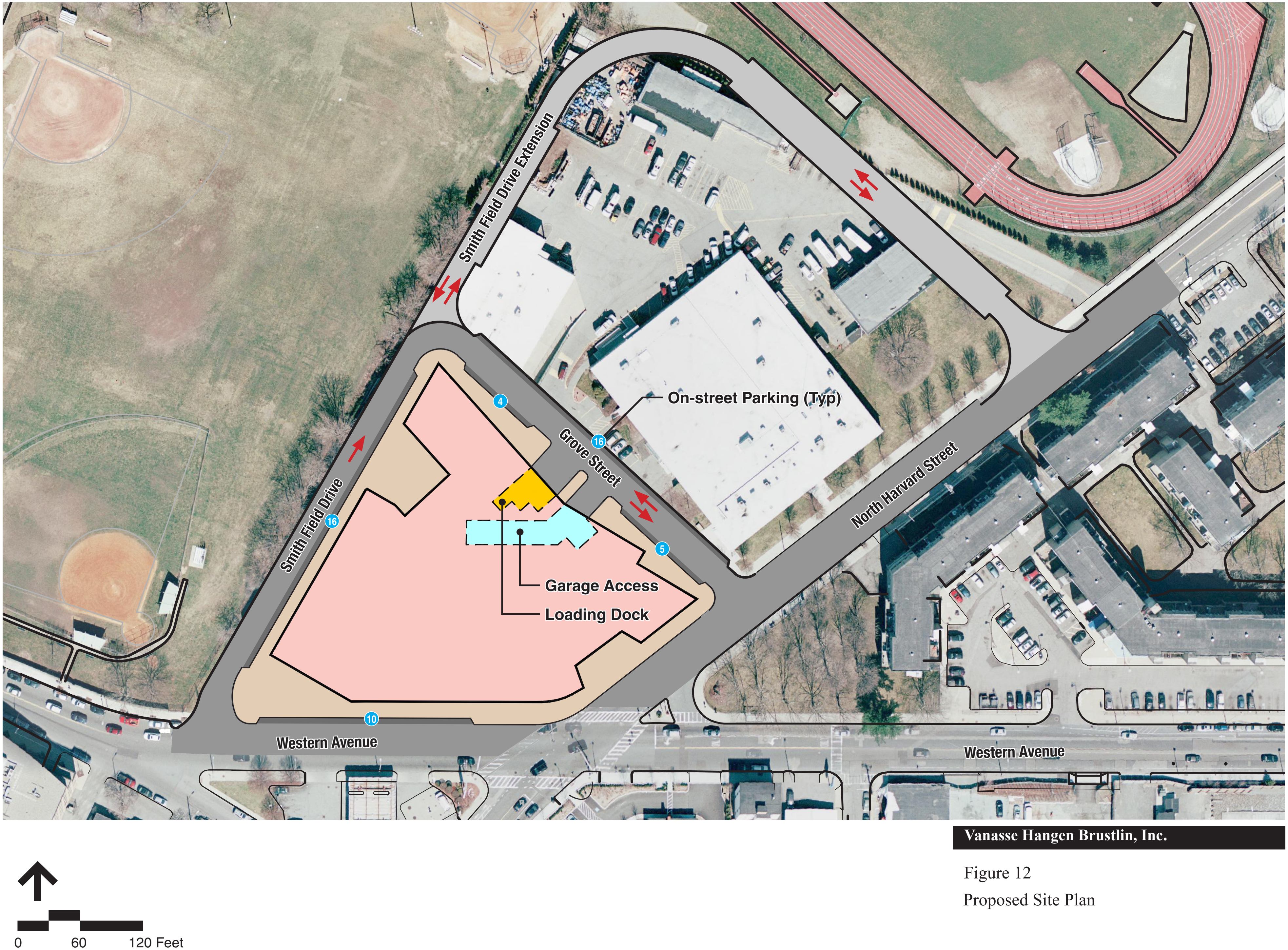


Figure 11
2017 Build Conditions
Weekday Evening
Peak Hour Traffic Volumes

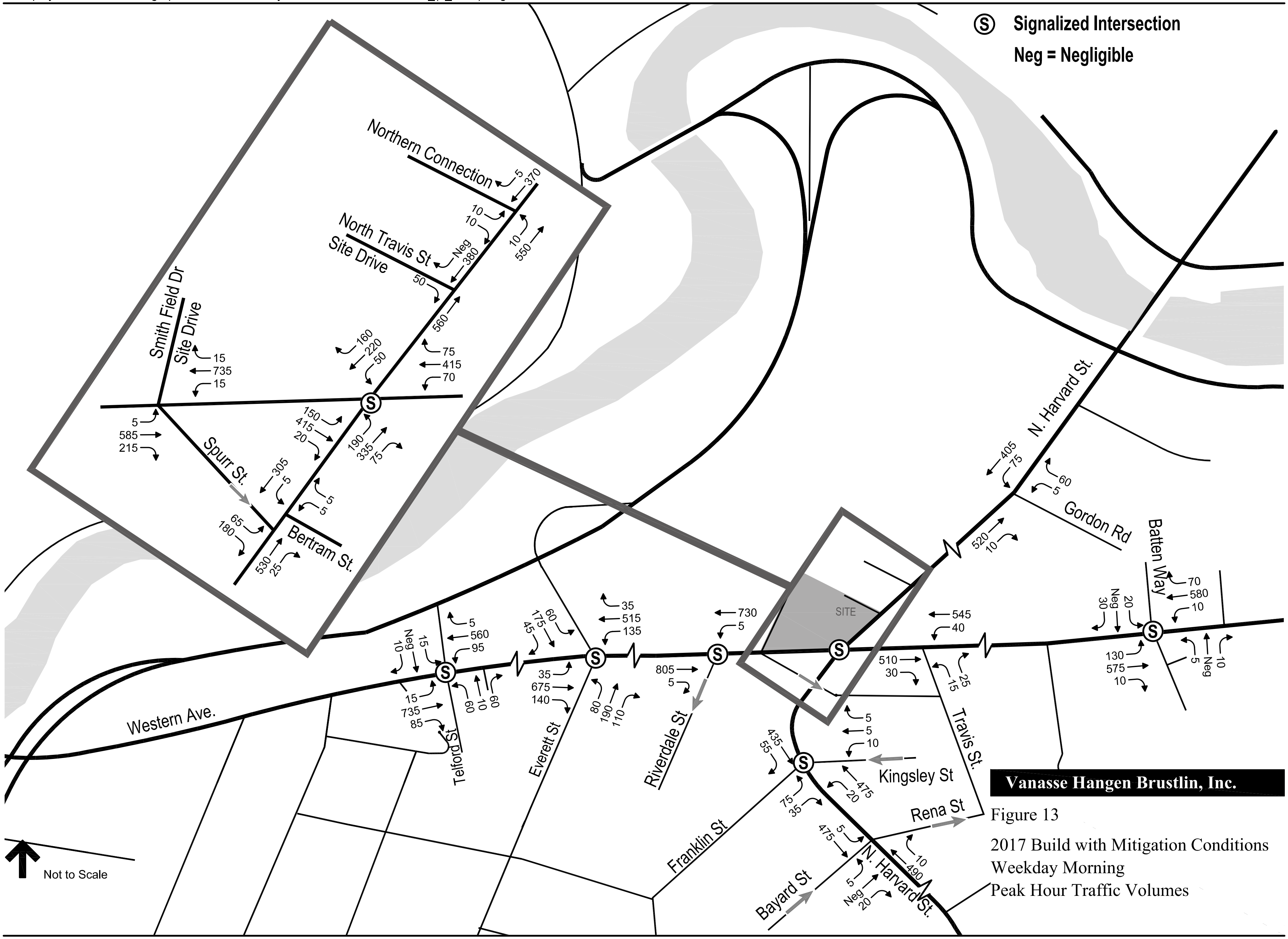


Vanasse Hangen Brustlin, Inc.

Figure 12

Proposed Site Plan

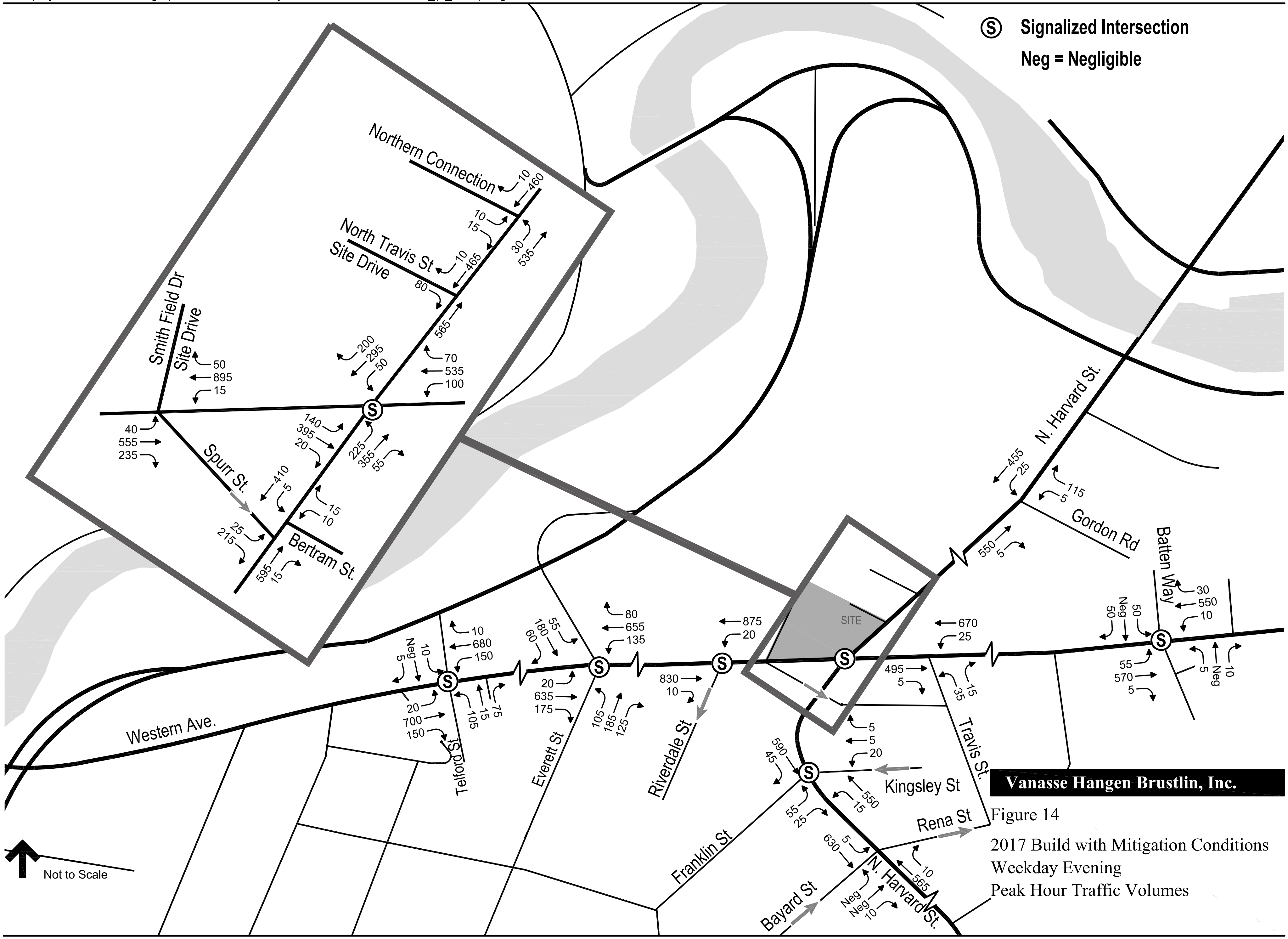
\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg



Vanasse Hangen Brustlin, Inc.

Figure 13

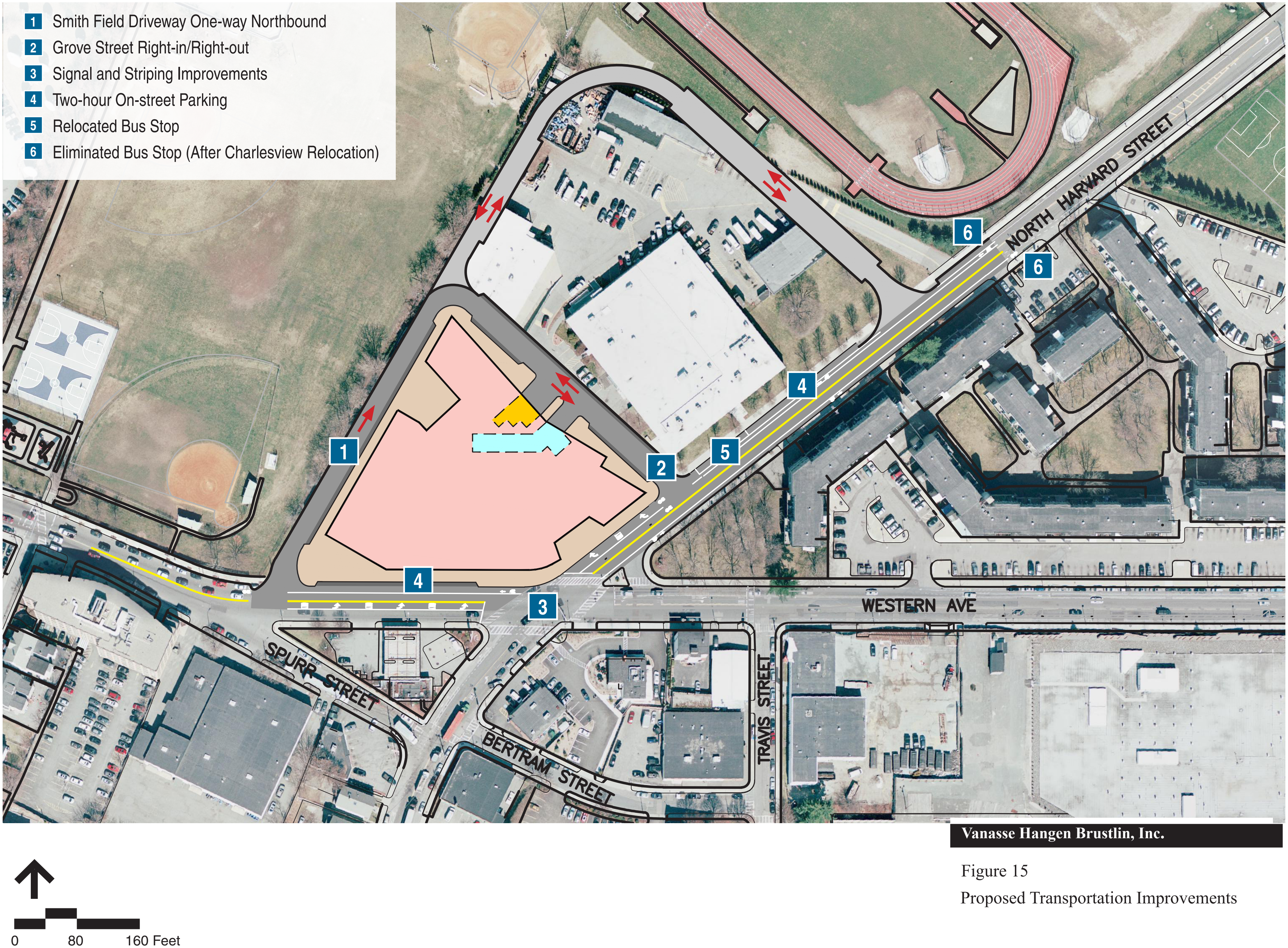
2017 Build with Mitigation Conditions
Weekday Morning
Peak Hour Traffic Volumes



Vanasse Hangen Brustlin, Inc.

Figure 14

2017 Build with Mitigation Conditions
Weekday Evening
Peak Hour Traffic Volumes



Vanasse Hangen Brustlin, Inc.

Figure 15

Proposed Transportation Improvements

Transportation Technical Appendix

Barry's Corner
Retail and Housing Commons
Transportation Study
Technical Appendix

Traffic Count Data
- ATR Data
- TMC Data
- Seasonal Adjustment Factors

Vehicle Crash Data
- MassDOT Crash Data
- MassDOT Crash Rate Worksheets

Transit
- MBTA Bus Schedules and Ridership

Background Traffic
- Historical Annual Growth
- Background Project Growth

Build Condition Traffic
- Displaced Trips
- Trip Generation
- Trip Distribution
- Site-Generated Traffic Volume Networks

Intersection Capacity Analyses
- Overall Capacity Summary Tables
- 2012 Existing Conditions
- 2017 No-Build Conditions
- 2017 Build Conditions
- 2017 Build with Mitigation Conditions

Traffic Count Data
ATR Data
TMC Data
Seasonal Adjustment Factors

Western Avenue
east of Everett Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122864 A VOLUME
Site Code: 10463.00

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		05-Apr-12 Thu
12:00	31		148		44		180		75		328		
12:15	22		132		26		157		48		289		
12:30	14		147		25		189		39		336		
12:45	14	81	158	585	19	114	142	668	33	195	300	1253	
01:00	9		128		20		175		29		303		
01:15	10		131		18		180		28		311		
01:30	17		156		18		170		35		326		
01:45	7	43	139	554	9	65	148	673	16	108	287	1227	
02:00	10		150		12		170		22		320		
02:15	6		148		14		164		20		312		
02:30	12		136		7		157		19		293		
02:45	10	38	126	560	10	43	138	629	20	81	264	1189	
03:00	3		137		6		171		9		308		
03:15	8		177		10		182		18		359		
03:30	11		158		12		174		23		332		
03:45	9	31	169	641	9	37	167	694	18	68	336	1335	
04:00	10		152		5		158		15		310		
04:15	10		152		7		168		17		320		
04:30	10		158		16		161		26		319		
04:45	17	47	159	621	24	52	182	669	41	99	341	1290	
05:00	15		172		20		185		35		357		
05:15	30		184		30		195		60		379		
05:30	29		174		40		208		69		382		
05:45	41	115	161	691	64	154	226	814	105	269	387	1505	
06:00	54		179		74		237		128		416		
06:15	61		164		100		209		161		373		
06:30	86		140		119		171		205		311		
06:45	108	309	146	629	131	424	164	781	239	733	310	1410	
07:00	118		116		130		162		248		278		
07:15	134		146		144		164		278		310		
07:30	140		142		147		118		287		260		
07:45	159	551	114	518	146	567	117	561	305	1118	231	1079	
08:00	178		134		160		133		338		267		
08:15	179		102		177		120		356		222		
08:30	190		86		178		96		368		182		
08:45	194	741	88	410	202	717	97	446	396	1458	185	856	
09:00	166		88		198		96		364		184		
09:15	165		78		182		100		347		178		
09:30	138		69		127		119		265		188		
09:45	139	608	58	293	154	661	90	405	293	1269	148	698	
10:00	109		70		135		84		244		154		
10:15	124		56		119		66		243		122		
10:30	114		52		138		70		252		122		
10:45	134	481	62	240	125	517	46	266	259	998	108	506	
11:00	122		40		135		66		257		106		
11:15	129		30		124		62		253		92		
11:30	154		36		134		38		288		74		
11:45	146	551	48	154	148	541	33	199	294	1092	81	353	
Total	3596		5896		3892		6805		7488		12701		
Percent	48.0%		46.4%		52.0%		53.6%						
Day Total		9492				10697				20189			
Peak	08:00		05:15		08:30		05:30		08:15		05:15		
Vol.	741		698		760		880		1484		1564		
P.H.F.	0.955		0.948		0.941		0.928		0.937		0.940		

Western Avenue
west of Hague Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

122864 B VOLUME
Site Code: 10463.00

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		05-Apr-12 Thu
12:00	14		86		31		101		45		187		
12:15	9		74		29		104		38		178		
12:30	8		62		22		98		30		160		
12:45	8	39	87	309	17	99	110	413	25	138	197	722	
01:00	10		76		21		92		31		168		
01:15	5		74		12		114		17		188		
01:30	3		74		5		104		8		178		
01:45	6	24	82	306	14	52	100	410	20	76	182	716	
02:00	3		84		6		129		9		213		
02:15	4		88		12		96		16		184		
02:30	10		85		8		110		18		195		
02:45	4	21	74	331	7	33	112	447	11	54	186	778	
03:00	2		76		4		118		6		194		
03:15	3		86		7		143		10		229		
03:30	2		91		5		136		7		227		
03:45	10	17	92	345	7	23	114	511	17	40	206	856	
04:00	6		80		8		106		14		186		
04:15	6		49		5		122		11		171		
04:30	4		76		8		126		12		202		
04:45	6	22	84	289	13	34	113	467	19	56	197	756	
05:00	10		94		26		138		36		232		
05:15	9		109		23		165		32		274		
05:30	18		89		33		153		51		242		
05:45	32	69	100	392	46	128	160	616	78	197	260	1008	
06:00	22		72		38		146		60		218		
06:15	45		88		60		147		105		235		
06:30	46		72		73		112		119		184		
06:45	70	183	63	295	80	251	120	525	150	434	183	820	
07:00	64		80		96		102		160		182		
07:15	74		60		93		110		167		170		
07:30	64		70		100		72		164		142		
07:45	100	302	58	268	84	373	79	363	184	675	137	631	
08:00	108		78		106		88		214		166		
08:15	102		58		129		86		231		144		
08:30	96		51		116		75		212		126		
08:45	112	418	32	219	126	477	81	330	238	895	113	549	
09:00	104		48		112		64		216		112		
09:15	86		35		100		71		186		106		
09:30	79		38		102		80		181		118		
09:45	74	343	30	151	96	410	70	285	170	753	100	436	
10:00	78		46		95		68		173		114		
10:15	65		21		93		65		158		86		
10:30	66		31		89		55		155		86		
10:45	69	278	26	124	90	367	38	226	159	645	64	350	
11:00	70		24		87		44		157		68		
11:15	70		20		98		46		168		66		
11:30	84		18		85		29		169		47		
11:45	85	309	18	80	92	362	27	146	177	671	45	226	
Total	2025		3109		2609		4739		4634		7848		
Percent	43.7%		39.6%		56.3%		60.4%						
Day Total		5134				7348				12482			
Peak	08:00		05:00		08:15		05:15		08:15		05:00		
Vol.	418		392		483		624		897		1008		
P.H.F.	0.933		0.899		0.936		0.945		0.942		0.920		

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N. Harvard Street
north of Hefferan Street
City, State: Boston, MA
Client: VHB/ K. Keen

122864 C VOLUME
Site Code: 10463.00

Start		NB				SB				Combined			05-Apr-12
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Thu
12:00	22		91		36		80		58		171		
12:15	27		82		25		72		52		154		
12:30	18		76		20		88		38		164		
12:45	19	86	72	321	15	96	70	310	34	182	142	631	
01:00	14		96		21		100		35		196		
01:15	10		76		17		82		27		158		
01:30	16		85		15		84		31		169		
01:45	10	50	86	343	7	60	78	344	17	110	164	687	
02:00	11		98		12		93		23		191		
02:15	9		68		10		86		19		154		
02:30	5		88		6		106		11		194		
02:45	8	33	94	348	12	40	126	411	20	73	220	759	
03:00	4		82		5		77		9		159		
03:15	8		80		6		90		14		170		
03:30	3		124		7		93		10		217		
03:45	3	18	102	388	5	23	121	381	8	41	223	769	
04:00	4		94		6		98		10		192		
04:15	6		95		7		105		13		200		
04:30	4		114		6		86		10		200		
04:45	14	28	114	417	12	31	108	397	26	59	222	814	
05:00	6		135		14		104		20		239		
05:15	18		138		18		100		36		238		
05:30	24		123		24		100		48		223		
05:45	38	86	141	537	42	98	120	424	80	184	261	961	
06:00	36		138		38		111		74		249		
06:15	38		156		30		130		68		286		
06:30	70		161		67		100		137		261		
06:45	64	208	130	585	82	217	112	453	146	425	242	1038	
07:00	77		119		86		94		163		213		
07:15	87		103		74		109		161		212		
07:30	105		136		78		102		183		238		
07:45	143	412	93	451	90	328	118	423	233	740	211	874	
08:00	108		86		86		95		194		181		
08:15	138		66		90		92		228		158		
08:30	128		60		87		86		215		146		
08:45	148	522	76	288	94	357	72	345	242	879	148	633	
09:00	114		67		92		80		206		147		
09:15	93		60		112		88		205		148		
09:30	98		57		77		90		175		147		
09:45	88	393	65	249	78	359	85	343	166	752	150	592	
10:00	108		51		74		68		182		119		
10:15	78		58		66		65		144		123		
10:30	92		56		86		53		178		109		
10:45	91	369	46	211	72	298	57	243	163	667	103	454	
11:00	83		64		78		63		161		127		
11:15	73		34		74		52		147		86		
11:30	98		45		84		43		182		88		
11:45	87	341	41	184	94	330	42	200	181	671	83	384	
Total	2546		4322		2237		4274		4783		8596		
Percent	53.2%		50.3%		46.8%		49.7%						
Day Total		6868				6511				13379			
Peak	08:15		05:45		08:30		05:30		08:15		05:45		
Vol.	528		596		385		461		891		1057		
P.H.F.	0.892		0.925		0.859		0.887		0.920		0.924		

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 C
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	12	10	7	0	6	96	13	0	10	17	8	0	21	99	6	0	305
07:15 AM	4	19	7	0	8	100	17	0	5	23	7	0	23	111	5	0	329
07:30 AM	8	22	5	0	8	84	21	0	9	35	10	0	28	121	6	0	357
07:45 AM	4	29	8	0	7	103	23	0	23	30	16	0	22	138	9	0	412
Total	28	80	27	0	29	383	74	0	47	105	41	0	94	469	26	0	1403
08:00 AM	6	21	7	0	9	114	21	0	21	28	15	0	27	153	9	0	431
08:15 AM	10	40	9	0	4	123	20	0	32	61	22	0	48	157	8	0	534
08:30 AM	5	22	15	0	10	110	30	0	26	47	20	0	29	144	8	0	466
08:45 AM	12	26	7	0	8	116	31	0	18	44	21	0	30	160	5	0	478
Total	33	109	38	0	31	463	102	0	97	180	78	0	134	614	30	0	1909
Grand Total	61	189	65	0	60	846	176	0	144	285	119	0	228	1083	56	0	3312
Apprch %	19.4	60	20.6	0	5.5	78.2	16.3	0	26.3	52	21.7	0	16.7	79.2	4.1	0	
Total %	1.8	5.7	2	0	1.8	25.5	5.3	0	4.3	8.6	3.6	0	6.9	32.7	1.7	0	
Cars	58	185	63	0	58	769	165	0	136	283	112	0	216	987	55	0	3087
% Cars	95.1	97.9	96.9	0	96.7	90.9	93.8	0	94.4	99.3	94.1	0	94.7	91.1	98.2	0	93.2
Heavy Vehicles	3	4	2	0	2	77	11	0	8	2	7	0	12	96	1	0	225
% Heavy Vehicles	4.9	2.1	3.1	0	3.3	9.1	6.2	0	5.6	0.7	5.9	0	5.3	8.9	1.8	0	6.8

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	6	21	7	0	34	9	114	21	0	144	21	28	15	0	64	27	153	9	0	189	431
08:15 AM	10	40	9	0	59	4	123	20	0	147	32	61	22	0	115	48	157	8	0	213	534
08:30 AM	5	22	15			10	110	30	0	150	26	47	20	0	93	29	144	8	0	181	466
08:45 AM	12							31		155	18	44	21	0	83	30	160	5	0	195	478
Total Volume	33	109	38	0	180	31	463	102	0	596	97	180	78	0	355	134	614	30	0	778	1909
% App. Total	18.3	60.6	21.1	0		5.2	77.7	17.1	0		27.3	50.7	22	0		17.2	78.9	3.9	0		
PHF	.688	.681	.633	.000	.763	.775	.941	.823	.000	.961	.758	.738	.886	.000	.772	.698	.959	.833	.000	.913	.894
Cars	33	107	36	0	176	30	428	96	0	554	92	179	76	0	347	125	560	29	0	714	1791
% Cars	100	98.2	94.7	0	97.8	96.8	92.4	94.1	0	93.0	94.8	99.4	97.4	0	97.7	93.3	91.2	96.7	0	91.8	93.8
Heavy Vehicles	0	2	2	0	4	1	35	6	0	42	5	1	2	0	8	9	54	1	0	64	118
% Heavy Vehicles	0	1.8	5.3	0	2.2	3.2	7.6	5.9	0	7.0	5.2	0.6	2.6	0	2.3	6.7	8.8	3.3	0	8.2	6.2

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 C
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	11	10	7	0	5	88	13	0	10	17	7	0	21	88	6	0	283
07:15 AM	3	18	7	0	8	91	17	0	3	23	5	0	21	102	5	0	303
07:30 AM	7	22	5	0	8	70	17	0	9	35	9	0	27	108	6	0	323
07:45 AM	4	28	8	0	7	92	22	0	22	29	15	0	22	129	9	0	387
Total	25	78	27	0	28	341	69	0	44	104	36	0	91	427	26	0	1296
08:00 AM	6	21	6	0	9	106	21	0	21	28	15	0	25	138	9	0	405
08:15 AM	10	39	9	0	4	112	19	0	30	61	22	0	46	148	8	0	508
08:30 AM	5	21	15	0	10	103	26	0	25	47	19	0	27	130	7	0	435
08:45 AM	12	26	6	0	7	107	30	0	16	43	20	0	27	144	5	0	443
Total	33	107	36	0	30	428	96	0	92	179	76	0	125	560	29	0	1791
Grand Total	58	185	63	0	58	769	165	0	136	283	112	0	216	987	55	0	3087
Apprch %	19	60.5	20.6	0	5.8	77.5	16.6	0	25.6	53.3	21.1	0	17.2	78.5	4.4	0	
Total %	1.9	6	2	0	1.9	24.9	5.3	0	4.4	9.2	3.6	0	7	32	1.8	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	6	21	6	0	33	9	106	21	0	136	21	28	15	0	64	25	138	9	0	172	405
08:15 AM	10	39	9	0	58	4	112	19	0	135	30	61	22	0	113	46	148	8	0	202	508
08:30 AM	5	21	15			10	103	26	0	139	25	47	19	0	91	27	130	7	0	164	435
08:45 AM	12							30		144	16	43	20	0	79	27	144	5	0	176	443
Total Volume	33	107	36	0	176	30	428	96	0	554	92	179	76	0	347	125	560	29	0	714	1791
% App. Total	18.8	60.8	20.5	0		5.4	77.3	17.3	0		26.5	51.6	21.9	0		17.5	78.4	4.1	0		
PHF	.688	.686	.600	.000	.759	.750	.955	.800	.000	.962	.767	.734	.864	.000	.768	.679	.946	.806	.000	.884	.881

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 C
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	1	0	0	0	1	8	0	0	0	0	1	0	0	11	0	0	22
07:15 AM	1	1	0	0	0	9	0	0	2	0	2	0	2	9	0	0	26
07:30 AM	1	0	0	0	0	14	4	0	0	0	1	0	1	13	0	0	34
07:45 AM	0	1	0	0	0	11	1	0	1	1	1	0	0	9	0	0	25
Total	3	2	0	0	1	42	5	0	3	1	5	0	3	42	0	0	107
08:00 AM	0	0	1	0	0	8	0	0	0	0	0	0	2	15	0	0	26
08:15 AM	0	1	0	0	0	11	1	0	2	0	0	0	2	9	0	0	26
08:30 AM	0	1	0	0	0	7	4	0	1	0	1	0	2	14	1	0	31
08:45 AM	0	0	1	0	1	9	1	0	2	1	1	0	3	16	0	0	35
Total	0	2	2	0	1	35	6	0	5	1	2	0	9	54	1	0	118
Grand Total	3	4	2	0	2	77	11	0	8	2	7	0	12	96	1	0	225
Apprch %	33.3	44.4	22.2	0	2.2	85.6	12.2	0	47.1	11.8	41.2	0	11	88.1	0.9	0	
Total %	1.3	1.8	0.9	0	0.9	34.2	4.9	0	3.6	0.9	3.1	0	5.3	42.7	0.4	0	

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	1	0	1	0	8	0	0	8	0	0	0	0	0	2	15	0	0	17	26
08:15 AM	0	1	0	0	1	0	11			12	2										
08:30 AM	0	1	0	0	1	0	7	4	0	11	1	0	1	0	2	2	14	1	0	17	31
08:45 AM	0	0	1	0	1	1	9	1	0	11	2	1	1	0	4	3	16	0	0	19	35
Total Volume	0	2	2	0	4	1	35	6	0	42	5	1	2	0	8	9	54	1	0	64	118
% App. Total	0	50	50	0		2.4	83.3	14.3	0		62.5	12.5	25	0		14.1	84.4	1.6	0		
PHF	.000	.500	.500	.000	1.00	.250	.795	.375	.000	.875	.625	.250	.500	.000	.500	.750	.844	.250	.000	.842	.843

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 C
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	2	0	0	0	3	0	2	0	4	0	4	0	6	21
07:15 AM	0	0	0	2	0	0	0	1	0	0	0	1	0	5	0	0	9
07:30 AM	0	0	0	4	0	1	0	1	1	1	1	3	0	7	0	1	20
07:45 AM	0	1	0	2	0	4	0	3	0	0	0	2	0	2	0	4	18
Total	0	1	0	10	0	5	0	8	1	3	1	10	0	18	0	11	68
08:00 AM	0	0	0	1	0	1	1	3	0	0	1	3	1	6	0	2	19
08:15 AM	0	1	0	4	0	3	0	3	0	0	0	4	0	4	0	7	26
08:30 AM	0	1	0	4	1	5	0	2	1	1	0	0	0	7	0	8	30
08:45 AM	0	0	0	4	0	4	0	1	0	0	0	0	0	8	0	2	19
Total	0	2	0	13	1	13	1	9	1	1	1	7	1	25	0	19	94
Grand Total	0	3	0	23	1	18	1	17	2	4	2	17	1	43	0	30	162
Apprch %	0	11.5	0	88.5	2.7	48.6	2.7	45.9	8	16	8	68	1.4	58.1	0	40.5	
Total %	0	1.9	0	14.2	0.6	11.1	0.6	10.5	1.2	2.5	1.2	10.5	0.6	26.5	0	18.5	

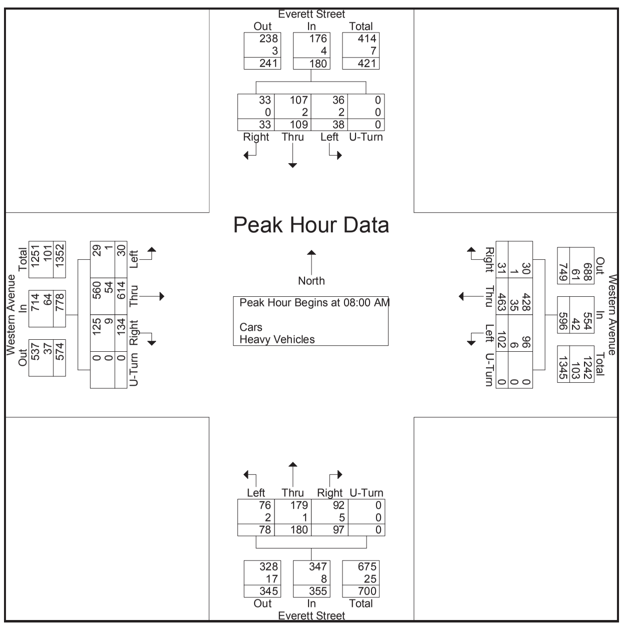
	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	1	1	0	1	1	3	5	0	0	1	3	4	1	6	0	2	9	19
08:15 AM	0	1	0	4	5	0	3	0	3	6	0	0	0	4	4	0	4	0	7	11	26
08:30 AM	0	1	0	4	5	1	5	0	2	8	1	1	0	0	2	0	7	0	8	15	30
08:45 AM	0	0	0	4	4	0	4	0	1	5	0	0	0	0	0	0	8	0	2	10	19
Total Volume	0	2	0	13	15	1	13	1	9	24	1	1	1	7	10	1	25	0	19	45	94
% App. Total	0	13.3	0	86.7		4.2	54.2	4.2	37.5		10	10	10	70		2.2	55.6	0	42.2		
PHF	.000	.500	.000	.813	.750	.250	.650	.250	.750	.750	.250	.250	.250	.438	.625	.250	.781	.000	.594	.750	.783

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 C
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	6	21	7	0	34	9	114	21	0	144	21	28	15	0	64	27	153	**9**	**0**	**189**	**431**
08:15 AM	**10**	**40**	9	0	**59**	4	**123**	**20**	**0**	**147**	**32**	**61**	**22**	0	**115**	**48**	**157**	**8**	**0**	**213**	**534**
08:30 AM	5	22	**15**			**10**	110	30	0	150	26	47	20	0	93	29	144	8	0	181	466
08:45 AM	**12**							**31**		**155**	18	44	21	0	83	30	**160**	5	0	195	478
Total Volume	33	109	38	0	180	31	463	102	0	596	97	180	78	0	355	134	614	30	0	778	1909
% App. Total	18.3	60.6	21.1	0		5.2	77.7	17.1	0		27.3	50.7	22	0		17.2	78.9	3.9	0		
PHF	.688	.681	.633	.000	.763	.775	.941	.823	.000	.961	.758	.738	.886	.000	.772	.698	.959	.833	.000	.913	.894
Cars	33	107	36	0	176	30	428	96	0	554	92	179	76	0	347	125	560	29	0	714	1791
% Cars	100	98.2	94.7	0	97.8	96.8	92.4	94.1	0	93.0	94.8	99.4	97.4	0	97.7	93.3	91.2	96.7	0	91.8	93.8
Heavy Vehicles	0	2	2	0	4	1	35	6	0	42	5	1	2	0	8	9	54	1	0	64	118
% Heavy Vehicles	0	1.8	5.3	0	2.2	3.2	7.6	5.9	0	7.0	5.2	0.6	2.6	0	2.3	6.7	8.8	3.3	0	8.2	6.2



N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 CC
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	7	32	13	0	16	123	21	0	22	26	9	0	35	119	4	0	427
04:15 PM	8	32	14	0	10	127	29	0	18	20	16	0	29	111	6	0	420
04:30 PM	9	33	9	0	16	114	21	0	24	28	23	0	33	132	3	0	445
04:45 PM	9	39	7	0	15	156	25	0	17	33	16	0	39	126	7	0	489
Total	33	136	43	0	57	520	96	0	81	107	64	0	136	488	20	0	1781
05:00 PM	7	42	9	0	17	136	22	0	20	37	23	0	46	144	4	0	507
05:15 PM	8	43	19	0	9	147	23	0	13	25	27	0	49	153	4	0	520
05:30 PM	13	39	11	0	15	138	20	0	16	29	34	0	33	137	2	0	487
05:45 PM	10	37	13	0	14	160	40	0	25	32	18	0	36	125	8	0	518
Total	38	161	52	0	55	581	105	0	74	123	102	0	164	559	18	0	2032
Grand Total	71	297	95	0	112	1101	201	0	155	230	166	0	300	1047	38	0	3813
Apprch %	15.3	64.1	20.5	0	7.9	77.9	14.2	0	28.1	41.7	30.1	0	21.7	75.6	2.7	0	
Total %	1.9	7.8	2.5	0	2.9	28.9	5.3	0	4.1	6	4.4	0	7.9	27.5	1	0	
Cars	70	296	94	0	111	1056	198	0	149	229	162	0	293	995	38	0	3691
% Cars	98.6	99.7	98.9	0	99.1	95.9	98.5	0	96.1	99.6	97.6	0	97.7	95	100	0	96.8
Heavy Vehicles	1	1	1	0	1	45	3	0	6	1	4	0	7	52	0	0	122
% Heavy Vehicles	1.4	0.3	1.1	0	0.9	4.1	1.5	0	3.9	0.4	2.4	0	2.3	5	0	0	3.2

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	7	42	9	0	58	**17**	136	22	0	175	20	**37**	**23**	**0**	**80**	46	144	4	0	194	507
05:15 PM	8	**43**	**19**		**70**	9	147	23	0	179	13	25	27	0	65	**49**	**153**	4	0	**206**	**520**
05:30 PM	**13**												**34**	0	79	33	137	2	0	172	487
05:45 PM	10	37	13	0	60	14	**160**	**40**		**214**	**25**							**8**			
Total Volume	38	161	52	0	251	55	581	105	0	741	74	123	102	0	299	164	559	18	0	741	2032
% App. Total	15.1	64.1	20.7	0		7.4	78.4	14.2	0		24.7	41.1	34.1	0		22.1	75.4	2.4	0		
PHF	.731	.936	.684	.000	.896	.809	.908	.656	.000	.866	.740	.831	.750	.000	.934	.837	.913	.563	.000	.899	.977
Cars	38	161	51	0	250	55	560	103	0	718	71	123	99	0	293	160	537	18	0	715	1976
% Cars	100	100	98.1	0	99.6	100	96.4	98.1	0	96.9	95.9	100	97.1	0	98.0	97.6	96.1	100	0	96.5	97.2
Heavy Vehicles	0	0	1	0	1	0	21	2	0	23	3	0	3	0	6	4	22	0	0	26	56
% Heavy Vehicles	0	0	1.9	0	0.4	0	3.6	1.9	0	3.1	4.1	0	2.9	0	2.0	2.4	3.9	0	0	3.5	2.8

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 CC
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	6	32	13	0	16	119	21	0	21	26	9	0	35	111	4	0	413
04:15 PM	8	31	14	0	10	121	29	0	16	20	15	0	28	106	6	0	404
04:30 PM	9	33	9	0	15	108	21	0	24	27	23	0	33	124	3	0	429
04:45 PM	9	39	7	0	15	148	24	0	17	33	16	0	37	117	7	0	469
Total	32	135	43	0	56	496	95	0	78	106	63	0	133	458	20	0	1715
05:00 PM	7	42	9	0	17	133	22	0	18	37	21	0	44	140	4	0	494
05:15 PM	8	43	18	0	9	140	21	0	13	25	27	0	48	150	4	0	506
05:30 PM	13	39	11	0	15	133	20	0	15	29	33	0	32	130	2	0	472
05:45 PM	10	37	13	0	14	154	40	0	25	32	18	0	36	117	8	0	504
Total	38	161	51	0	55	560	103	0	71	123	99	0	160	537	18	0	1976
Grand Total	70	296	94	0	111	1056	198	0	149	229	162	0	293	995	38	0	3691
Apprch %	15.2	64.3	20.4	0	8.1	77.4	14.5	0	27.6	42.4	30	0	22.1	75	2.9	0	
Total %	1.9	8	2.5	0	3	28.6	5.4	0	4	6.2	4.4	0	7.9	27	1	0	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
05:00 PM	7	42	9	0	58	**17**	133	22	0	172	18	**37**	**21**	**0**	**76**	**44**	**140**	**4**	**0**	**188**	**494**
05:15 PM	**8**	**43**	**18**	**0**	**69**	9	140	21	0	170	13	25	27	0	65	**48**	**150**	4	0	**202**	**506**
05:30 PM	**13**												**33**	0	**77**	32	130	2	0	164	472
05:45 PM	10	37	13	0	60	14	**154**	**40**		**208**	**25**							**8**			
Total Volume	38	161	51	0	250	55	560	103	0	718	71	123	99	0	293	160	537	18	0	715	1976
% App. Total	15.2	64.4	20.4	0		7.7	78	14.3	0		24.2	42	33.8	0		22.4	75.1	2.5	0		
PHF	.731	.936	.708	.000	.906	.809	.909	.644	.000	.863	.710	.831	.750	.000	.951	.833	.895	.563	.000	.885	.976

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 CC
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	1	0	0	0	0	4	0	0	1	0	0	0	0	8	0	0	14
04:15 PM	0	1	0	0	0	6	0	0	2	0	1	0	1	5	0	0	16
04:30 PM	0	0	0	0	1	6	0	0	0	1	0	0	0	8	0	0	16
04:45 PM	0	0	0	0	0	8	1	0	0	0	0	0	2	9	0	0	20
Total	1	1	0	0	1	24	1	0	3	1	1	0	3	30	0	0	66
05:00 PM	0	0	0	0	0	3	0	0	2	0	2	0	2	4	0	0	13
05:15 PM	0	0	1	0	0	7	2	0	0	0	0	0	1	3	0	0	14
05:30 PM	0	0	0	0	0	5	0	0	1	0	1	0	1	7	0	0	15
05:45 PM	0	0	0	0	0	6	0	0	0	0	0	0	0	8	0	0	14
Total	0	0	1	0	0	21	2	0	3	0	3	0	4	22	0	0	56
Grand Total	1	1	1	0	1	45	3	0	6	1	4	0	7	52	0	0	122
Apprch %	33.3	33.3	33.3	0	2	91.8	6.1	0	54.5	9.1	36.4	0	11.9	88.1	0	0	
Total %	0.8	0.8	0.8	0	0.8	36.9	2.5	0	4.9	0.8	3.3	0	5.7	42.6	0	0	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:00 PM

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
04:00 PM	**1**	**0**	**0**	**0**	**1**	0	4	0	0	4	1	0	0	0	1	0	8	0	0	8	14
04:15 PM	0	**1**	0	0	1	0	6	0	0	6	**2**		**1**	0	**3**	1	5	0	0	6	16
04:30 PM	0	0	0	0	0	**1**	6	0	0	7	0	**1**									
04:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**1**	**0**	**9**	0	0	0	0	0	**2**	**9**	0	0	**11**	**20**
Total Volume	1	1	0	0	2	1	24	1	0	26	3	1	1	0	5	3	30	0	0	33	66
% App. Total	50	50	0	0		3.8	92.3	3.8	0		60	20	20	0		9.1	90.9	0	0		
PHF	.250	.250	.000	.000	.500	.250	.750	.250	.000	.722	.375	.250	.250	.000	.417	.375	.833	.000	.000	.750	.825

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 CC
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Everett Street From North				Western Avenue From East				Everett Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	2	0	13	0	3	1	6	0	1	1	0	0	2	0	4	33
04:15 PM	0	0	0	6	0	1	1	1	1	0	0	10	0	1	0	2	23
04:30 PM	0	0	0	4	0	5	0	3	1	0	0	5	1	2	0	6	27
04:45 PM	0	1	0	5	0	1	0	4	0	2	0	2	0	5	0	7	27
Total	0	3	0	28	0	10	2	14	2	3	1	17	1	10	0	19	110
05:00 PM	0	0	0	9	0	6	0	6	0	0	0	6	0	3	0	5	35
05:15 PM	0	1	0	11	0	6	1	3	3	1	0	6	1	10	0	4	47
05:30 PM	0	2	1	4	0	7	0	4	0	1	0	6	0	5	0	7	37
05:45 PM	0	0	0	3	0	2	3	3	1	1	2	9	0	3	0	3	30
Total	0	3	1	27	0	21	4	16	4	3	2	27	1	21	0	19	149
Grand Total	0	6	1	55	0	31	6	30	6	6	3	44	2	31	0	38	259
Apprch %	0	9.7	1.6	88.7	0	46.3	9	44.8	10.2	10.2	5.1	74.6	2.8	43.7	0	53.5	
Total %	0	2.3	0.4	21.2	0	12	2.3	11.6	2.3	2.3	1.2	17	0.8	12	0	14.7	

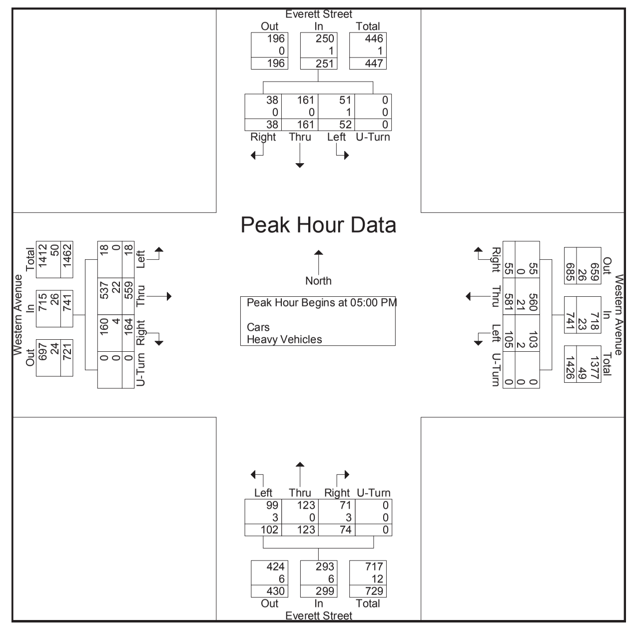
	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	9	9	0	6	0	**6**	**12**	0	0	0	6	6	0	3	0	5	8	35
05:15 PM	0	1	0	**11**	**12**	0	6	1	3	10	**3**	**1**				**1**	**10**	0	4	**15**	**47**
05:30 PM	0	**2**	**1**				**7**												**7**		
05:45 PM	**0**	**0**	**0**	**3**	**3**	**0**	**2**	**3**	**3**	**8**	**1**	**1**	**2**	**9**	**13**	0	3	0	3	6	30
Total Volume	0	3	1	27	31	0	21	4	16	41	4	3	2	27	36	1	21	0	19	41	149
% App. Total	0	9.7	3.2	87.1		0	51.2	9.8	39		11.1	8.3	5.6	75		2.4	51.2	0	46.3		
PHF	.000	.375	.250	.614	.646	.000	.750	.333	.667	.854	.333	.750	.250	.750	.692	.250	.525	.000	.679	.683	.793

N/S: Everett Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 CC
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Everett Street From North					Western Avenue From East					Everett Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	7	42	9	0	58	**17**	136	22	0	175	20	**37**	**23**	**0**	**80**	46	144	4	0	194	507
05:15 PM	8	**43**	**19**		**70**	9	147	23	0	179	13	25	27	0	65	**49**	**153**	4	0	**206**	**520**
05:30 PM	**13**												**34**	0	79	33	137	2	0	172	487
05:45 PM	10	37	13	0	60	14	**160**	**40**		**214**	**25**							**8**			
Total Volume	38	161	52	0	251	55	581	105	0	741	74	123	102	0	299	164	559	18	0	741	2032
% App. Total	15.1	64.1	20.7	0		7.4	78.4	14.2	0		24.7	41.1	34.1	0		22.1	75.4	2.4	0		
PHF	.731	.936	.684	.000	.896	.809	.908	.656	.000	.866	.740	.831	.750	.000	.934	.837	.913	.563	.000	.899	.977
Cars	38	161	51	0	250	55	560	103	0	718	71	123	99	0	293	160	537	18	0	715	1976
% Cars	100	100	98.1	0	99.6	100	96.4	98.1	0	96.9	95.9	100	97.1	0	98.0	97.6	96.1	100	0	96.5	97.2
Heavy Vehicles	0	0	1	0	1	0	21	2	0	23	3	0	3	0	6	4	22	0	0	26	56
% Heavy Vehicles	0	0	1.9	0	0.4	0	3.6	1.9	0	3.1	4.1	0	2.9	0	2.0	2.4	3.9	0	0	3.5	2.8



S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 D
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	114	1	0	0	0	0	1	106	0	222
07:15 AM	115	0	0	0	0	0	2	132	0	249
07:30 AM	113	1	0	0	0	0	0	125	0	239
07:45 AM	127	1	0	0	0	0	2	153	0	283
Total	469	3	0	0	0	0	5	516	0	993
08:00 AM	152	0	0	0	0	0	0	170	0	322
08:15 AM	156	2	0	0	0	0	0	176	0	334
08:30 AM	147	4	0	0	0	0	1	183	0	335
08:45 AM	159	0	0	0	0	0	4	180	0	343
Total	614	6	0	0	0	0	5	709	0	1334
Grand Total	1083	9	0	0	0	0	10	1225	0	2327
Apprch %	99.2	0.8	0	0	0	0	0.8	99.2	0	
Total %	46.5	0.4	0	0	0	0	0.4	52.6	0	
Cars	1001	9	0	0	0	0	8	1124	0	2142
% Cars	92.4	100	0	0	0	0	80	91.8	0	92
Heavy Vehicles	82	0	0	0	0	0	2	101	0	185
% Heavy Vehicles	7.6	0	0	0	0	0	20	8.2	0	8

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
08:00 AM	152	0	0	152	0	0	0	0	0	170	0	170	322
08:15 AM	156	2	0	158	0	0	0	0	0	176	0	176	334
08:30 AM	147	**4**	**0**	**151**	**0**	**0**	**0**	**0**	**1**	**183**	**0**	**184**	335
08:45 AM	**159**	0	0	**159**	0	0	0	0	**4**	180	0	184	**343**
Total Volume	614	6	0	620	0	0	0	0	5	709	0	714	1334
% App. Total	99	1	0		0	0	0		0.7	99.3	0		
PHF	.965	.375	.000	.975	.000	.000	.000	.000	.313	.969	.000	.970	.972
Cars	569	6	0	575	0	0	0	0	4	650	0	654	1229
% Cars	92.7	100	0	92.7	0	0	0	0	80.0	91.7	0	91.6	92.1
Heavy Vehicles	45	0	0	45	0	0	0	0	1	59	0	60	105
% Heavy Vehicles	7.3	0	0	7.3	0	0	0	0	20.0	8.3	0	8.4	7.9

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 D
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	106	1	0	0	0	0	1	94	0	202
07:15 AM	108	0	0	0	0	0	1	122	0	231
07:30 AM	100	1	0	0	0	0	0	114	0	215
07:45 AM	118	1	0	0	0	0	2	144	0	265
Total	432	3	0	0	0	0	4	474	0	913
08:00 AM	142	0	0	0	0	0	0	155	0	297
08:15 AM	141	2	0	0	0	0	0	166	0	309
08:30 AM	136	4	0	0	0	0	1	169	0	310
08:45 AM	150	0	0	0	0	0	3	160	0	313
Total	569	6	0	0	0	0	4	650	0	1229
Grand Total	1001	9	0	0	0	0	8	1124	0	2142
Apprch %	99.1	0.9	0	0	0	0	0.7	99.3	0	
Total %	46.7	0.4	0	0	0	0	0.4	52.5	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
08:00 AM	142	0	0	142	0	0	0	0	0	155	0	155	297
08:15 AM	141	2	0	143	0	0	0	0	0	166	0	166	309
08:30 AM	136	**4**	**0**	**140**	**0**	**0**	**0**	**0**	**1**	**169**	**0**	**170**	310
08:45 AM	**150**	0	0	**150**	0	0	0	0	**3**	160	0	163	**313**
Total Volume	569	6	0	575	0	0	0	0	4	650	0	654	1229
% App. Total	99	1	0		0	0	0		0.6	99.4	0		
PHF	.948	.375	.000	.958	.000	.000	.000	.000	.333	.962	.000	.962	.982

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 D
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	8	0	0	0	0	0	0	12	0	20
07:15 AM	7	0	0	0	0	0	1	10	0	18
07:30 AM	13	0	0	0	0	0	0	11	0	24
07:45 AM	9	0	0	0	0	0	0	9	0	18
Total	37	0	0	0	0	0	1	42	0	80
08:00 AM	10	0	0	0	0	0	0	15	0	25
08:15 AM	15	0	0	0	0	0	0	10	0	25
08:30 AM	11	0	0	0	0	0	0	14	0	25
08:45 AM	9	0	0	0	0	0	1	20	0	30
Total	45	0	0	0	0	0	1	59	0	105
Grand Total	82	0	0	0	0	0	2	101	0	185
Apprch %	100	0	0	0	0	0	1.9	98.1	0	
Total %	44.3	0	0	0	0	0	1.1	54.6	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
08:00 AM	10	0	0	10	0	0	0	0	0	15	0	15	25
08:15 AM	**15**	0	0	**15**	0	0	0	0	0	10	0	10	25
08:30 AM	11	0	0	11	0	0	0	0	0	14	0	14	25
08:45 AM	9	0	0	9	0	0	0	0	**1**	**20**		**21**	**30**
Total Volume	45	0	0	45	0	0	0	0	1	59	0	60	105
% App. Total	100	0	0		0	0	0		1.7	98.3	0		
PHF	.750	.000	.000	.750	.000	.000	.000	.000	.250	.738	.000	.714	.875

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 D
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	1	0	0	1	0	4	2	8
07:15 AM	0	0	1	0	0	1	0	6	3	11
07:30 AM	1	0	0	0	0	3	0	8	3	15
07:45 AM	2	0	3	0	0	7	0	2	1	15
Total	3	0	5	0	0	12	0	20	9	49
08:00 AM	2	0	1	0	0	7	0	8	1	19
08:15 AM	4	0	1	0	0	1	0	3	2	11
08:30 AM	8	0	4	0	0	11	0	7	1	31
08:45 AM	7	0	1	0	0	4	0	14	2	28
Total	21	0	7	0	0	23	0	32	6	89
Grand Total	24	0	12	0	0	35	0	52	15	138
Apprch %	66.7	0	33.3	0	0	100	0	77.6	22.4	
Total %	17.4	0	8.7	0	0	25.4	0	37.7	10.9	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

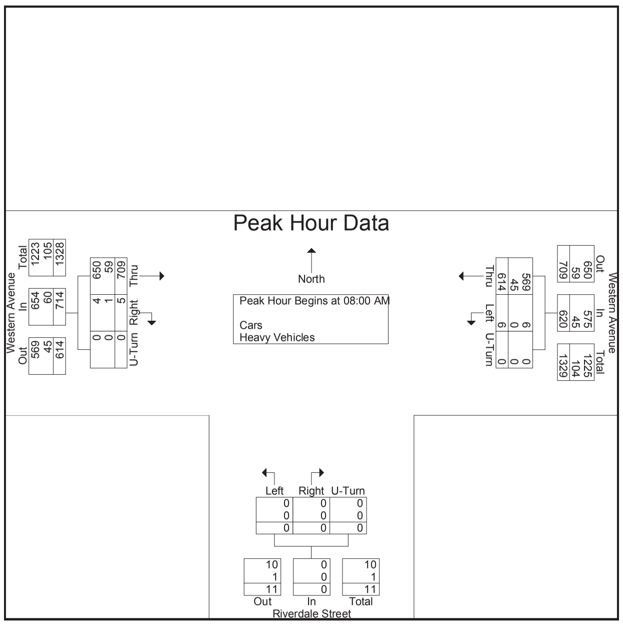
	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
08:00 AM	2	0	1	3	0	0	7	7	0	8	1	9	19
08:15 AM	4	0	1	5	0	0	1	1	0	3	**2**	**5**	**11**
08:30 AM	**8**	0	**4**	**12**	0	0	**11**	**11**	0	7	1	8	**31**
08:45 AM	7	0	1	8	0	0	4	4	0	**14**		**16**	28
Total Volume	21	0	7	28	0	0	23	23	0	32	6	38	89
% App. Total	75	0	25		0	0	100		0	84.2	15.8		
PHF	.656	.000	.438	.583	.000	.000	.523	.523	.000	.571	.750	.594	.718

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 D
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	152	0	0	152	0	0	0	0	0	170	0	170	322
08:15 AM	156	2	0	158	0	0	0	0	0	176	0	176	334
08:30 AM	147	**4**	**0**	**151**	**0**	**0**	**0**	**0**	**1**	**183**	**0**	**184**	335
08:45 AM	**159**	0	0	**159**	0	0	0	0	**4**	180	0	184	**343**
Total Volume	614	6	0	620	0	0	0	0	5	709	0	714	1334
% App. Total	99	1	0		0	0	0		0.7	99.3	0		
PHF	.965	.375	.000	.975	.000	.000	.000	.000	.313	.969	.000	.970	.972
Cars	569	6	0	575	0	0	0	0	4	650	0	654	1229
% Cars	92.7	100	0	92.7	0	0	0	0	80.0	91.7	0	91.6	92.1
Heavy Vehicles	45	0	0	45	0	0	0	0	1	59	0	60	105
% Heavy Vehicles	7.3	0	0	7.3	0	0	0	0	20.0	8.3	0	8.4	7.9



S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 DD
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	184	5	0	0	0	0	3	152	0	344
04:15 PM	143	2	0	0	0	0	4	144	0	293
04:30 PM	150	5	0	0	0	0	0	154	0	309
04:45 PM	189	2	0	0	0	0	4	156	0	351
Total	666	14	0	0	0	0	11	606	0	1297
05:00 PM	176	5	0	0	0	0	0	174	0	355
05:15 PM	179	5	0	0	0	0	3	175	0	362
05:30 PM	181	7	0	0	0	0	5	161	0	354
05:45 PM	218	2	0	0	0	0	4	162	1	387
Total	754	19	0	0	0	0	12	672	1	1458
Grand Total	1420	33	0	0	0	0	23	1278	1	2755
Apprch %	97.7	2.3	0	0	0	0	1.8	98.2	0.1	
Total %	51.5	1.2	0	0	0	0	0.8	46.4	0	
Cars	1354	32	0	0	0	0	21	1222	1	2630
% Cars	95.4	97	0	0	0	0	91.3	95.6	100	95.5
Heavy Vehicles	66	1	0	0	0	0	2	56	0	125
% Heavy Vehicles	4.6	3	0	0	0	0	8.7	4.4	0	4.5

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	176	5	0	181	0	0	0	0	0	174	0	174	355
05:15 PM	179	5	0	184	0	0	0	0	3	**175**	**0**	**178**	362
05:30 PM	181	**7**							**5**	161	0	166	354
05:45 PM	**218**	2	0	**220**	0	0	0	0	4	162	**1**		**387**
Total Volume	754	19	0	773	0	0	0	0	12	672	1	685	1458
% App. Total	97.5	2.5	0		0	0	0		1.8	98.1	0.1		
PHF	.865	.679	.000	.878	.000	.000	.000	.000	.600	.960	.250	.962	.942
Cars	724	18	0	742	0	0	0	0	12	646	1	659	1401
% Cars	96.0	94.7	0	96.0	0	0	0	0	100	96.1	100	96.2	96.1
Heavy Vehicles	30	1	0	31	0	0	0	0	0	26	0	26	57
% Heavy Vehicles	4.0	5.3	0	4.0	0	0	0	0	0	3.9	0	3.8	3.9

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 DD
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	174	5	0	0	0	0	2	143	0	324
04:15 PM	136	2	0	0	0	0	4	136	0	278
04:30 PM	140	5	0	0	0	0	0	147	0	292
04:45 PM	180	2	0	0	0	0	3	150	0	335
Total	630	14	0	0	0	0	9	576	0	1229
05:00 PM	168	5	0	0	0	0	0	168	0	341
05:15 PM	169	5	0	0	0	0	3	171	0	348
05:30 PM	175	7	0	0	0	0	5	152	0	339
05:45 PM	212	1	0	0	0	0	4	155	1	373
Total	724	18	0	0	0	0	12	646	1	1401
Grand Total	1354	32	0	0	0	0	21	1222	1	2630
Apprch %	97.7	2.3	0	0	0	0	1.7	98.2	0.1	
Total %	51.5	1.2	0	0	0	0	0.8	46.5	0	

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	168	5	0	173	0	0	0	0	0	168	0	168	341
05:15 PM	169	5	0	174	0	0	0	0	3	**171**	**0**	**174**	348
05:30 PM	175	**7**							**5**	152	0	157	339
05:45 PM	**212**	1	0	**213**	0	0	0	0	4	155	**1**		**373**
Total Volume	724	18	0	742	0	0	0	0	12	646	1	659	1401
% App. Total	97.6	2.4	0		0	0	0		1.8	98	0.2		
PHF	.854	.643	.000	.871	.000	.000	.000	.000	.600	.944	.250	.947	.939

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 DD
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	10	0	0	0	0	0	1	9	0	20
04:15 PM	7	0	0	0	0	0	0	8	0	15
04:30 PM	10	0	0	0	0	0	0	7	0	17
04:45 PM	9	0	0	0	0	0	1	6	0	16
Total	36	0	0	0	0	0	2	30	0	68
05:00 PM	8	0	0	0	0	0	0	6	0	14
05:15 PM	10	0	0	0	0	0	0	4	0	14
05:30 PM	6	0	0	0	0	0	0	9	0	15
05:45 PM	6	1	0	0	0	0	0	7	0	14
Total	30	1	0	0	0	0	0	26	0	57
Grand Total	66	1	0	0	0	0	2	56	0	125
Apprch %	98.5	1.5	0	0	0	0	3.4	96.6	0	
Total %	52.8	0.8	0	0	0	0	1.6	44.8	0	

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	**10**	0	0	**10**	0	0	0	0	**1**	**9**	**0**	**10**	**20**
04:15 PM	7	0	0	7	0	0	0	0	0	8	0	8	15
04:30 PM	10	0	0	10	0	0	0	0	0	7	0	7	17
04:45 PM	9	0	0	9	0	0	0	0	1	6	0	7	16
Total Volume	36	0	0	36	0	0	0	0	2	30	0	32	68
% App. Total	100	0	0		0	0	0		6.2	93.8	0		
PHF	.900	.000	.000	.900	.000	.000	.000	.000	.500	.833	.000	.800	.850

S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 DD
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Western Avenue From East			Riverdale Street From South			Western Avenue From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
04:00 PM	0	0	1	0	0	5	0	2	4	12
04:15 PM	1	0	0	0	0	10	0	2	4	17
04:30 PM	4	0	3	0	0	4	0	4	3	18
04:45 PM	2	0	0	0	0	4	0	6	2	14
Total	7	0	4	0	0	23	0	14	13	61
05:00 PM	0	0	1	0	0	8	0	4	4	17
05:15 PM	0	0	1	0	0	9	0	11	11	32
05:30 PM	1	0	1	0	0	2	0	5	9	18
05:45 PM	0	0	0	0	0	9	0	3	4	16
Total	1	0	3	0	0	28	0	23	28	83
Grand Total	8	0	7	0	0	51	0	37	41	144
Apprch %	53.3	0	46.7	0	0	100	0	47.4	52.6	
Total %	5.6	0	4.9	0	0	35.4	0	25.7	28.5	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
05:00 PM	0	0	**1**	**1**	**0**	**0**	**8**	**8**	**0**	**4**	**4**	**8**	**17**
05:15 PM	**0**	**0**	**1**	**1**	**0**	**0**	**9**	**9**	0	**11**	**11**	**22**	**32**
05:30 PM	**1**	0	1	**2**	0	0	2	2	0	5	9	14	18
05:45 PM	0	0	0	0	0	0	9	9	0	3	4	7	16
Total Volume	1	0	3	4	0	0	28	28	0	23	28	51	83
% App. Total	25	0	75		0	0	100		0	45.1	54.9		
PHF	.250	.000	.750	.500	.000	.000	.778	.778	.000	.523	.636	.580	.648

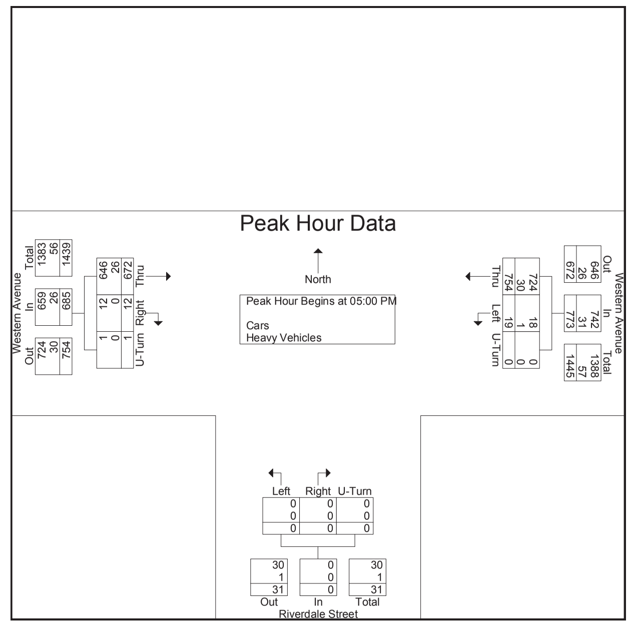
S: Riverdale Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 DD
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	Western Avenue From East				Riverdale Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
05:00 PM	176	5	0	181	0	0	0	0	0	174	0	174	355
05:15 PM	179	5	0	184	0	0	0	0	3	**175**	**0**	**178**	362
05:30 PM	181	**7**							**5**	161	0	166	354
05:45 PM	**218**	2	0	**220**	0	0	0	0	4	162	**1**		**387**
Total Volume	754	19	0	773	0	0	0	0	12	672	1	685	1458
% App. Total	97.5	2.5	0		0	0	0		1.8	98.1	0.1		
PHF	.865	.679	.000	.878	.000	.000	.000	.000	.600	.960	.250	.962	.942
Cars	724	18	0	742	0	0	0	0	12	646	1	659	1401
% Cars	96.0	94.7	0	96.0	0	0	0	0	100	96.1	100	96.2	96.1
Heavy Vehicles	30	1	0	31	0	0	0	0	0	26	0	26	57
% Heavy Vehicles	4.0	5.3	0	4.0	0	0	0	0	0	3.9	0	3.8	3.9



S/SE: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 E
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Right	Bear Right	Thru	U-Turn	Int. Total
07:00 AM	120	1	0	0	0	0	0	0	0	2	0	0	0	44	66	0	233
07:15 AM	131	0	0	0	0	0	0	0	0	0	0	0	0	42	86	0	259
07:30 AM	121	0	0	1	0	0	0	0	1	0	0	0	0	55	71	0	249
07:45 AM	142	1	0	0	0	0	0	0	0	0	0	0	0	33	125	0	301
Total	514	2	0	1	0	0	0	0	1	2	0	0	0	174	348	0	1042
08:00 AM	156	0	3	0	0	0	0	0	1	0	0	0	0	58	106	0	324
08:15 AM	165	0	5	0	0	0	0	0	0	0	0	0	0	53	120	0	343
08:30 AM	145	0	4	0	0	0	0	0	0	0	0	0	0	46	135	0	330
08:45 AM	164	1	3	0	0	0	0	0	0	0	0	0	0	49	126	0	343
Total	630	1	15	0	0	0	0	0	1	0	0	0	0	206	487	0	1340
Grand Total	1144	3	15	1	0	0	0	0	2	2	0	0	0	380	835	0	2382
Apprch %	98.4	0.3	1.3	0.1	0	0	0	0	50	50	0	0	0	31.3	68.7	0	
Total %	48	0.1	0.6	0	0	0	0	0	0.1	0.1	0	0	0	16	35.1	0	
Cars	1059	1	12	1	0	0	0	0	1	0	0	0	0	340	771	0	2185
% Cars	92.6	33.3	80	100	0	0	0	0	50	0	0	0	0	89.5	92.3	0	91.7
Heavy Vehicles	85	2	3	0	0	0	0	0	1	2	0	0	0	40	64	0	197
% Heavy Vehicles	7.4	66.7	20	0	0	0	0	0	50	100	0	0	0	10.5	7.7	0	8.3

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	156	0	3	0	159	0	0	0	0	0	**1**	**0**	**0**	**0**	**1**	0	**58**	106	0	164	324
08:15 AM	**165**		**5**		**170**	0	0	0	0	0	0	0	0	0	0	0	53	120	0	173	**343**
08:30 AM	145	0	4	0	149	0	0	0	0	0	0	0	0	0	0	0	46	**135**		**181**	330
08:45 AM	164	**1**	3	0	168	0	0	0	0	0	0	0	0	0	0	0	49	126	0	175	343
Total Volume	630	1	15	0	646	0	0	0	0	0	1	0	0	0	1	0	206	487	0	693	1340
% App. Total	97.5	0.2	2.3	0		0	0	0	0		100	0	0	0		0	29.7	70.3	0		
PHF	.955	.250	.750	.000	.950	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.888	.902	.000	.957	.977
Cars	592	0	12	0	604	0	0	0	0	0	1	0	0	0	1	0	180	452	0	632	1237
% Cars	94.0	0	80.0	0	93.5	0	0	0	0	0	100	0	0	0	100	0	87.4	92.8	0	91.2	92.3
Heavy Vehicles	38	1	3	0	42	0	0	0	0	0	0	0	0	0	0	0	26	35	0	61	103
% Heavy Vehicles	6.0	100	20.0	0	6.5	0	0	0	0	0	0	0	0	0	0	0	12.6	7.2	0	8.8	7.7

S/SE: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 E
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Right	Bear Right	Thru	U-Turn	Int. Total
07:00 AM	109	0	0	0	0	0	0	0	0	0	0	0	0	40	57	0	206
07:15 AM	122	0	0	0	0	0	0	0	0	0	0	0	0	39	78	0	239
07:30 AM	105	0	0	1	0	0	0	0	0	0	0	0	0	51	65	0	222
07:45 AM	131	1	0	0	0	0	0	0	0	0	0	0	0	30	119	0	281
Total	467	1	0	1	0	0	0	0	0	0	0	0	0	160	319	0	948
08:00 AM	148	0	2	0	0	0	0	0	1	0	0	0	0	52	95	0	298
08:15 AM	153	0	4	0	0	0	0	0	0	0	0	0	0	48	114	0	319
08:30 AM	137	0	3	0	0	0	0	0	0	0	0	0	0	41	126	0	307
08:45 AM	154	0	3	0	0	0	0	0	0	0	0	0	0	39	117	0	313
Total	592	0	12	0	0	0	0	0	1	0	0	0	0	180	452	0	1237
Grand Total	1059	1	12	1	0	0	0	0	1	0	0	0	0	340	771	0	2185
Apprch %	98.7	0.1	1.1	0.1	0	0	0	0	100	0	0	0	0	30.6	69.4	0	
Total %	48.5	0	0.5	0	0	0	0	0	0	0	0	0	0	15.6	35.3	0	

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	148	0	2	0	150	0	0	0	0	0	**1**	**0**	**0**	**0**	**1**	0	**52**	95	0	147	298
08:15 AM	153	0	**4**		**157**	0	0	0	0	0	0	0	0	0	0	0	48	114	0	162	**319**
08:30 AM	137	0	3	0	140	0	0	0	0	0	0	0	0	0	0	0	41	**126**		**167**	307
08:45 AM	**154**																				
Total Volume	592	0	12	0	604	0	0	0	0	0	1	0	0	0	1	0	180	452	0	632	1237
% App. Total	98	0	2	0		0	0	0	0		100	0	0	0		0	28.5	71.5	0		
PHF	.961	.000	.750	.000	.962	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.865	.897	.000	.946	.969

S/SE: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 E
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Right	Bear Right	Thru	U-Turn	Int. Total
07:00 AM	11	1	0	0	0	0	0	0	0	2	0	0	0	4	9	0	27
07:15 AM	9	0	0	0	0	0	0	0	0	0	0	0	0	3	8	0	20
07:30 AM	16	0	0	0	0	0	0	0	1	0	0	0	0	4	6	0	27
07:45 AM	11	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0	20
Total	47	1	0	0	0	0	0	0	1	2	0	0	0	14	29	0	94
08:00 AM	8	0	1	0	0	0	0	0	0	0	0	0	0	6	11	0	26
08:15 AM	12	0	1	0	0	0	0	0	0	0	0	0	0	5	6	0	24
08:30 AM	8	0	1	0	0	0	0	0	0	0	0	0	0	5	9	0	23
08:45 AM	10	1	0	0	0	0	0	0	0	0	0	0	0	10	9	0	30
Total	38	1	3	0	0	0	0	0	0	0	0	0	0	26	35	0	103
Grand Total	85	2	3	0	0	0	0	0	1	2	0	0	0	40	64	0	197
Apprch %	94.4	2.2	3.3	0	0	0	0	0	33.3	66.7	0	0	0	38.5	61.5	0	
Total %	43.1	1	1.5	0	0	0	0	0	0.5	1	0	0	0	20.3	32.5	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
08:00 AM	8	0	1	0	9	0	0	0	0	0	0	0	0	0	0	0	6	11	0	17	26
08:15 AM	12	0	1	0	13	0	0	0	0	0	0	0	0	0	0	0	5	6	0	11	24
08:30 AM	8	0	1	0	9	0	0	0	0	0	0	0	0	0	0	0	5	9	0	14	23
08:45 AM	10	1	0	0	11	0	0	0	0	0	0	0	0	0	0	0	10	9	0	19	30
Total Volume	38	1	3	0	42	0	0	0	0	0	0	0	0	0	0	0	26	35	0	61	103
% App. Total	90.5	2.4	7.1	0		0	0	0	0		0	0	0	0		0	42.6	57.4	0		
PHF	.792	.250	.750	.000	.808	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.650	.795	.000	.803	.858

S/SE: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 E
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	Peds	Hard Right	Bear Left	Hard Left	Peds	Hard Right	Right	Left	Peds	Right	Bear Right	Thru	Peds	Int. Total
07:00 AM	0	0	0	1	0	0	0	0	0	0	0	2	0	0	4	3	10
07:15 AM	0	0	0	1	0	0	0	1	0	0	0	3	0	0	6	1	12
07:30 AM	2	0	0	0	0	0	0	0	0	0	0	8	0	0	9	7	26
07:45 AM	5	0	0	0	0	0	0	0	0	0	0	8	0	0	2	3	18
Total	7	0	0	2	0	0	0	1	0	0	0	21	0	0	21	14	66
08:00 AM	2	0	0	0	0	0	0	0	0	0	0	2	0	0	8	0	12
08:15 AM	4	0	0	1	0	0	0	1	0	0	0	4	0	0	5	3	18
08:30 AM	9	0	0	0	0	0	0	1	0	0	0	11	0	0	7	4	32
08:45 AM	8	0	0	0	0	0	0	1	0	0	0	13	0	0	13	5	40
Total	23	0	0	1	0	0	0	3	0	0	0	30	0	0	33	12	102
Grand Total	30	0	0	3	0	0	0	4	0	0	0	51	0	0	54	26	168
Apprch %	90.9	0	0	9.1	0	0	0	100	0	0	0	100	0	0	67.5	32.5	
Total %	17.9	0	0	1.8	0	0	0	2.4	0	0	0	30.4	0	0	32.1	15.5	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

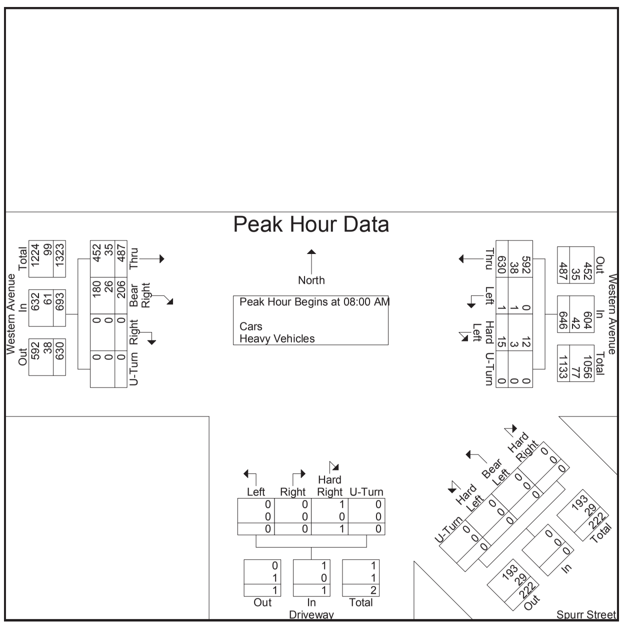
	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Left	Hard Left	Peds	App. Total	Hard Right	Right	Left	Peds	App. Total	Right	Bear Right	Thru	Peds	App. Total	Int. Total
08:00 AM	2	0	0	0	2	0	0	0	0	0	0	0	0	2	2	0	0	8	0	8	12
08:15 AM	4	0	0	1	5	0	0	0	1	1	0	0	0	4	4	0	0	5	3	8	18
08:30 AM	9				9	0	0	0	1	1	0	0	0	11	11	0	0	7	4	11	32
08:45 AM	8	0	0	0	8	0	0	0	1	1	0	0	0	13	13	0	0	13	5	18	40
Total Volume	23	0	0	1	24	0	0	0	3	3	0	0	0	30	30	0	0	33	12	45	102
% App. Total	95.8	0	0	4.2		0	0	0	100		0	0	0	100		0	0	73.3	26.7		
PHF	.639	.000	.000	.250	.667	.000	.000	.000	.750	.750	.000	.000	.000	.577	.577	.000	.000	.635	.600	.625	.638

S/SE: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 E
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	156	0	3	0	159	0	0	0	0	0	**1**	**0**	**0**	**0**	**1**	0	**58**	106	0	164	324
08:15 AM	**165**		**5**		**170**	0	0	0	0	0	0	0	0	0	0	0	53	120	0	173	**343**
08:30 AM	145	0	4	0	149	0	0	0	0	0	0	0	0	0	0	0	46	**135**		**181**	330
08:45 AM	164	**1**	3	0	168	0	0	0	0	0	0	0	0	0	0	0	49	126	0	175	343
Total Volume	630	1	15	0	646	0	0	0	0	0	1	0	0	0	1	0	206	487	0	693	1340
% App. Total	97.5	0.2	2.3	0		0	0	0	0		100	0	0	0		0	29.7	70.3	0		
PHF	.955	.250	.750	.000	.950	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.888	.902	.000	.957	.977
Cars	592	0	12	0	604	0	0	0	0	0	1	0	0	0	1	0	180	452	0	632	1237
% Cars	94.0	0	80.0	0	93.5	0	0	0	0	0	100	0	0	0	100	0	87.4	92.8	0	91.2	92.3
Heavy Vehicles	38	1	3	0	42	0	0	0	0	0	0	0	0	0	0	0	26	35	0	61	103
% Heavy Vehicles	6.0	100	20.0	0	6.5	0	0	0	0	0	0	0	0	0	0	0	12.6	7.2	0	8.8	7.7



S/SW: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 EE
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Right	Bear Right	Thru	U-Turn	Int. Total
04:00 PM	182	0	3	0	0	0	0	0	0	0	0	0	0	67	87	0	339
04:15 PM	143	0	2	0	0	0	0	0	0	0	0	0	1	57	85	0	288
04:30 PM	166	1	5	0	0	0	0	0	0	1	0	0	0	56	94	0	323
04:45 PM	184	0	3	0	0	0	0	0	1	1	0	0	1	50	107	0	347
Total	675	1	13	0	0	0	0	0	1	2	0	0	2	230	373	0	1297
05:00 PM	162	0	4	0	0	0	0	0	0	2	0	0	0	58	134	1	361
05:15 PM	177	0	5	0	0	0	0	0	0	0	0	0	0	60	124	1	367
05:30 PM	177	0	2	1	0	0	0	0	0	0	1	0	0	53	110	0	344
05:45 PM	217	0	2	0	0	0	0	0	0	0	0	0	0	59	112	0	390
Total	733	0	13	1	0	0	0	0	0	2	1	0	0	230	480	2	1462
Grand Total	1408	1	26	1	0	0	0	0	1	4	1	0	2	460	853	2	2759
Apprch %	98.1	0.1	1.8	0.1	0	0	0	0	16.7	66.7	16.7	0	0.2	34.9	64.8	0.2	
Total %	51	0	0.9	0	0	0	0	0	0	0.1	0	0	0.1	16.7	30.9	0.1	
Cars	1352	1	24	1	0	0	0	0	1	4	1	0	2	434	823	2	2645
% Cars	96	100	92.3	100	0	0	0	0	100	100	100	0	100	94.3	96.5	100	95.9
Heavy Vehicles	56	0	2	0	0	0	0	0	0	0	0	0	0	26	30	0	114
% Heavy Vehicles	4	0	7.7	0	0	0	0	0	0	0	0	0	0	5.7	3.5	0	4.1

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	162	0	4	0	166	0	0	0	0	0	0	**2**	**0**	**0**	**2**	0	58	**134**	**1**	**193**	361
05:15 PM	177	0	**5**														**60**	124	1	185	367
05:30 PM	177	0	2	**1**									**1**	0	1	0	53	110	0	163	344
05:45 PM	**217**				**219**	0	0	0	0	0	0	0	0	0	0	0	59	112	0	171	**390**
Total Volume	733	0	13	1	747	0	0	0	0	0	0	2	1	0	3	0	230	480	2	712	1462
% App. Total	98.1	0	1.7	0.1		0	0	0	0		0	66.7	33.3	0		0	32.3	67.4	0.3		
PHF	.844	.000	.650	.250	.853	.000	.000	.000	.000	.000	.000	.250	.250	.000	.375	.000	.958	.896	.500	.922	.937
Cars	709	0	12	1	722	0	0	0	0	0	0	2	1	0	3	0	224	460	2	686	1411
% Cars	96.7	0	92.3	100	96.7	0	0	0	0	0	0	100	100	0	100	0	97.4	95.8	100	96.3	96.5
Heavy Vehicles	24	0	1	0	25	0	0	0	0	0	0	0	0	0	0	0	6	20	0	26	51
% Heavy Vehicles	3.3	0	7.7	0	3.3	0	0	0	0	0	0	0	0	0	0	0	2.6	4.2	0	3.7	3.5

S/SW: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 EE
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Right	Bear Right	Thru	U-Turn	Int. Total
04:00 PM	172	0	3	0	0	0	0	0	0	0	0	0	0	61	84	0	320
04:15 PM	138	0	2	0	0	0	0	0	0	0	0	0	1	54	81	0	276
04:30 PM	158	1	5	0	0	0	0	0	0	1	0	0	0	49	93	0	307
04:45 PM	175	0	2	0	0	0	0	0	1	1	0	0	1	46	105	0	331
Total	643	1	12	0	0	0	0	0	1	2	0	0	2	210	363	0	1234
05:00 PM	159	0	3	0	0	0	0	0	0	2	0	0	0	57	128	1	350
05:15 PM	168	0	5	0	0	0	0	0	0	0	0	0	0	58	122	1	354
05:30 PM	173	0	2	1	0	0	0	0	0	0	1	0	0	52	103	0	332
05:45 PM	209	0	2	0	0	0	0	0	0	0	0	0	0	57	107	0	375
Total	709	0	12	1	0	0	0	0	0	2	1	0	0	224	460	2	1411
Grand Total	1352	1	24	1	0	0	0	0	1	4	1	0	2	434	823	2	2645
Apprch %	98.1	0.1	1.7	0.1	0	0	0	0	16.7	66.7	16.7	0	0.2	34.4	65.3	0.2	
Total %	51.1	0	0.9	0	0	0	0	0	0	0.2	0	0	0.1	16.4	31.1	0.1	

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	159	0	3	0	162	0	0	0	0	0	0	**2**	**0**	**0**	**2**	0	57	**128**	**1**	**186**	350
05:15 PM	168	0	**5**														**58**	122	1	181	354
05:30 PM	173	0	2	**1**									**1**	0	1	0	52	103	0	155	332
05:45 PM	**209**				**211**	0	0	0	0	0	0	0	0	0	0	0	57	107	0	164	**375**
Total Volume	709	0	12	1	722	0	0	0	0	0	0	2	1	0	3	0	224	460	2	686	1411
% App. Total	98.2	0	1.7	0.1		0	0	0	0		0	66.7	33.3	0		0	32.7	67.1	0.3		
PHF	.848	.000	.600	.250	.855	.000	.000	.000	.000	.000	.000	.250	.250	.000	.375	.000	.966	.898	.500	.922	.941

S/SW: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 EE
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Left	Hard Left	U-Turn	Hard Right	Right	Left	U-Turn	Right	Bear Right	Thru	U-Turn	Int. Total
04:00 PM	10	0	0	0	0	0	0	0	0	0	0	0	0	6	3	0	19
04:15 PM	5	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0	12
04:30 PM	8	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	16
04:45 PM	9	0	1	0	0	0	0	0	0	0	0	0	0	4	2	0	16
Total	32	0	1	0	0	0	0	0	0	0	0	0	0	20	10	0	63
05:00 PM	3	0	1	0	0	0	0	0	0	0	0	0	0	1	6	0	11
05:15 PM	9	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	13
05:30 PM	4	0	0	0	0	0	0	0	0	0	0	0	0	1	7	0	12
05:45 PM	8	0	0	0	0	0	0	0	0	0	0	0	0	2	5	0	15
Total	24	0	1	0	0	0	0	0	0	0	0	0	0	6	20	0	51
Grand Total	56	0	2	0	0	0	0	0	0	0	0	0	0	26	30	0	114
Apprch %	96.6	0	3.4	0	0	0	0	0	0	0	0	0	0	46.4	53.6	0	
Total %	49.1	0	1.8	0	0	0	0	0	0	0	0	0	0	22.8	26.3	0	

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**10**	**0**	**0**	**0**	**10**	0	0	0	0	0	0	0	0	0	0	0	6	3	0	**9**	**19**
04:15 PM	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	3	**4**			
04:30 PM	**8**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	1	0	8	16
04:45 PM	9	0	**1**																		
Total Volume	32	0	1	0	33	0	0	0	0	0	0	0	0	0	0	0	20	10	0	30	63
% App. Total	97	0	3	0		0	0	0	0		0	0	0	0		0	66.7	33.3	0		
PHF	.800	.000	.250	.000	.825	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.714	.625	.000	.833	.829

S/SW: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 EE
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Western Avenue From East				Spurr Street From Southeast				Driveway From South				Western Avenue From West				
Start Time	Thru	Left	Hard Left	Peds	Hard Right	Bear Left	Hard Left	Peds	Hard Right	Right	Left	Peds	Right	Bear Right	Thru	Peds	Int. Total
04:00 PM	5	0	0	0	0	0	0	0	0	0	0	8	0	0	2	2	17
04:15 PM	3	0	0	0	0	0	0	0	0	0	0	9	0	1	2	3	18
04:30 PM	4	0	0	0	0	0	0	0	0	0	0	7	0	0	4	8	23
04:45 PM	2	0	0	1	0	0	0	0	0	0	0	9	0	2	5	1	20
Total	14	0	0	1	0	0	0	0	0	0	0	33	0	3	13	14	78
05:00 PM	6	0	0	1	0	0	0	2	0	0	0	18	0	0	4	11	42
05:15 PM	5	0	0	0	0	0	0	3	0	0	0	12	0	1	12	3	36
05:30 PM	8	0	0	0	0	0	0	2	0	0	0	7	0	0	6	0	23
05:45 PM	7	0	0	3	0	0	0	2	0	0	0	17	0	0	3	8	40
Total	26	0	0	4	0	0	0	9	0	0	0	54	0	1	25	22	141
Grand Total	40	0	0	5	0	0	0	9	0	0	0	87	0	4	38	36	219
Apprch %	88.9	0	0	11.1	0	0	0	100	0	0	0	100	0	5.1	48.7	46.2	
Total %	18.3	0	0	2.3	0	0	0	4.1	0	0	0	39.7	0	1.8	17.4	16.4	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

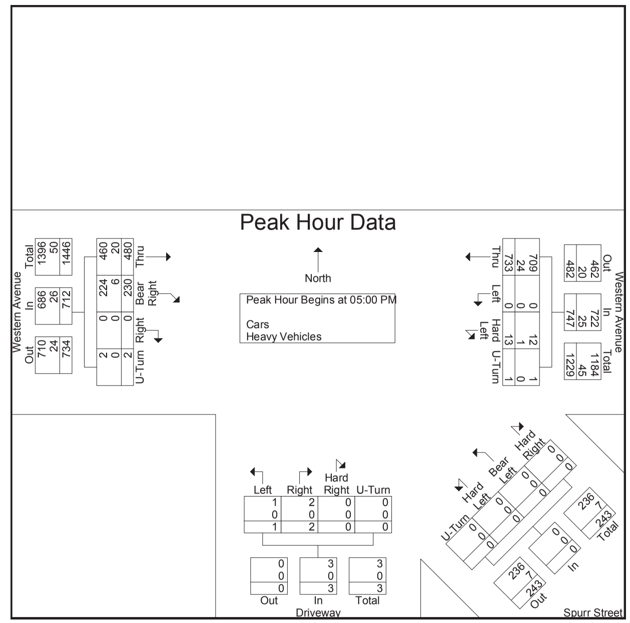
	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Left	Hard Left	Peds	App. Total	Hard Right	Right	Left	Peds	App. Total	Right	Bear Right	Thru	Peds	App. Total	Int. Total
05:00 PM	6	0	0	1	7	0	0	0	2	2	0	0	0	**18**	**18**	0	0	4	**11**	**15**	**42**
05:15 PM	5	0	0	0	5	0	0	0	**3**	**3**	0	0	0	12	12	0	**1**	**12**		**16**	36
05:30 PM	**8**																				
05:45 PM	**7**	**0**	**0**	**3**	**10**	0	0	0	2	2	0	0	0	17	17	0	0	3	8	11	40
Total Volume	26	0	0	4	30	0	0	0	9	9	0	0	0	54	54	0	1	25	22	48	141
% App. Total	86.7	0	0	13.3		0	0	0	100		0	0	0	100		0	2.1	52.1	45.8		
PHF	.813	.000	.000	.333	.750	.000	.000	.000	.750	.750	.000	.000	.000	.750	.750	.000	.250	.521	.500	.750	.839

S/SW: Driveway/ Spurr Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 EE
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Western Avenue From East					Spurr Street From Southeast					Driveway From South					Western Avenue From West					
Start Time	Thru	Left	Hard Left	U-Turn	App. Total	Hard Right	Bear Left	Hard Left	U-Turn	App. Total	Hard Right	Right	Left	U-Turn	App. Total	Right	Bear Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	162	0	4	0	166	0	0	0	0	0	0	**2**	**0**	**0**	**2**	0	58	**134**	**1**	**193**	361
05:15 PM	177	0	**5**														**60**	124	1	185	367
05:30 PM	177	0	2	**1**									**1**	0	1	0	53	110	0	163	344
05:45 PM	**217**				**219**	0	0	0	0	0	0	0	0	0	0	0	59	112	0	171	**390**
Total Volume	733	0	13	1	747	0	0	0	0	0	0	2	1	0	3	0	230	480	2	712	1462
% App. Total	98.1	0	1.7	0.1		0	0	0	0		0	66.7	33.3	0		0	32.3	67.4	0.3		
PHF	.844	.000	.650	.250	.853	.000	.000	.000	.000	.000	.000	.250	.250	.000	.375	.000	.958	.896	.500	.922	.937
Cars	709	0	12	1	722	0	0	0	0	0	0	2	1	0	3	0	224	460	2	686	1411
% Cars	96.7	0	92.3	100	96.7	0	0	0	0	0	0	100	100	0	100	0	97.4	95.8	100	96.3	96.5
Heavy Vehicles	24	0	1	0	25	0	0	0	0	0	0	0	0	0	0	0	6	20	0	26	51
% Heavy Vehicles	3.3	0	7.7	0	3.3	0	0	0	0	0	0	0	0	0	0	0	2.6	4.2	0	3.7	3.5



N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 F
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	37	33	5	0	10	57	18	0	8	42	33	0	0	41	24	0	308
07:15 AM	35	47	9	0	5	75	12	0	13	61	26	0	3	53	23	0	362
07:30 AM	29	35	4	0	5	70	10	0	15	69	33	0	2	48	17	0	337
07:45 AM	39	46	9	0	6	69	8	0	12	88	40	0	1	92	32	0	442
Total	140	161	27	0	26	271	48	0	48	260	132	0	6	234	96	0	1449
08:00 AM	46	46	6	0	13	75	16	0	19	68	40	0	2	76	21	0	428
08:15 AM	34	53	6	0	16	90	15	0	13	80	44	0	0	74	38	0	463
08:30 AM	30	51	2	0	16	77	17	0	12	73	36	0	0	82	41	0	437
08:45 AM	34	48	7	0	9	91	16	0	18	96	48	0	1	93	37	0	498
Total	144	198	21	0	54	333	64	0	62	317	168	0	3	325	137	0	1826
Grand Total	284	359	48	0	80	604	112	0	110	577	300	0	9	559	233	0	3275
Apprch %	41.1	52	6.9	0	10.1	75.9	14.1	0	11.1	58.5	30.4	0	1.1	69.8	29.1	0	
Total %	8.7	11	1.5	0	2.4	18.4	3.4	0	3.4	17.6	9.2	0	0.3	17.1	7.1	0	
Cars	249	326	39	0	66	568	103	0	95	522	278	0	6	519	213	0	2984
% Cars	87.7	90.8	81.2	0	82.5	94	92	0	86.4	90.5	92.7	0	66.7	92.8	91.4	0	91.1
Heavy Vehicles	35	33	9	0	14	36	9	0	15	55	22	0	3	40	20	0	291
% Heavy Vehicles	12.3	9.2	18.8	0	17.5	6	8	0	13.6	9.5	7.3	0	33.3	7.2	8.6	0	8.9

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	**46**	**46**	**6**	**0**	**98**	13	75	16	0	104	**19**	**68**	**40**	**0**	**127**	**2**	**76**	**21**	**0**	**99**	**428**
08:15 AM	**34**	**53**	6	0	93	**16**	90	15	0	**121**	13	80	44	0	137	0	74	38	0	112	463
08:30 AM	30	51	2	0	83	16	77	**17**										**41**			
08:45 AM	**34**	**48**	**7**	**0**	**89**	**9**	**91**	**16**	**0**	**116**	**18**	**96**	**48**	0	**162**	1	**93**	37	0	**131**	**498**
Total Volume	144	198	21	0	363	54	333	64	0	451	62	317	168	0	547	3	325	137	0	465	1826
% App. Total	39.7	54.5	5.8	0		12	73.8	14.2	0		11.3	58	30.7	0		0.6	69.9	29.5	0		
PHF	.783	.934	.750	.000	.926	.844	.915	.941	.000	.932	.816	.826	.875	.000	.844	.375	.874	.835	.000	.887	.917
Cars	130	186	18	0	334	45	316	61	0	422	56	296	159	0	511	3	304	125	0	432	1699
% Cars	90.3	93.9	85.7	0	92.0	83.3	94.9	95.3	0	93.6	90.3	93.4	94.6	0	93.4	100	93.5	91.2	0	92.9	93.0
Heavy Vehicles	14	12	3	0	29	9	17	3	0	29	6	21	9	0	36	0	21	12	0	33	127
% Heavy Vehicles	9.7	6.1	14.3	0	8.0	16.7	5.1	4.7	0	6.4	9.7	6.6	5.4	0	6.6	0	6.5	8.8	0	7.1	7.0

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 F
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	34	26	5	0	7	54	17	0	6	36	27	0	0	33	21	0	266
07:15 AM	30	41	6	0	4	72	10	0	11	47	25	0	2	49	22	0	319
07:30 AM	22	34	4	0	5	61	8	0	13	62	30	0	0	46	15	0	300
07:45 AM	33	39	6	0	5	65	7	0	9	81	37	0	1	87	30	0	400
Total	119	140	21	0	21	252	42	0	39	226	119	0	3	215	88	0	1285
08:00 AM	42	42	6	0	12	73	15	0	17	67	39	0	2	72	18	0	405
08:15 AM	31	50	5	0	11	84	15	0	11	73	40	0	0	69	36	0	425
08:30 AM	24	48	2	0	14	74	16	0	12	67	34	0	0	77	37	0	405
08:45 AM	33	46	5	0	8	85	15	0	16	89	46	0	1	86	34	0	464
Total	130	186	18	0	45	316	61	0	56	296	159	0	3	304	125	0	1699
Grand Total	249	326	39	0	66	568	103	0	95	522	278	0	6	519	213	0	2984
Apprch %	40.6	53.1	6.4	0	9	77.1	14	0	10.6	58.3	31.1	0	0.8	70.3	28.9	0	
Total %	8.3	10.9	1.3	0	2.2	19	3.5	0	3.2	17.5	9.3	0	0.2	17.4	7.1	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	**42**	**42**	**6**	**0**	**90**	12	73	15	0	100	**17**	**67**	**39**	**0**	**123**	**2**	**72**	**18**	**0**	**92**	**405**
08:15 AM	**31**	**50**	5	0	86	11	84	15	0	**110**	11	73	40	0	124	0	69	36	0	105	425
08:30 AM	24	48	2	0	74	**14**	74	**16**										**37**			
08:45 AM	**33**	**46**	**5**	**0**	**84**	**8**	**85**	**15**	**0**	**108**	**16**	**89**	**46**	0	**151**	1	**86**	34	0	**121**	**464**
Total Volume	130	186	18	0	334	45	316	61	0	422	56	296	159	0	511	3	304	125	0	432	1699
% App. Total	38.9	55.7	5.4	0		10.7	74.9	14.5	0		11	57.9	31.1	0		0.7	70.4	28.9	0		
PHF	.774	.930	.750	.000	.928	.804	.929	.953	.000	.959	.824	.831	.864	.000	.846	.375	.884	.845	.000	.893	.915

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 F
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	3	7	0	0	3	3	1	0	2	6	6	0	0	8	3	0	42
07:15 AM	5	6	3	0	1	3	2	0	2	14	1	0	1	4	1	0	43
07:30 AM	7	1	0	0	0	9	2	0	2	7	3	0	2	2	2	0	37
07:45 AM	6	7	3	0	1	4	1	0	3	7	3	0	0	5	2	0	42
Total	21	21	6	0	5	19	6	0	9	34	13	0	3	19	8	0	164
08:00 AM	4	4	0	0	1	2	1	0	2	1	1	0	0	4	3	0	23
08:15 AM	3	3	1	0	5	6	0	0	2	7	4	0	0	5	2	0	38
08:30 AM	6	3	0	0	2	3	1	0	0	6	2	0	0	5	4	0	32
08:45 AM	1	2	2	0	1	6	1	0	2	7	2	0	0	7	3	0	34
Total	14	12	3	0	9	17	3	0	6	21	9	0	0	21	12	0	127
Grand Total	35	33	9	0	14	36	9	0	15	55	22	0	3	40	20	0	291
Apprch %	45.5	42.9	11.7	0	23.7	61	15.3	0	16.3	59.8	23.9	0	4.8	63.5	31.7	0	
Total %	12	11.3	3.1	0	4.8	12.4	3.1	0	5.2	18.9	7.6	0	1	13.7	6.9	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:00 AM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	3	**7**	0	0	10	**3**	3	1	0	7	2	6	**6**	0	14	0	**8**	**3**	**0**	**11**	42
07:15 AM	5	6	**3**					**2**				**14**			**17**	1	4	1	0	6	**43**
07:30 AM	**7**						**9**			**11**	2	7	3	0	12	**2**					
07:45 AM	**6**	**7**	**3**	**0**	**16**	1	4	1	0	6	**3**	**7**	**3**	**0**	**13**	**0**	**5**	**2**	**0**	**7**	**42**
Total Volume	21	21	6	0	48	5	19	6	0	30	9	34	13	0	56	3	19	8	0	30	164
% App. Total	43.8	43.8	12.5	0		16.7	63.3	20	0		16.1	60.7	23.2	0		10	63.3	26.7	0		
PHF	.750	.750	.500	.000	.750	.417	.528	.750	.000	.682	.750	.607	.542	.000	.824	.375	.594	.667	.000	.682	.953

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 F
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	1	0	1	0	0	0	9	0	0	0	2	0	3	1	5	22
07:15 AM	0	4	0	1	0	0	1	10	0	3	0	2	0	5	1	3	30
07:30 AM	0	2	0	1	0	1	0	15	1	9	0	3	0	4	2	3	41
07:45 AM	2	5	0	1	0	3	0	16	0	4	0	2	0	0	0	9	42
Total	2	12	0	4	0	4	1	50	1	16	0	9	0	12	4	20	135
08:00 AM	0	4	0	2	0	0	0	15	1	4	1	1	0	6	1	9	44
08:15 AM	1	6	0	6	0	3	1	18	1	9	0	8	0	4	0	11	68
08:30 AM	2	3	0	9	0	6	1	19	0	6	0	3	0	4	1	14	68
08:45 AM	0	4	0	6	0	2	0	14	1	9	0	4	0	6	4	13	63
Total	3	17	0	23	0	11	2	66	3	28	1	16	0	20	6	47	243
Grand Total	5	29	0	27	0	15	3	116	4	44	1	25	0	32	10	67	378
Apprch %	8.2	47.5	0	44.3	0	11.2	2.2	86.6	5.4	59.5	1.4	33.8	0	29.4	9.2	61.5	
Total %	1.3	7.7	0	7.1	0	4	0.8	30.7	1.1	11.6	0.3	6.6	0	8.5	2.6	17.7	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:00 AM

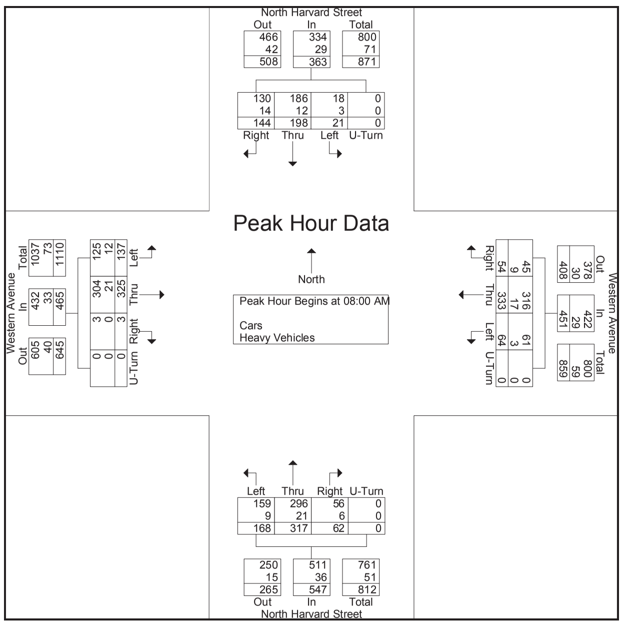
	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
08:00 AM	0	4	0	2	6	0	0	0	15	15	**1**	**4**	**1**	1	7	0	**6**	1	9	16	44
08:15 AM	1	**6**	0	6	13	0	3	**1**				**9**		**8**	**18**	0	4	0	11	15	**68**
08:30 AM	**2**			**9**	**14**	0	**6**		**19**	**26**	0	6	0	3	9	0	4	1	**14**		
08:45 AM	**0**	**4**	**0**	**6**	**10**	**0**	**2**	**0**	**14**	**16**	**1**	**9**	**0**	**4**	**14**	**0**	**6**	**4**	**13**	**23**	63
Total Volume	3	17	0	23	43	0	11	2	66	79	3	28	1	16	48	0	20	6	47	73	243
% App. Total	7	39.5	0	53.5		0	13.9	2.5	83.5		6.2	58.3	2.1	33.3		0	27.4	8.2	64.4		
PHF	.375	.708	.000	.639	.768	.000	.458	.500	.868	.760	.750	.778	.250	.500	.667	.000	.833	.375	.839	.793	.893

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 F
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	**46**	**46**	**6**	**0**	**98**	13	75	16	0	104	**19**	**68**	**40**	**0**	**127**	**2**	**76**	**21**	**0**	**99**	**428**
08:15 AM	34	**53**	6	0	93	**16**	90	15	0	**121**	13	80	44	0	137	0	74	38	0	112	463
08:30 AM	30	51	2	0	83	16	77	**17**										**41**			
08:45 AM	34	48	**7**	**0**	89	**9**	**91**	**16**	**0**	**116**	18	96	48	0	**162**	1	**93**	37	0	**131**	**498**
Total Volume	144	198	21	0	363	54	333	64	0	451	62	317	168	0	547	3	325	137	0	465	1826
% App. Total	39.7	54.5	5.8	0		12	73.8	14.2	0		11.3	58	30.7	0		0.6	69.9	29.5	0		
PHF	.783	.934	.750	.000	.926	.844	.915	.941	.000	.932	.816	.826	.875	.000	.844	.375	.874	.835	.000	.887	.917
Cars	130	186	18	0	334	45	316	61	0	422	56	296	159	0	511	3	304	125	0	432	1699
% Cars	90.3	93.9	85.7	0	92.0	83.3	94.9	95.3	0	93.6	90.3	93.4	94.6	0	93.4	100	93.5	91.2	0	92.9	93.0
Heavy Vehicles	14	12	3	0	29	9	17	3	0	29	6	21	9	0	36	0	21	12	0	33	127
% Heavy Vehicles	9.7	6.1	14.3	0	8.0	16.7	5.1	4.7	0	6.4	9.7	6.6	5.4	0	6.6	0	6.5	8.8	0	7.1	7.0



N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 FF
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	42	49	3	0	7	97	19	0	13	59	33	0	2	66	20	0	410
04:15 PM	46	54	5	0	9	72	24	0	7	62	25	0	3	48	22	0	377
04:30 PM	32	48	2	0	15	99	22	0	5	65	38	0	5	66	29	0	426
04:45 PM	41	57	4	0	13	85	24	0	18	68	46	0	1	64	32	0	453
Total	161	208	14	0	44	353	89	0	43	254	142	0	11	244	103	0	1666
05:00 PM	33	49	3	0	12	99	24	0	16	70	30	0	5	85	34	0	460
05:15 PM	45	66	7	0	10	89	21	0	9	86	51	0	1	85	37	0	507
05:30 PM	36	56	3	0	11	99	15	0	11	78	38	0	2	68	31	0	448
05:45 PM	50	59	5	0	14	121	22	0	10	82	45	0	3	77	34	0	522
Total	164	230	18	0	47	408	82	0	46	316	164	0	11	315	136	0	1937
Grand Total	325	438	32	0	91	761	171	0	89	570	306	0	22	559	239	0	3603
Apprch %	40.9	55.1	4	0	8.9	74.4	16.7	0	9.2	59.1	31.7	0	2.7	68.2	29.1	0	
Total %	9	12.2	0.9	0	2.5	21.1	4.7	0	2.5	15.8	8.5	0	0.6	15.5	6.6	0	
Cars	309	411	30	0	86	735	165	0	78	545	289	0	22	541	220	0	3431
% Cars	95.1	93.8	93.8	0	94.5	96.6	96.5	0	87.6	95.6	94.4	0	100	96.8	92.1	0	95.2
Heavy Vehicles	16	27	2	0	5	26	6	0	11	25	17	0	0	18	19	0	172
% Heavy Vehicles	4.9	6.2	6.2	0	5.5	3.4	3.5	0	12.4	4.4	5.6	0	0	3.2	7.9	0	4.8

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	33	49	3	0	85	12	99	**24**	**0**	**135**	**16**	**70**	**30**	**0**	**116**	**5**	**85**	34	0	**124**	460
05:15 PM	45	**66**	**7**		**118**	10	89	21	0	120	9	**86**	**51**	0	**146**	1	85	**37**			
05:30 PM	**36**	**56**	**3**	**0**	**95**	**11**	**99**	**15**	**0**	**125**	**11**	**78**	**38**	**0**	**127**	**2**	**68**	**31**	**0**	**101**	**448**
05:45 PM	**50**	**59**	**5**	**0**	**114**	**14**	**121**	**22**	**0**	**157**	10	82	45	0	137	3	77	34	0	114	**522**
Total Volume	164	230	18	0	412	47	408	82	0	537	46	316	164	0	526	11	315	136	0	462	1937
% App. Total	39.8	55.8	4.4	0		8.8	76	15.3	0		8.7	60.1	31.2	0		2.4	68.2	29.4	0		
PHF	.820	.871	.643	.000	.873	.839	.843	.854	.000	.855	.719	.919	.804	.000	.901	.550	.926	.919	.000	.931	.928
Cars	157	218	17	0	392	44	396	79	0	519	40	306	158	0	504	11	303	127	0	441	1856
% Cars	95.7	94.8	94.4	0	95.1	93.6	97.1	96.3	0	96.6	87.0	96.8	96.3	0	95.8	100	96.2	93.4	0	95.5	95.8
Heavy Vehicles	7	12	1	0	20	3	12	3	0	18	6	10	6	0	22	0	12	9	0	21	81
% Heavy Vehicles	4.3	5.2	5.6	0	4.9	6.4	2.9	3.7	0	3.4	13.0	3.2	3.7	0	4.2	0	3.8	6.6	0	4.5	4.2

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 FF
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	39	44	2	0	7	91	18	0	10	53	31	0	2	65	14	0	376
04:15 PM	44	50	5	0	8	68	23	0	6	56	25	0	3	45	20	0	353
04:30 PM	29	44	2	0	15	96	21	0	5	63	35	0	5	66	27	0	408
04:45 PM	40	55	4	0	12	84	24	0	17	67	40	0	1	62	32	0	438
Total	152	193	13	0	42	339	86	0	38	239	131	0	11	238	93	0	1575
05:00 PM	32	45	3	0	12	96	24	0	14	68	29	0	5	83	29	0	440
05:15 PM	43	63	7	0	10	85	21	0	7	84	49	0	1	83	36	0	489
05:30 PM	35	53	3	0	10	97	14	0	9	75	37	0	2	65	29	0	429
05:45 PM	47	57	4	0	12	118	20	0	10	79	43	0	3	72	33	0	498
Total	157	218	17	0	44	396	79	0	40	306	158	0	11	303	127	0	1856
Grand Total	309	411	30	0	86	735	165	0	78	545	289	0	22	541	220	0	3431
Apprch %	41.2	54.8	4	0	8.7	74.5	16.7	0	8.6	59.8	31.7	0	2.8	69.1	28.1	0	
Total %	9	12	0.9	0	2.5	21.4	4.8	0	2.3	15.9	8.4	0	0.6	15.8	6.4	0	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
05:00 PM	32	45	3	0	80	**12**	96	**24**	**0**	**132**	**14**	**68**	**29**	**0**	**111**	**5**	**83**	29	0	117	440
05:15 PM	43	**63**	**7**		**113**	10	85	21	0	116	7	**84**	**49**	0	**140**	1	83	**36**		**120**	489
05:30 PM	35	53	3	0	91	10	97	14	0	121	9	75	37	0	121	2	65	29	0	96	429
05:45 PM	**47**						**118**			**150**	10	79	43	0	132	3	72	33	0	108	**498**
Total Volume	157	218	17	0	392	44	396	79	0	519	40	306	158	0	504	11	303	127	0	441	1856
% App. Total	40.1	55.6	4.3	0		8.5	76.3	15.2	0		7.9	60.7	31.3	0		2.5	68.7	28.8	0		
PHF	.835	.865	.607	.000	.867	.917	.839	.823	.000	.865	.714	.911	.806	.000	.900	.550	.913	.882	.000	.919	.932

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 FF
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	3	5	1	0	0	6	1	0	3	6	2	0	0	1	6	0	34
04:15 PM	2	4	0	0	1	4	1	0	1	6	0	0	0	3	2	0	24
04:30 PM	3	4	0	0	0	3	1	0	0	2	3	0	0	0	2	0	18
04:45 PM	1	2	0	0	1	1	0	0	1	1	6	0	0	2	0	0	15
Total	9	15	1	0	2	14	3	0	5	15	11	0	0	6	10	0	91
05:00 PM	1	4	0	0	0	3	0	0	2	2	1	0	0	2	5	0	20
05:15 PM	2	3	0	0	0	4	0	0	2	2	2	0	0	2	1	0	18
05:30 PM	1	3	0	0	1	2	1	0	2	3	1	0	0	3	2	0	19
05:45 PM	3	2	1	0	2	3	2	0	0	3	2	0	0	5	1	0	24
Total	7	12	1	0	3	12	3	0	6	10	6	0	0	12	9	0	81
Grand Total	16	27	2	0	5	26	6	0	11	25	17	0	0	18	19	0	172
Apprch %	35.6	60	4.4	0	13.5	70.3	16.2	0	20.8	47.2	32.1	0	0	48.6	51.4	0	
Total %	9.3	15.7	1.2	0	2.9	15.1	3.5	0	6.4	14.5	9.9	0	0	10.5	11	0	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:00 PM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
04:00 PM	**3**	**5**	**1**	**0**	**9**	0	**6**	**1**	**0**	**7**	**3**	**6**	**2**	**0**	**11**	0	1	**6**	**0**	**7**	**34**
04:15 PM	2	4	0	0	6	**1**	4	1	0	6	1	6	0	0	7	0	**3**	2	0	5	24
04:30 PM	3	4	0	0	7	0	3	1	0	4	0	2	3	0	5	0	0	2	0	2	18
04:45 PM	1	2	0	0	3	1	1	0	0	2	1	1	**6**	0	8	0	2	0	0	2	15
Total Volume	9	15	1	0	25	2	14	3	0	19	5	15	11	0	31	0	6	10	0	16	91
% App. Total	36	60	4	0		10.5	73.7	15.8	0		16.1	48.4	35.5	0		0	37.5	62.5	0		
PHF	.750	.750	.250	.000	.694	.500	.583	.750	.000	.679	.417	.625	.458	.000	.705	.000	.500	.417	.000	.571	.669

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 FF
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Western Avenue From East				North Harvard Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	2	2	0	6	0	1	1	11	0	6	0	0	0	0	0	10	39
04:15 PM	1	11	0	3	0	2	0	21	0	6	0	0	0	1	0	5	50
04:30 PM	2	6	0	8	0	4	0	12	0	7	0	3	0	2	1	12	57
04:45 PM	0	6	0	3	0	1	0	16	0	7	0	5	0	1	3	12	54
Total	5	25	0	20	0	8	1	60	0	26	0	8	0	4	4	39	200
05:00 PM	1	11	0	5	0	3	0	17	1	7	0	3	0	0	2	7	57
05:15 PM	0	8	0	12	0	3	1	9	0	5	0	9	0	4	1	21	73
05:30 PM	2	8	0	6	0	4	1	13	0	7	1	5	0	2	2	17	68
05:45 PM	2	9	0	6	1	4	1	24	2	6	0	3	0	2	1	35	96
Total	5	36	0	29	1	14	3	63	3	25	1	20	0	8	6	80	294
Grand Total	10	61	0	49	1	22	4	123	3	51	1	28	0	12	10	119	494
Apprch %	8.3	50.8	0	40.8	0.7	14.7	2.7	82	3.6	61.4	1.2	33.7	0	8.5	7.1	84.4	
Total %	2	12.3	0	9.9	0.2	4.5	0.8	24.9	0.6	10.3	0.2	5.7	0	2.4	2	24.1	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 PM	1	**11**	0	5	17	0	3	0	17	20	1	**7**	**0**	**3**	**11**	**0**	**0**	**2**	**7**	**9**	**57**
05:15 PM	**0**	**8**	**0**	**12**	**20**	0	3	**1**	**9**	**13**	**0**	**5**	**0**	**9**	**14**	0	**4**	1	21	26	73
05:30 PM	**2**						**4**						**1**	5	13	0	2	2	17	21	68
05:45 PM	2	9	0	6	17	**1**	4	1	**24**	**30**	**2**								**35**	**38**	**96**
Total Volume	5	36	0	29	70	1	14	3	63	81	3	25	1	20	49	0	8	6	80	94	294
% App. Total	7.1	51.4	0	41.4		1.2	17.3	3.7	77.8		6.1	51	2	40.8		0	8.5	6.4	85.1		
PHF	.625	.818	.000	.604	.875	.250	.875	.750	.656	.675	.375	.893	.250	.556	.875	.000	.500	.750	.571	.618	.766

N/S: North Harvard Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

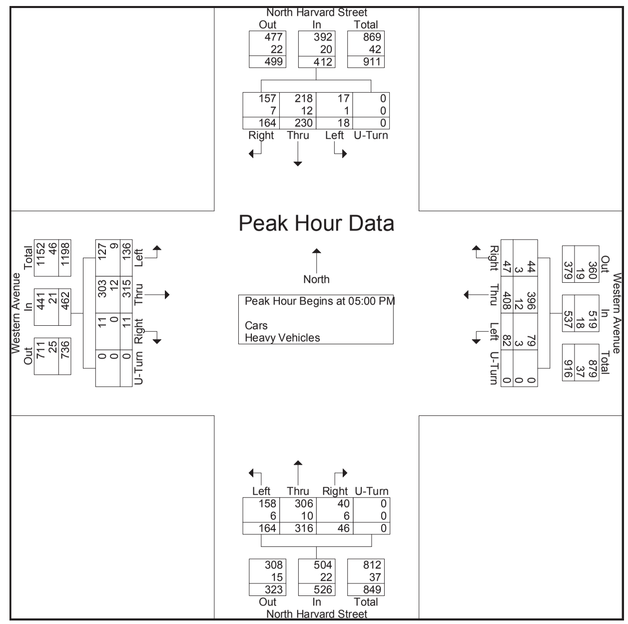
PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 FF
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Western Avenue From East					North Harvard Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
05:00 PM	33	49	3	0	85	12	99	**24**	**0**	**135**	**16**	**70**	**30**	**0**	**116**	**5**	**85**	34	0	**124**	460
05:15 PM	45	**66**	**7**		**118**	10	89	21	0	120	9	**86**	**51**	0	**146**	1	85	**37**			
05:30 PM	**36**	**56**	**3**	**0**	**95**	**11**	**99**	**15**	**0**	**125**	**11**	**78**	**38**	**0**	**127**	**2**	**68**	**31**	**0**	**101**	**448**
05:45 PM	**50**	**59**	**5**	**0**	**114**	**14**	**121**	**22**	**0**	**157**	10	82	45	0	137	3	77	34	0	114	**522**
Total Volume	164	230	18	0	412	47	408	82	0	537	46	316	164	0	526	11	315	136	0	462	1937
% App. Total	39.8	55.8	4.4	0		8.8	76	15.3	0		8.7	60.1	31.2	0		2.4	68.2	29.4	0		
PHF	.820	.871	.643	.000	.873	.839	.843	.854	.000	.855	.719	.919	.804	.000	.901	.550	.926	.919	.000	.931	.928
Cars	157	218	17	0	392	44	396	79	0	519	40	306	158	0	504	11	303	127	0	441	1856
% Cars	95.7	94.8	94.4	0	95.1	93.6	97.1	96.3	0	96.6	87.0	96.8	96.3	0	95.8	100	96.2	93.4	0	95.5	95.8
Heavy Vehicles	7	12	1	0	20	3	12	3	0	18	6	10	6	0	22	0	12	9	0	21	81
% Heavy Vehicles	4.3	5.2	5.6	0	4.9	6.4	2.9	3.7	0	3.4	13.0	3.2	3.7	0	4.2	0	3.8	6.6	0	4.5	4.2



S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 G
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	81	5	0	4	0	0	3	52	0	145
07:15 AM	95	3	0	1	1	0	1	74	0	175
07:30 AM	88	1	0	2	1	0	1	65	0	158
07:45 AM	80	2	0	2	1	0	4	106	0	195
Total	344	11	0	9	3	0	9	297	0	673
08:00 AM	110	4	0	8	2	0	1	101	0	226
08:15 AM	119	6	0	4	3	0	2	93	0	227
08:30 AM	110	11	0	7	0	0	3	94	0	225
08:45 AM	115	8	0	7	2	0	3	112	0	247
Total	454	29	0	26	7	0	9	400	0	925
Grand Total	798	40	0	35	10	0	18	697	0	1598
Apprch %	95.2	4.8	0	77.8	22.2	0	2.5	97.5	0	
Total %	49.9	2.5	0	2.2	0.6	0	1.1	43.6	0	
Cars	741	40	0	34	9	0	17	639	0	1480
% Cars	92.9	100	0	97.1	90	0	94.4	91.7	0	92.6
Heavy Vehicles	57	0	0	1	1	0	1	58	0	118
% Heavy Vehicles	7.1	0	0	2.9	10	0	5.6	8.3	0	7.4

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
08:00 AM	110	4	0	114	**8**	2	0	**10**	1	101	0	102	226
08:15 AM	**119**	6	0	**125**	4	**3**	0	7	2	93	0	95	227
08:30 AM	110	**11**							**3**	94	0	97	225
08:45 AM	115	8	0	123	7	2	0	9	3	**112**		**115**	**247**
Total Volume	454	29	0	483	26	7	0	33	9	400	0	409	925
% App. Total	94	6	0		78.8	21.2	0		2.2	97.8	0		
PHF	.954	.659	.000	.966	.813	.583	.000	.825	.750	.893	.000	.889	.936
Cars	429	29	0	458	25	6	0	31	9	374	0	383	872
% Cars	94.5	100	0	94.8	96.2	85.7	0	93.9	100	93.5	0	93.6	94.3
Heavy Vehicles	25	0	0	25	1	1	0	2	0	26	0	26	53
% Heavy Vehicles	5.5	0	0	5.2	3.8	14.3	0	6.1	0	6.5	0	6.4	5.7

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 G
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	73	5	0	4	0	0	3	43	0	128
07:15 AM	87	3	0	1	1	0	1	65	0	158
07:30 AM	78	1	0	2	1	0	1	62	0	145
07:45 AM	74	2	0	2	1	0	3	95	0	177
Total	312	11	0	9	3	0	8	265	0	608
08:00 AM	107	4	0	8	2	0	1	96	0	218
08:15 AM	109	6	0	4	2	0	2	88	0	211
08:30 AM	106	11	0	6	0	0	3	89	0	215
08:45 AM	107	8	0	7	2	0	3	101	0	228
Total	429	29	0	25	6	0	9	374	0	872
Grand Total	741	40	0	34	9	0	17	639	0	1480
Apprch %	94.9	5.1	0	79.1	20.9	0	2.6	97.4	0	
Total %	50.1	2.7	0	2.3	0.6	0	1.1	43.2	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
08:00 AM	107	4	0	111	**8**	**2**	0	**10**	1	96	0	97	218
08:15 AM	**109**	6	0	115	4	2	0	6	2	88	0	90	211
08:30 AM	106	**11**		**117**	6	0	0	6	**3**	89	0	92	215
08:45 AM	107	8	0	115	7	2	0	9	3	**101**		**104**	**228**
Total Volume	429	29	0	458	25	6	0	31	9	374	0	383	872
% App. Total	93.7	6.3	0		80.6	19.4	0		2.3	97.7	0		
PHF	.984	.659	.000	.979	.781	.750	.000	.775	.750	.926	.000	.921	.956

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 G
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	8	0	0	0	0	0	0	9	0	17
07:15 AM	8	0	0	0	0	0	0	9	0	17
07:30 AM	10	0	0	0	0	0	0	3	0	13
07:45 AM	6	0	0	0	0	0	1	11	0	18
Total	32	0	0	0	0	0	1	32	0	65
08:00 AM	3	0	0	0	0	0	0	5	0	8
08:15 AM	10	0	0	0	1	0	0	5	0	16
08:30 AM	4	0	0	1	0	0	0	5	0	10
08:45 AM	8	0	0	0	0	0	0	11	0	19
Total	25	0	0	1	1	0	0	26	0	53
Grand Total	57	0	0	1	1	0	1	58	0	118
Apprch %	100	0	0	50	50	0	1.7	98.3	0	
Total %	48.3	0	0	0.8	0.8	0	0.8	49.2	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:00 AM

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	8	0	0	8	0	0	0	0	0	9	0	9	17
07:15 AM	8	0	0	8	0	0	0	0	0	9	0	9	17
07:30 AM	**10**	0	0	**10**	0	0	0	0	0	3	0	3	13
07:45 AM	6	0	0	6	0	0	0	0	**1**	**11**		**12**	**18**
Total Volume	32	0	0	32	0	0	0	0	1	32	0	33	65
% App. Total	100	0	0		0	0	0		3	97	0		
PHF	.800	.000	.000	.800	.000	.000	.000	.000	.250	.727	.000	.688	.903

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 G
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	0	0	0	3	0	2	3	8
07:15 AM	0	0	0	0	0	4	0	7	0	11
07:30 AM	2	0	0	0	0	3	0	6	1	12
07:45 AM	5	0	1	2	0	4	0	4	2	18
Total	7	0	1	2	0	14	0	19	6	49
08:00 AM	1	0	0	1	0	2	0	7	1	12
08:15 AM	5	0	1	0	0	2	0	7	2	17
08:30 AM	6	1	0	2	0	3	0	5	1	18
08:45 AM	4	0	2	3	0	3	0	10	3	25
Total	16	1	3	6	0	10	0	29	7	72
Grand Total	23	1	4	8	0	24	0	48	13	121
Apprch %	82.1	3.6	14.3	25	0	75	0	78.7	21.3	
Total %	19	0.8	3.3	6.6	0	19.8	0	39.7	10.7	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

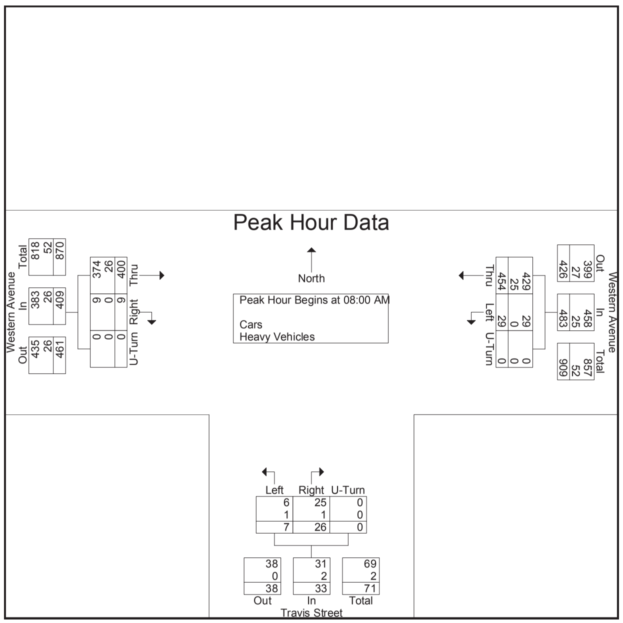
	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
08:00 AM	1	0	0	1	1	0	2	3	0	7	1	8	12
08:15 AM	5	0	1	6	0	0	2	2	0	7	2	9	17
08:30 AM	**6**	**1**	**0**	**7**	2	0	**3**	5	0	5	1	6	18
08:45 AM	4	0	**2**		**3**	0	3	**6**	0	**10**	**3**	**13**	**25**
Total Volume	16	1	3	20	6	0	10	16	0	29	7	36	72
% App. Total	80	5	15		37.5	0	62.5		0	80.6	19.4		
PHF	.667	.250	.375	.714	.500	.000	.833	.667	.000	.725	.583	.692	.720

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 G
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	110	4	0	114	**8**	2	0	**10**	1	101	0	102	226
08:15 AM	**119**	6	0	**125**	4	**3**	0	7	2	93	0	95	227
08:30 AM	110	**11**							**3**	94	0	97	225
08:45 AM	115	8	0	123	7	2	0	9	3	**112**		**115**	**247**
Total Volume	454	29	0	483	26	7	0	33	9	400	0	409	925
% App. Total	94	6	0		78.8	21.2	0		2.2	97.8	0		
PHF	.954	.659	.000	.966	.813	.583	.000	.825	.750	.893	.000	.889	.936
Cars	429	29	0	458	25	6	0	31	9	374	0	383	872
% Cars	94.5	100	0	94.8	96.2	85.7	0	93.9	100	93.5	0	93.6	94.3
Heavy Vehicles	25	0	0	25	1	1	0	2	0	26	0	26	53
% Heavy Vehicles	5.5	0	0	5.2	3.8	14.3	0	6.1	0	6.5	0	6.4	5.7



S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 GG
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	112	2	0	2	2	1	2	80	0	201
04:15 PM	105	0	0	1	0	0	1	64	0	171
04:30 PM	113	3	0	3	0	0	1	70	0	190
04:45 PM	116	5	0	5	2	0	0	83	0	211
Total	446	10	0	11	4	1	4	297	0	773
05:00 PM	138	2	0	3	2	0	0	100	1	246
05:15 PM	122	5	0	3	1	0	0	103	0	234
05:30 PM	133	8	0	4	3	0	1	84	0	233
05:45 PM	151	4	1	6	1	0	0	88	0	251
Total	544	19	1	16	7	0	1	375	1	964
Grand Total	990	29	1	27	11	1	5	672	1	1737
Apprch %	97.1	2.8	0.1	69.2	28.2	2.6	0.7	99.1	0.1	
Total %	57	1.7	0.1	1.6	0.6	0.1	0.3	38.7	0.1	
Cars	958	29	1	25	11	1	5	639	1	1670
% Cars	96.8	100	100	92.6	100	100	100	95.1	100	96.1
Heavy Vehicles	32	0	0	2	0	0	0	33	0	67
% Heavy Vehicles	3.2	0	0	7.4	0	0	0	4.9	0	3.9

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	138	2	0	140	3	2	0	5	0	100	**1**	**101**	**246**
05:15 PM	**122**	**5**	**0**	**127**	**3**	**1**	**0**	**4**	**0**	**103**	**0**	**103**	234
05:30 PM	133	**8**				**3**	0	**7**	**1**	84	0	85	233
05:45 PM	**151**	4	**1**	**156**	**6**	1	0	7	0	88	0	88	**251**
Total Volume	544	19	1	564	16	7	0	23	1	375	1	377	964
% App. Total	96.5	3.4	0.2		69.6	30.4	0		0.3	99.5	0.3		
PHF	.901	.594	.250	.904	.667	.583	.000	.821	.250	.910	.250	.915	.960
Cars	525	19	1	545	15	7	0	22	1	353	1	355	922
% Cars	96.5	100	100	96.6	93.8	100	0	95.7	100	94.1	100	94.2	95.6
Heavy Vehicles	19	0	0	19	1	0	0	1	0	22	0	22	42
% Heavy Vehicles	3.5	0	0	3.4	6.3	0	0	4.3	0	5.9	0	5.8	4.4

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 GG
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	108	2	0	2	2	1	2	76	0	193
04:15 PM	100	0	0	1	0	0	1	60	0	162
04:30 PM	111	3	0	2	0	0	1	70	0	187
04:45 PM	114	5	0	5	2	0	0	80	0	206
Total	433	10	0	10	4	1	4	286	0	748
05:00 PM	135	2	0	3	2	0	0	95	1	238
05:15 PM	119	5	0	3	1	0	0	100	0	228
05:30 PM	126	8	0	4	3	0	1	77	0	219
05:45 PM	145	4	1	5	1	0	0	81	0	237
Total	525	19	1	15	7	0	1	353	1	922
Grand Total	958	29	1	25	11	1	5	639	1	1670
Apprch %	97	2.9	0.1	67.6	29.7	2.7	0.8	99.1	0.2	
Total %	57.4	1.7	0.1	1.5	0.7	0.1	0.3	38.3	0.1	

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	135	2	0	137	3	2	0	5	0	95	**1**	**96**	**238**
05:15 PM	119	5	0	124	3	1	0	4	0	**100**		**100**	228
05:30 PM	126	**8**				**3**	0	**7**	**1**	77	0	78	219
05:45 PM	**145**	4	**1**	**150**	**5**	1	0	6	0	81	0	81	237
Total Volume	525	19	1	545	15	7	0	22	1	353	1	355	922
% App. Total	96.3	3.5	0.2		68.2	31.8	0		0.3	99.4	0.3		
PHF	.905	.594	.250	.908	.750	.583	.000	.786	.250	.883	.250	.888	.968

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 GG
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	4	0	0	0	0	0	0	4	0	8
04:15 PM	5	0	0	0	0	0	0	4	0	9
04:30 PM	2	0	0	1	0	0	0	0	0	3
04:45 PM	2	0	0	0	0	0	0	3	0	5
Total	13	0	0	1	0	0	0	11	0	25
05:00 PM	3	0	0	0	0	0	0	5	0	8
05:15 PM	3	0	0	0	0	0	0	3	0	6
05:30 PM	7	0	0	0	0	0	0	7	0	14
05:45 PM	6	0	0	1	0	0	0	7	0	14
Total	19	0	0	1	0	0	0	22	0	42
Grand Total	32	0	0	2	0	0	0	33	0	67
Apprch %	100	0	0	100	0	0	0	100	0	
Total %	47.8	0	0	3	0	0	0	49.3	0	

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	3	0	0	3	0	0	0	0	0	5	0	5	8
05:15 PM	3	0	0	3	0	0	0	0	0	3	0	3	6
05:30 PM	**7**	0	0	**7**	0	0	0	0	0	**7**	**0**	**7**	**14**
05:45 PM	6	0	0	6	**1**	0	0	**1**	0	7	0	7	14
Total Volume	19	0	0	19	1	0	0	1	0	22	0	22	42
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.679	.000	.000	.679	.250	.000	.000	.250	.000	.786	.000	.786	.750

S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 GG
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Western Avenue From East			Travis Street From South			Western Avenue From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
04:00 PM	4	1	0	0	0	4	0	0	0	9
04:15 PM	0	0	0	0	0	2	0	1	2	5
04:30 PM	1	2	0	1	0	0	0	1	1	6
04:45 PM	2	0	2	0	0	3	0	1	3	11
Total	7	3	2	1	0	9	0	3	6	31
05:00 PM	4	0	0	0	0	1	0	2	5	12
05:15 PM	4	3	0	0	0	2	0	6	6	21
05:30 PM	8	1	0	1	0	0	0	4	4	18
05:45 PM	6	2	0	0	0	0	0	5	5	18
Total	22	6	0	1	0	3	0	17	20	69
Grand Total	29	9	2	2	0	12	0	20	26	100
Apprch %	72.5	22.5	5	14.3	0	85.7	0	43.5	56.5	
Total %	29	9	2	2	0	12	0	20	26	

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	4	0	0	4	0	0	1	1	0	2	5	7	12
05:15 PM	4	**3**	**0**	**7**	**0**	**0**	**2**	**2**	0	**6**	**6**	**12**	**21**
05:30 PM	**8**	1	0	**9**	**1**	0	0	1	0	4	4	8	18
05:45 PM	6	2	0	8	0	0	0	0	0	5	5	10	18
Total Volume	22	6	0	28	1	0	3	4	0	17	20	37	69
% App. Total	78.6	21.4	0		25	0	75		0	45.9	54.1		
PHF	.688	.500	.000	.778	.250	.000	.375	.500	.000	.708	.833	.771	.821

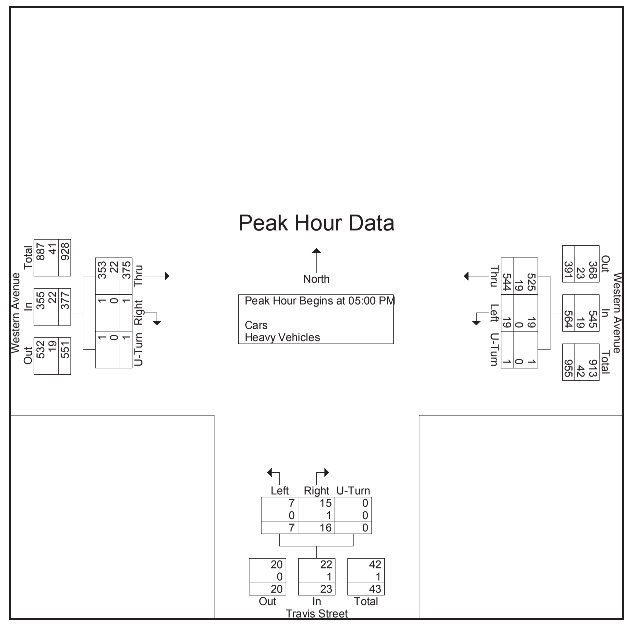
S: Travis Street
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 GG
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	Western Avenue From East				Travis Street From South				Western Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	138	2	0	140	3	2	0	5	0	100	**1**	**101**	**246**
05:15 PM	**122**	**5**	**0**	**127**	**3**	**1**	**0**	**4**	**0**	**103**	**0**	**103**	234
05:30 PM	133	**8**				**3**	0	**7**	**1**	84	0	85	233
05:45 PM	**151**	4	**1**	**156**	**6**	1	0	7	0	88	0	88	**251**
Total Volume	544	19	1	564	16	7	0	23	1	375	1	377	964
% App. Total	96.5	3.4	0.2		69.6	30.4	0		0.3	99.5	0.3		
PHF	.901	.594	.250	.904	.667	.583	.000	.821	.250	.910	.250	.915	.960
Cars	525	19	1	545	15	7	0	22	1	353	1	355	922
% Cars	96.5	100	100	96.6	93.8	100	0	95.7	100	94.1	100	94.2	95.6
Heavy Vehicles	19	0	0	19	1	0	0	1	0	22	0	22	42
% Heavy Vehicles	3.5	0	0	3.4	6.3	0	0	4.3	0	5.9	0	5.8	4.4



N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 H
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	2	0	3	0	10	63	10	0	20	6	9	0	4	57	4	0	188
07:15 AM	0	0	0	0	8	88	12	0	21	12	8	0	6	61	1	0	217
07:30 AM	0	2	4	0	11	76	2	0	36	12	10	0	5	67	7	0	232
07:45 AM	1	0	4	0	18	75	4	0	22	16	9	0	6	89	13	0	257
Total	3	2	11	0	47	302	28	0	99	46	36	0	21	274	25	0	894
08:00 AM	4	0	7	0	13	95	9	0	49	16	9	0	3	85	12	0	302
08:15 AM	7	1	4	0	12	106	8	0	46	16	5	0	8	98	15	0	326
08:30 AM	4	0	6	0	17	93	6	0	41	23	5	0	5	100	16	0	316
08:45 AM	5	3	6	0	20	91	9	0	28	15	4	0	5	76	15	0	277
Total	20	4	23	0	62	385	32	0	164	70	23	0	21	359	58	0	1221
Grand Total	23	6	34	0	109	687	60	0	263	116	59	0	42	633	83	0	2115
Apprch %	36.5	9.5	54	0	12.7	80.3	7	0	60	26.5	13.5	0	5.5	83.5	10.9	0	
Total %	1.1	0.3	1.6	0	5.2	32.5	2.8	0	12.4	5.5	2.8	0	2	29.9	3.9	0	
Cars	23	5	30	0	98	626	40	0	235	116	51	0	35	573	80	0	1912
% Cars	100	83.3	88.2	0	89.9	91.1	66.7	0	89.4	100	86.4	0	83.3	90.5	96.4	0	90.4
Heavy Vehicles	0	1	4	0	11	61	20	0	28	0	8	0	7	60	3	0	203
% Heavy Vehicles	0	16.7	11.8	0	10.1	8.9	33.3	0	10.6	0	13.6	0	16.7	9.5	3.6	0	9.6

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	4	0	**7**	0	11	13	95	**9**	0	117	**49**	16	**9**	0	**74**	3	85	12	0	100	302
08:15 AM	**7**	1	4	0	12	12	**106**	8	0	**126**	46	16	5	0	67	**8**	98	15	0	**121**	**326**
08:30 AM	4	0	6	0	10	17	93	6	0	116	41	**23**	5	0	69	5	**100**	**16**	0	121	316
08:45 AM	5	**3**	6	0	**14**	**20**	91	9	0	120	28	15	4	0	47	5	76	15	0	96	277
Total Volume	20	4	23	0	47	62	385	32	0	479	164	70	23	0	257	21	359	58	0	438	1221
% App. Total	42.6	8.5	48.9	0		12.9	80.4	6.7	0		63.8	27.2	8.9	0		4.8	82	13.2	0		
PHF	.714	.333	.821	.000	.839	.775	.908	.889	.000	.950	.837	.761	.639	.000	.868	.656	.898	.906	.000	.905	.936
Cars	20	4	21	0	45	55	358	19	0	432	150	70	22	0	242	18	328	56	0	402	1121
% Cars	100	100	91.3	0	95.7	88.7	93.0	59.4	0	90.2	91.5	100	95.7	0	94.2	85.7	91.4	96.6	0	91.8	91.8
Heavy Vehicles																					
% Heavy Vehicles	0	0	8.7	0	4.3	11.3	7.0	40.6	0	9.8	8.5	0	4.3	0	5.8	14.3	8.6	3.4	0	8.2	8.2

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 H
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Cars

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	2	0	2	0	10	54	10	0	14	6	5	0	4	50	4	0	161
07:15 AM	0	0	0	0	6	77	9	0	20	12	8	0	5	56	1	0	194
07:30 AM	0	1	4	0	10	70	1	0	29	12	8	0	4	61	7	0	207
07:45 AM	1	0	3	0	17	67	1	0	22	16	8	0	4	78	12	0	229
Total	3	1	9	0	43	268	21	0	85	46	29	0	17	245	24	0	791
08:00 AM	4	0	6	0	10	88	7	0	44	16	8	0	3	78	12	0	276
08:15 AM	7	1	3	0	11	100	3	0	43	16	5	0	8	91	14	0	302
08:30 AM	4	0	6	0	15	86	4	0	36	23	5	0	5	93	16	0	293
08:45 AM	5	3	6	0	19	84	5	0	27	15	4	0	2	66	14	0	250
Total	20	4	21	0	55	358	19	0	150	70	22	0	18	328	56	0	1121
Grand Total	23	5	30	0	98	626	40	0	235	116	51	0	35	573	80	0	1912
Apprch %	39.7	8.6	51.7	0	12.8	81.9	5.2	0	58.5	28.9	12.7	0	5.1	83.3	11.6	0	
Total %	1.2	0.3	1.6	0	5.1	32.7	2.1	0	12.3	6.1	2.7	0	1.8	30	4.2	0	

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	4	0	**6**	0	10	10	88	**7**	0	105	**44**	16	**8**	0	**68**	3	78	12	0	93	276
08:15 AM	**7**	1	3	0	11	11	**100**	3	0	**114**	43	16	5	0	64	**8**	91	14	0	113	**302**
08:30 AM	4	0	6	0	10	15	86	4	0	105	36	**23**	5	0	64	5	**93**	**16**	0	**114**	293
08:45 AM	5	**3**	6	0	**14**	**19**	84	5	0	108	27	15	4	0	46	2	66	14	0	82	250
Total Volume	20	4	21	0	45	55	358	19	0	432	150	70	22	0	242	18	328	56	0	402	1121
% App. Total	44.4	8.9	46.7	0		12.7	82.9	4.4	0		62	28.9	9.1	0		4.5	81.6	13.9	0		
PHF	.714	.333	.875	.000	.804	.724	.895	.679	.000	.947	.852	.761	.688	.000	.890	.563	.882	.875	.000	.882	.928

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 H
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	0	1	0	0	9	0	0	6	0	4	0	0	7	0	0	27
07:15 AM	0	0	0	0	2	11	3	0	1	0	0	0	1	5	0	0	23
07:30 AM	0	1	0	0	1	6	1	0	7	0	2	0	1	6	0	0	25
07:45 AM	0	0	1	0	1	8	3	0	0	0	1	0	2	11	1	0	28
Total	0	1	2	0	4	34	7	0	14	0	7	0	4	29	1	0	103
08:00 AM	0	0	1	0	3	7	2	0	5	0	1	0	0	7	0	0	26
08:15 AM	0	0	1	0	1	6	5	0	3	0	0	0	0	7	1	0	24
08:30 AM	0	0	0	0	2	7	2	0	5	0	0	0	0	7	0	0	23
08:45 AM	0	0	0	0	1	7	4	0	1	0	0	0	3	10	1	0	27
Total	0	0	2	0	7	27	13	0	14	0	1	0	3	31	2	0	100
Grand Total	0	1	4	0	11	61	20	0	28	0	8	0	7	60	3	0	203
Apprch %	0	20	80	0	12	66.3	21.7	0	77.8	0	22.2	0	10	85.7	4.3	0	
Total %	0	0.5	2	0	5.4	30	9.9	0	13.8	0	3.9	0	3.4	29.6	1.5	0	

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	**1**	0	**1**	0	9	0	0	9	6	0	**4**	0	**10**	0	7	0	0	7	27
07:15 AM	0	0	0	0	0	**2**	**11**	**3**	0	**16**	1	0	0	0	1	1	5	0	0	6	23
07:30 AM	0	**1**	0	0	1	1	6	1	0	8	**7**	0	2	0	9	1	6	0	0	7	25
07:45 AM	0	0	1	0	1	1	8	3	0	12	0	0	1	0	1	**2**	**11**	**1**	0	**14**	**28**
Total Volume	0	1	2	0	3	4	34	7	0	45	14	0	7	0	21	4	29	1	0	34	103
% App. Total	0	33.3	66.7	0		8.9	75.6	15.6	0		66.7	0	33.3	0		11.8	85.3	2.9	0		
PHF	.000	.250	.500	.000	.750	.500	.773	.583	.000	.703	.500	.000	.438	.000	.525	.500	.659	.250	.000	.607	.920

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 H
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	2	0	1	0	0	0	0	0	1	0	2	0	0	6
07:15 AM	0	0	0	2	1	0	1	0	0	0	0	7	0	9	0	1	21
07:30 AM	0	0	0	4	0	3	0	0	0	0	0	2	0	8	0	2	19
07:45 AM	0	0	0	4	0	1	0	0	0	0	0	8	0	11	0	1	25
Total	0	0	0	12	1	5	1	0	0	0	0	18	0	30	0	4	71
08:00 AM	0	0	0	4	1	3	0	0	1	0	0	11	0	8	1	1	30
08:15 AM	0	0	0	5	0	3	1	0	1	0	0	3	0	7	0	1	21
08:30 AM	0	0	0	1	0	2	0	0	1	0	0	3	0	10	0	1	18
08:45 AM	0	0	0	7	0	4	0	1	1	0	0	5	0	8	0	0	26
Total	0	0	0	17	1	12	1	1	4	0	0	22	0	33	1	3	95
Grand Total	0	0	0	29	2	17	2	1	4	0	0	40	0	63	1	7	166
Apprch %	0	0	0	100	9.1	77.3	9.1	4.5	9.1	0	0	90.9	0	88.7	1.4	9.9	
Total %	0	0	0	17.5	1.2	10.2	1.2	0.6	2.4	0	0	24.1	0	38	0.6	4.2	

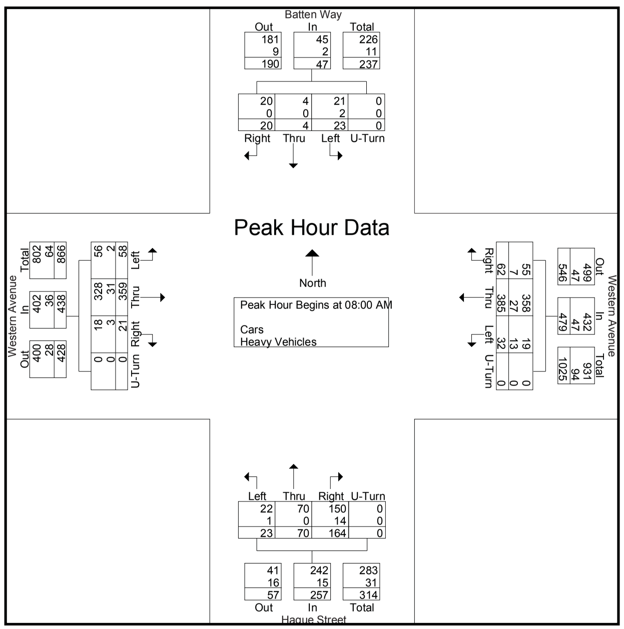
	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	2	2	**1**	0	**1**	0	2	0	0	0	7	7	0	9	0	1	10	21
07:30 AM	0	0	0	**4**	**4**	0	**3**	0	0	3	0	0	0	2	2	0	8	0	**2**	10	19
07:45 AM	0	0	0	4	4	0	1	0	0	1	0	0	0	8	8	0	**11**	0	1	**12**	25
08:00 AM	0	0	0	4	4	1	3	0	0	**4**	**1**	0	0	**11**	**12**	0	8	**1**	1	10	**30**
Total Volume	0	0	0	14	14	2	7	1	0	10	1	0	0	28	29	0	36	1	5	42	95
% App. Total	0	0	0	100		20	70	10	0		3.4	0	0	96.6		0	85.7	2.4	11.9		
PHF	.000	.000	.000	.875	.875	.500	.583	.250	.000	.625	.250	.000	.000	.636	.604	.000	.818	.250	.625	.875	.792

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 H
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	4	0	**7**	0	11	13	95	**9**	0	117	**49**	16	**9**	0	**74**	3	85	12	0	100	302
08:15 AM	**7**	1	4	0	12	12	**106**	8	0	**126**	46	16	5	0	67	**8**	98	15	0	**121**	**326**
08:30 AM	4	0	6	0	10	17	93	6	0	116	41	**23**	5	0	69	5	**100**	**16**	0	121	316
08:45 AM	5	**3**	6	0	**14**	**20**	91	9	0	120	28	15	4	0	47	5	76	15	0	96	277
Total Volume	20	4	23	0	47	62	385	32	0	479	164	70	23	0	257	21	359	58	0	438	1221
% App. Total	42.6	8.5	48.9	0		12.9	80.4	6.7	0		63.8	27.2	8.9	0		4.8	82	13.2	0		
PHF	.714	.333	.821	.000	.839	.775	.908	.889	.000	.950	.837	.761	.639	.000	.868	.656	.898	.906	.000	.905	.936
Cars	20	4	21	0	45	55	358	19	0	432	150	70	22	0	242	18	328	56	0	402	1121
% Cars	100	100	91.3	0	95.7	88.7	93.0	59.4	0	90.2	91.5	100	95.7	0	94.2	85.7	91.4	96.6	0	91.8	91.8
Heavy Vehicles																					
% Heavy Vehicles	0	0	8.7	0	4.3	11.3	7.0	40.6	0	9.8	8.5	0	4.3	0	5.8	14.3	8.6	3.4	0	8.2	8.2



N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 HH
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	6	1	16	0	6	95	5	0	17	2	7	0	2	59	4	0	220
04:15 PM	4	2	4	0	9	102	10	0	7	0	6	0	1	63	2	0	210
04:30 PM	7	0	7	0	3	99	2	0	10	5	9	0	3	78	2	0	225
04:45 PM	5	0	9	0	5	100	8	0	13	3	6	0	2	90	3	0	244
Total	22	3	36	0	23	396	25	0	47	10	28	0	8	290	11	0	899
05:00 PM	13	0	21	0	11	100	13	0	30	7	8	0	3	92	7	1	306
05:15 PM	15	1	10	0	8	98	8	0	16	7	12	0	3	86	6	0	270
05:30 PM	12	0	7	0	5	120	5	1	24	7	19	0	3	61	1	0	265
05:45 PM	11	0	12	0	9	118	7	0	16	3	17	0	0	80	5	0	278
Total	51	1	50	0	33	436	33	1	86	24	56	0	9	319	19	1	1119
Grand Total	73	4	86	0	56	832	58	1	133	34	84	0	17	609	30	1	2018
Apprch %	44.8	2.5	52.8	0	5.9	87.9	6.1	0.1	53	13.5	33.5	0	2.6	92.7	4.6	0.2	
Total %	3.6	0.2	4.3	0	2.8	41.2	2.9	0	6.6	1.7	4.2	0	0.8	30.2	1.5	0	
Cars	72	3	85	0	47	801	38	1	112	34	83	0	11	580	27	1	1895
% Cars	98.6	75	98.8	0	83.9	96.3	65.5	100	84.2	100	98.8	0	64.7	95.2	90	100	93.9
Heavy Vehicles	1	1	1	0	9	31	20	0	21	0	1	0	6	29	3	0	123
% Heavy Vehicles	1.4	25	1.2	0	16.1	3.7	34.5	0	15.8	0	1.2	0	35.3	4.8	10	0	6.1

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	13	0	**21**	0	**34**	**11**	100	**13**	0	124	**30**	**7**	8	0	45	**3**	**92**	**7**	**1**	**103**	**306**
05:15 PM	**15**	**1**	10	0	26	8	98	8	0	114	16	7	12	0	35	3	86	6	0	95	270
05:30 PM	12	0	7	0	19	5	**120**	5	**1**	131	24	7	**19**	0	**50**	3	61	1	0	65	265
05:45 PM	11	0	12	0	23	9	118	7	0	**134**	16	3	17	0	36	0	80	5	0	85	278
Total Volume	51	1	50	0	102	33	436	33	1	503	86	24	56	0	166	9	319	19	1	348	1119
% App. Total	50	1	49	0		6.6	86.7	6.6	0.2		51.8	14.5	33.7	0		2.6	91.7	5.5	0.3		
PHF	.850	.250	.595	.000	.750	.750	.908	.635	.250	.938	.717	.857	.737	.000	.830	.750	.867	.679	.250	.845	.914
Cars	50	1	50	0	101	29	423	25	1	478	74	24	56	0	154	7	307	19	1	334	1067
% Cars	98.0	100	100	0	99.0	87.9	97.0	75.8	100	95.0	86.0	100	100	0	92.8	77.8	96.2	100	100	96.0	95.4
Heavy Vehicles																					
% Heavy Vehicles	2.0	0	0	0	1.0	12.1	3.0	24.2	0	5.0	14.0	0	0	0	7.2	22.2	3.8	0	0	4.0	4.6

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 HH
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Cars

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	6	1	16	0	5	92	3	0	12	2	7	0	2	54	3	0	203
04:15 PM	4	1	4	0	8	95	6	0	6	0	5	0	0	60	2	0	191
04:30 PM	7	0	7	0	2	95	0	0	7	5	9	0	1	76	2	0	211
04:45 PM	5	0	8	0	3	96	4	0	13	3	6	0	1	83	1	0	223
Total	22	2	35	0	18	378	13	0	38	10	27	0	4	273	8	0	828
05:00 PM	13	0	21	0	10	98	10	0	27	7	8	0	1	88	7	1	291
05:15 PM	14	1	10	0	7	94	8	0	11	7	12	0	3	83	6	0	256
05:30 PM	12	0	7	0	4	115	4	1	21	7	19	0	3	59	1	0	253
05:45 PM	11	0	12	0	8	116	3	0	15	3	17	0	0	77	5	0	267
Total	50	1	50	0	29	423	25	1	74	24	56	0	7	307	19	1	1067
Grand Total	72	3	85	0	47	801	38	1	112	34	83	0	11	580	27	1	1895
Apprch %	45	1.9	53.1	0	5.3	90.3	4.3	0.1	48.9	14.8	36.2	0	1.8	93.7	4.4	0.2	
Total %	3.8	0.2	4.5	0	2.5	42.3	2	0.1	5.9	1.8	4.4	0	0.6	30.6	1.4	0.1	

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	13	0	**21**	0	**34**	**10**	98	**10**	0	118	**27**	**7**	8	0	42	1	**88**	**7**	**1**	**97**	**291**
05:15 PM	**14**	**1**	10	0	25	7	94	8	0	109	11	7	12	0	30	**3**	83	6	0	92	256
05:30 PM	12	0	7	0	19	4	115	4	**1**	124	21	7	**19**	0	**47**	3	59	1	0	63	253
05:45 PM	11	0	12	0	23	8	**116**	3	0	**127**	15	3	17	0	35	0	77	5	0	82	267
Total Volume	50	1	50	0	101	29	423	25	1	478	74	24	56	0	154	7	307	19	1	334	1067
% App. Total	49.5	1	49.5	0		6.1	88.5	5.2	0.2		48.1	15.6	36.4	0		2.1	91.9	5.7	0.3		
PHF	.893	.250	.595	.000	.743	.725	.912	.625	.250	.941	.685	.857	.737	.000	.819	.583	.872	.679	.250	.861	.917

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 HH
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	0	0	0	1	3	2	0	5	0	0	0	0	5	1	0	17
04:15 PM	0	1	0	0	1	7	4	0	1	0	1	0	1	3	0	0	19
04:30 PM	0	0	0	0	1	4	2	0	3	0	0	0	2	2	0	0	14
04:45 PM	0	0	1	0	2	4	4	0	0	0	0	0	1	7	2	0	21
Total	0	1	1	0	5	18	12	0	9	0	1	0	4	17	3	0	71
05:00 PM	0	0	0	0	1	2	3	0	3	0	0	0	2	4	0	0	15
05:15 PM	1	0	0	0	1	4	0	0	5	0	0	0	0	3	0	0	14
05:30 PM	0	0	0	0	1	5	1	0	3	0	0	0	0	2	0	0	12
05:45 PM	0	0	0	0	1	2	4	0	1	0	0	0	0	3	0	0	11
Total	1	0	0	0	4	13	8	0	12	0	0	0	2	12	0	0	52
Grand Total	1	1	1	0	9	31	20	0	21	0	1	0	6	29	3	0	123
Apprch %	33.3	33.3	33.3	0	15	51.7	33.3	0	95.5	0	4.5	0	15.8	76.3	7.9	0	
Total %	0.8	0.8	0.8	0	7.3	25.2	16.3	0	17.1	0	0.8	0	4.9	23.6	2.4	0	

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	1	3	2	0	6	**5**	0	0	0	**5**	0	5	1	0	6	17
04:15 PM	0	**1**	0	0	**1**	1	**7**	**4**	0	**12**	1	0	**1**	0	2	1	3	0	0	4	19
04:30 PM	0	0	0	0	0	1	4	2	0	7	3	0	0	0	3	**2**	2	0	0	4	14
04:45 PM	0	0	**1**	0	1	**2**	4	4	0	10	0	0	0	0	0	1	**7**	**2**	0	**10**	**21**
Total Volume	0	1	1	0	2	5	18	12	0	35	9	0	1	0	10	4	17	3	0	24	71
% App. Total	0	50	50	0		14.3	51.4	34.3	0		90	0	10	0		16.7	70.8	12.5	0		
PHF	.000	.250	.250	.000	.500	.625	.643	.750	.000	.729	.450	.000	.250	.000	.500	.500	.607	.375	.000	.600	.845

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 HH
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

Groups Printed- Peds and Bicycles

	Batten Way From North				Western Avenue From East				Hague Street From South				Western Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	1	0	1	5	0	7	0	0	0	0	0	6	0	2	1	1	24
04:15 PM	0	0	0	7	0	9	0	0	0	0	0	3	0	1	0	1	21
04:30 PM	0	0	0	5	0	6	0	0	0	0	0	9	0	0	0	3	23
04:45 PM	0	0	0	4	0	6	0	0	0	0	0	4	0	1	0	0	15
Total	1	0	1	21	0	28	0	0	0	0	0	22	0	4	1	5	83
05:00 PM	0	0	0	7	1	4	0	0	1	0	0	5	0	2	0	0	20
05:15 PM	0	2	0	5	0	16	2	0	1	0	0	6	0	4	0	1	37
05:30 PM	0	0	1	6	0	16	2	0	0	0	0	9	0	8	0	1	43
05:45 PM	0	0	0	3	1	10	0	0	0	2	0	9	0	2	0	2	29
Total	0	2	1	21	2	46	4	0	2	2	0	29	0	16	0	4	129
Grand Total	1	2	2	42	2	74	4	0	2	2	0	51	0	20	1	9	212
Apprch %	2.1	4.3	4.3	89.4	2.5	92.5	5	0	3.6	3.6	0	92.7	0	66.7	3.3	30	
Total %	0.5	0.9	0.9	19.8	0.9	34.9	1.9	0	0.9	0.9	0	24.1	0	9.4	0.5	4.2	

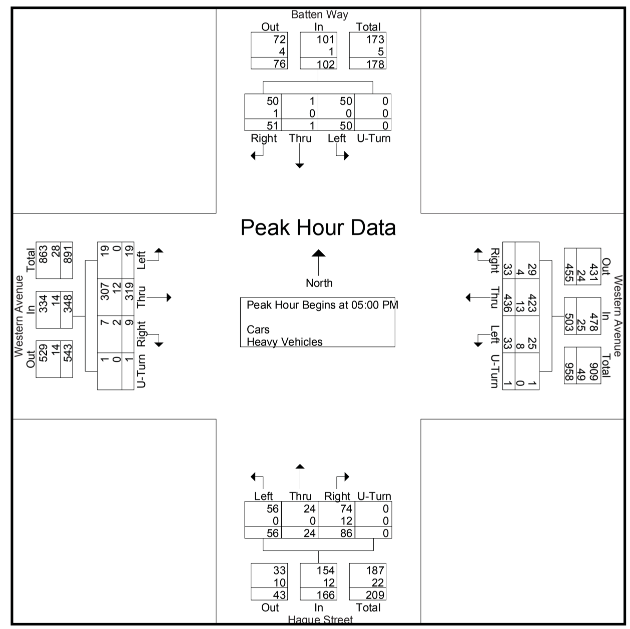
	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	**7**	**7**	**1**	4	0	0	5	**1**	0	0	5	6	0	2	0	0	2	20
05:15 PM	0	**2**	0	5	7	0	**16**	**2**	0	**18**	1	0	0	6	7	0	4	0	1	5	37
05:30 PM	0	0	**1**	6	7	0	16	2	0	18	0	0	0	**9**	9	0	**8**	0	1	**9**	**43**
05:45 PM	0	0	0	3	3	1	10	0	0	11	0	**2**	0	9	**11**	0	2	0	**2**	4	29
Total Volume	0	2	1	21	24	2	46	4	0	52	2	2	0	29	33	0	16	0	4	20	129
% App. Total	0	8.3	4.2	87.5		3.8	88.5	7.7	0		6.1	6.1	0	87.9		0	80	0	20		
PHF	.000	.250	.250	.750	.857	.500	.719	.500	.000	.722	.500	.250	.000	.806	.750	.000	.500	.000	.500	.556	.750

N/S: Batten Way
E/W: Western Avenue
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 HH
Site Code : 10463.00
Start Date : 4/3/2012
Page No : 1

	Batten Way From North					Western Avenue From East					Hague Street From South					Western Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	13	0	**21**	0	**34**	**11**	100	**13**	0	124	**30**	**7**	8	0	45	**3**	**92**	**7**	**1**	**103**	**306**
05:15 PM	**15**	**1**	10	0	26	8	98	8	0	114	16	7	12	0	35	3	86	6	0	95	270
05:30 PM	12	0	7	0	19	5	**120**	5	**1**	131	24	7	**19**	0	**50**	3	61	1	0	65	265
05:45 PM	11	0	12	0	23	9	118	7	0	**134**	16	3	17	0	36	0	80	5	0	85	278
Total Volume	51	1	50	0	102	33	436	33	1	503	86	24	56	0	166	9	319	19	1	348	1119
% App. Total	50	1	49	0		6.6	86.7	6.6	0.2		51.8	14.5	33.7	0		2.6	91.7	5.5	0.3		
PHF	.850	.250	.595	.000	.750	.750	.908	.635	.250	.938	.717	.857	.737	.000	.830	.750	.867	.679	.250	.845	.914
Cars	50	1	50	0	101	29	423	25	1	478	74	24	56	0	154	7	307	19	1	334	1067
% Cars	98.0	100	100	0	99.0	87.9	97.0	75.8	100	95.0	86.0	100	100	0	92.8	77.8	96.2	100	100	96.0	95.4
Heavy Vehicles																					
% Heavy Vehicles	2.0	0	0	0	1.0	12.1	3.0	24.2	0	5.0	14.0	0	0	0	7.2	22.2	3.8	0	0	4.0	4.6



N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 P
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	82	10	0	5	2	0	0	77	0	176
07:15 AM	76	7	0	4	0	0	2	82	0	171
07:30 AM	79	10	0	12	0	0	2	103	0	206
07:45 AM	93	14	0	11	0	0	0	140	0	258
Total	330	41	0	32	2	0	4	402	0	811
08:00 AM	91	8	0	14	1	0	3	102	0	219
08:15 AM	92	19	1	18	1	0	4	130	0	265
08:30 AM	89	23	0	10	2	0	2	122	0	248
08:45 AM	113	18	0	13	3	0	2	139	0	288
Total	385	68	1	55	7	0	11	493	0	1020
Grand Total	715	109	1	87	9	0	15	895	0	1831
Apprch %	86.7	13.2	0.1	90.6	9.4	0	1.6	98.4	0	
Total %	39	6	0.1	4.8	0.5	0	0.8	48.9	0	
Cars	643	108	1	75	9	0	14	804	0	1654
% Cars	89.9	99.1	100	86.2	100	0	93.3	89.8	0	90.3
Heavy Vehicles	72	1	0	12	0	0	1	91	0	177
% Heavy Vehicles	10.1	0.9	0	13.8	0	0	6.7	10.2	0	9.7

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	91	8	0	99	14	1	0	15	3	102	0	105	219
08:15 AM	92	19	**1**	**112**	**18**	1	0	**19**	**4**	130	0	134	265
08:30 AM	89	**23**											
08:45 AM	**113**	18	0	**131**	13	**3**	0	16	2	**139**	**0**	**141**	**288**
Total Volume	385	68	1	454	55	7	0	62	11	493	0	504	1020
% App. Total	84.8	15	0.2		88.7	11.3	0		2.2	97.8	0		
PHF	.852	.739	.250	.866	.764	.583	.000	.816	.688	.887	.000	.894	.885
Cars	362	67	1	430	47	7	0	54	10	452	0	462	946
% Cars	94.0	98.5	100	94.7	85.5	100	0	87.1	90.9	91.7	0	91.7	92.7
Heavy Vehicles	23	1	0	24	8	0	0	8	1	41	0	42	74
% Heavy Vehicles	6.0	1.5	0	5.3	14.5	0	0	12.9	9.1	8.3	0	8.3	7.3

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 P
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	73	10	0	5	2	0	0	65	0	155
07:15 AM	63	7	0	3	0	0	2	68	0	143
07:30 AM	70	10	0	10	0	0	2	89	0	181
07:45 AM	75	14	0	10	0	0	0	130	0	229
Total	281	41	0	28	2	0	4	352	0	708
08:00 AM	86	8	0	11	1	0	2	98	0	206
08:15 AM	88	19	1	16	1	0	4	115	0	244
08:30 AM	82	22	0	8	2	0	2	111	0	227
08:45 AM	106	18	0	12	3	0	2	128	0	269
Total	362	67	1	47	7	0	10	452	0	946
Grand Total	643	108	1	75	9	0	14	804	0	1654
Apprch %	85.5	14.4	0.1	89.3	10.7	0	1.7	98.3	0	
Total %	38.9	6.5	0.1	4.5	0.5	0	0.8	48.6	0	

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	86	8	0	94	11	1	0	12	2	98	0	100	206
08:15 AM	88	19	**1**	**108**	**16**	1	0	**17**	**4**	115	0	119	244
08:30 AM	82	**22**											
08:45 AM	**106**	18	0	**124**	12	**3**	0	15	2	**128**	**0**	**130**	**269**
Total Volume	362	67	1	430	47	7	0	54	10	452	0	462	946
% App. Total	84.2	15.6	0.2		87	13	0		2.2	97.8	0		
PHF	.854	.761	.250	.867	.734	.583	.000	.794	.625	.883	.000	.888	.879

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 P
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	9	0	0	0	0	0	0	12	0	21
07:15 AM	13	0	0	1	0	0	0	14	0	28
07:30 AM	9	0	0	2	0	0	0	14	0	25
07:45 AM	18	0	0	1	0	0	0	10	0	29
Total	49	0	0	4	0	0	0	50	0	103
08:00 AM	5	0	0	3	0	0	1	4	0	13
08:15 AM	4	0	0	2	0	0	0	15	0	21
08:30 AM	7	1	0	2	0	0	0	11	0	21
08:45 AM	7	0	0	1	0	0	0	11	0	19
Total	23	1	0	8	0	0	1	41	0	74
Grand Total	72	1	0	12	0	0	1	91	0	177
Apprch %	98.6	1.4	0	100	0	0	1.1	98.9	0	
Total %	40.7	0.6	0	6.8	0	0	0.6	51.4	0	

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	9	0	0	9	0	0	0	0	0	12	0	12	21
07:15 AM	13	0	0	13	1	0	0	1	0	**14**	**0**	**14**	28
07:30 AM	9	0	0	9	**2**	0	0	**2**	0	14	0	14	25
07:45 AM	**18**	0	0	**18**	1	0	0	1	0	10	0	10	**29**
Total Volume	49	0	0	49	4	0	0	4	0	50	0	50	103
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.681	.000	.000	.681	.500	.000	.000	.500	.000	.893	.000	.893	.888

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 P
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	1	0	0	0	0	2	0	2	0	5
07:15 AM	5	0	1	0	0	2	0	1	0	9
07:30 AM	2	0	0	0	0	9	0	0	0	11
07:45 AM	10	0	0	0	0	7	0	1	0	18
Total	18	0	1	0	0	20	0	4	0	43
08:00 AM	0	0	0	0	0	10	1	6	2	19
08:15 AM	0	1	0	0	0	18	2	9	0	30
08:30 AM	1	0	0	0	0	10	0	11	1	23
08:45 AM	0	0	0	1	0	7	0	20	0	28
Total	1	1	0	1	0	45	3	46	3	100
Grand Total	19	1	1	1	0	65	3	50	3	143
Apprch %	90.5	4.8	4.8	1.5	0	98.5	5.4	89.3	5.4	
Total %	13.3	0.7	0.7	0.7	0	45.5	2.1	35	2.1	

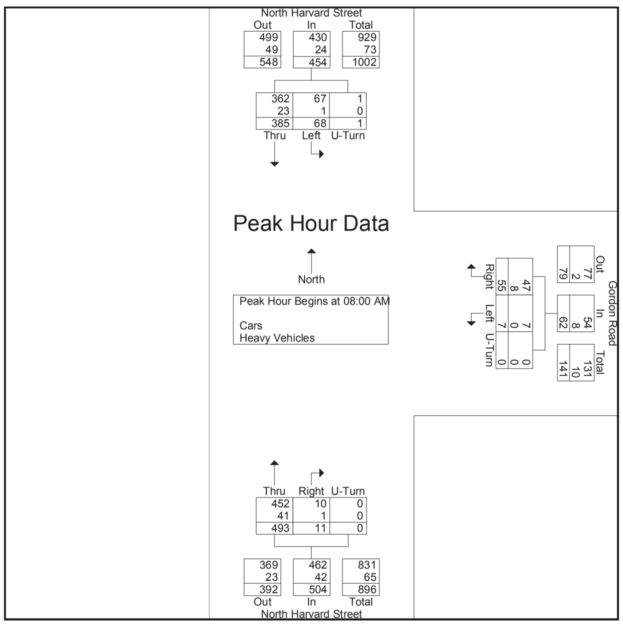
	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	0	0	0	0	0	0	10	10	1	6	**2**	**9**	**19**
08:15 AM	**0**	**1**	**0**	**1**	0	0	**18**	**18**	**2**	9	0	11	**30**
08:30 AM	**1**	0	0	1	0	0	10	10	0	11	1	12	23
08:45 AM	0	0	0	0	**1**	0	7	8	0	**20**		**20**	28
Total Volume	1	1	0	2	1	0	45	46	3	46	3	52	100
% App. Total	50	50	0		2.2	0	97.8		5.8	88.5	5.8		
PHF	.250	.250	.000	.500	.250	.000	.625	.639	.375	.575	.375	.650	.833

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 P
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	91	8	0	99	14	1	0	15	3	102	0	105	219
08:15 AM	92	19	**1**	**112**	**18**	1	0	**19**	**4**	130	0	134	265
08:30 AM	89	**23**											
08:45 AM	**113**	18	0	**131**	13	**3**	0	16	2	**139**	**0**	**141**	**288**
Total Volume	385	68	1	454	55	7	0	62	11	493	0	504	1020
% App. Total	84.8	15	0.2		88.7	11.3	0		2.2	97.8	0		
PHF	.852	.739	.250	.866	.764	.583	.000	.816	.688	.887	.000	.894	.885
Cars	362	67	1	430	47	7	0	54	10	452	0	462	946
% Cars	94.0	98.5	100	94.7	85.5	100	0	87.1	90.9	91.7	0	91.7	92.7
Heavy Vehicles	23	1	0	24	8	0	0	8	1	41	0	42	74
% Heavy Vehicles	6.0	1.5	0	5.3	14.5	0	0	12.9	9.1	8.3	0	8.3	7.3



N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 PP
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	96	7	0	11	2	0	1	90	0	207
04:15 PM	97	5	0	10	1	0	0	93	0	206
04:30 PM	89	10	0	17	0	0	0	112	1	229
04:45 PM	96	2	0	20	4	0	2	105	0	229
Total	378	24	0	58	7	0	3	400	1	871
05:00 PM	92	9	1	28	2	0	1	130	0	263
05:15 PM	95	7	1	21	1	0	1	130	0	256
05:30 PM	87	5	0	28	1	0	3	122	0	246
05:45 PM	114	2	0	24	1	0	1	135	0	277
Total	388	23	2	101	5	0	6	517	0	1042
Grand Total	766	47	2	159	12	0	9	917	1	1913
Apprch %	94	5.8	0.2	93	7	0	1	98.9	0.1	
Total %	40	2.5	0.1	8.3	0.6	0	0.5	47.9	0.1	
Cars	724	46	2	151	11	0	8	871	1	1814
% Cars	94.5	97.9	100	95	91.7	0	88.9	95	100	94.8
Heavy Vehicles	42	1	0	8	1	0	1	46	0	99
% Heavy Vehicles	5.5	2.1	0	5	8.3	0	11.1	5	0	5.2

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	92	**9**	**1**	**102**	**28**	**2**	0	**30**	1	130	0	131	263
05:15 PM	95	7	1	103	21	1	0	22	1	130	0	131	256
05:30 PM	87	5	0	92	28	1	0	29	**3**	122	0	125	246
05:45 PM	**114**	2	0	**116**	24	1	0	25	1	**135**		**136**	**277**
Total Volume	388	23	2	413	101	5	0	106	6	517	0	523	1042
% App. Total	93.9	5.6	0.5		95.3	4.7	0		1.1	98.9	0		
PHF	.851	.639	.500	.890	.902	.625	.000	.883	.500	.957	.000	.961	.940
Cars	370	23	2	395	97	5	0	102	6	497	0	503	1000
% Cars	95.4	100	100	95.6	96.0	100	0	96.2	100	96.1	0	96.2	96.0
Heavy Vehicles	18	0	0	18	4	0	0	4	0	20	0	20	42
% Heavy Vehicles	4.6	0	0	4.4	4.0	0	0	3.8	0	3.9	0	3.8	4.0

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 PP
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	89	7	0	10	2	0	1	83	0	192
04:15 PM	88	4	0	9	1	0	0	82	0	184
04:30 PM	84	10	0	16	0	0	0	106	1	217
04:45 PM	93	2	0	19	3	0	1	103	0	221
Total	354	23	0	54	6	0	2	374	1	814
05:00 PM	89	9	1	27	2	0	1	125	0	254
05:15 PM	89	7	1	20	1	0	1	127	0	246
05:30 PM	83	5	0	27	1	0	3	117	0	236
05:45 PM	109	2	0	23	1	0	1	128	0	264
Total	370	23	2	97	5	0	6	497	0	1000
Grand Total	724	46	2	151	11	0	8	871	1	1814
Apprch %	93.8	6	0.3	93.2	6.8	0	0.9	99	0.1	
Total %	39.9	2.5	0.1	8.3	0.6	0	0.4	48	0.1	

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	89	**9**	**1**	**99**	**27**	**2**	0	**29**	1	125	0	126	254
05:15 PM	89	7	1	97	20	1	0	21	1	127	0	128	246
05:30 PM	83	5	0	88	27	1	0	28	**3**	117	0	120	236
05:45 PM	**109**	2	0	**111**	23	1	0	24	1	**128**		**129**	**264**
Total Volume	370	23	2	395	97	5	0	102	6	497	0	503	1000
% App. Total	93.7	5.8	0.5		95.1	4.9	0		1.2	98.8	0		
PHF	.849	.639	.500	.890	.898	.625	.000	.879	.500	.971	.000	.975	.947

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 PP
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	7	0	0	1	0	0	0	7	0	15
04:15 PM	9	1	0	1	0	0	0	11	0	22
04:30 PM	5	0	0	1	0	0	0	6	0	12
04:45 PM	3	0	0	1	1	0	1	2	0	8
Total	24	1	0	4	1	0	1	26	0	57
05:00 PM	3	0	0	1	0	0	0	5	0	9
05:15 PM	6	0	0	1	0	0	0	3	0	10
05:30 PM	4	0	0	1	0	0	0	5	0	10
05:45 PM	5	0	0	1	0	0	0	7	0	13
Total	18	0	0	4	0	0	0	20	0	42
Grand Total	42	1	0	8	1	0	1	46	0	99
Apprch %	97.7	2.3	0	88.9	11.1	0	2.1	97.9	0	
Total %	42.4	1	0	8.1	1	0	1	46.5	0	

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	7	0	0	7	**1**	0	0	1	0	7	0	7	15
04:15 PM	**9**	**1**		**10**	1	0	0	1	0	**11**		**11**	**22**
04:30 PM	5	0	0	5	1	0	0	1	0	6	0	6	12
04:45 PM	3	0	0	3	1	**1**	0	**2**	**1**	2	0	3	8
Total Volume	24	1	0	25	4	1	0	5	1	26	0	27	57
% App. Total	96	4	0		80	20	0		3.7	96.3	0		
PHF	.667	.250	.000	.625	1.00	.250	.000	.625	.250	.591	.000	.614	.648

N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 PP
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North			Gordon Road From East			North Harvard Street From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
04:00 PM	6	0	0	1	0	12	0	9	1	29
04:15 PM	6	0	0	1	0	6	0	7	0	20
04:30 PM	2	0	0	1	0	15	1	8	1	28
04:45 PM	3	2	0	2	0	18	0	9	0	34
Total	17	2	0	5	0	51	1	33	2	111
05:00 PM	6	1	0	2	0	14	0	10	0	33
05:15 PM	4	0	1	1	0	21	0	16	0	43
05:30 PM	7	0	1	2	0	12	0	11	0	33
05:45 PM	11	0	0	0	0	15	0	8	0	34
Total	28	1	2	5	0	62	0	45	0	143
Grand Total	45	3	2	10	0	113	1	78	2	254
Apprch %	90	6	4	8.1	0	91.9	1.2	96.3	2.5	
Total %	17.7	1.2	0.8	3.9	0	44.5	0.4	30.7	0.8	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:45 PM

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:45 PM	3	**2**	**0**	**5**	**2**	0	18	20	0	9	0	9	34
05:00 PM	6	1	0	7	2	0	14	16	0	10	0	10	33
05:15 PM	4	0	**1**				**21**	**22**	0	**16**		**16**	**43**
05:30 PM	**7**	0	1	**8**	2	0	12	14	0	11	0	11	33
Total Volume	20	3	2	25	7	0	65	72	0	46	0	46	143
% App. Total	80	12	8		9.7	0	90.3		0	100	0		
PHF	.714	.375	.500	.781	.875	.000	.774	.818	.000	.719	.000	.719	.831

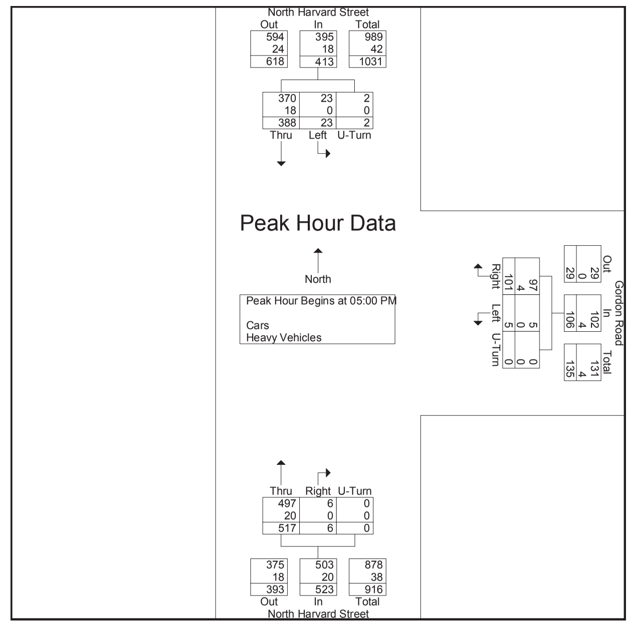
N/S: North Harvard Street
E: Gordon Road
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 PP
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North				Gordon Road From East				North Harvard Street From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
05:00 PM	92	**9**	**1**	**102**	**28**	**2**	0	**30**	1	130	0	131	263
05:15 PM	95	7	1	103	21	1	0	22	1	130	0	131	256
05:30 PM	87	5	0	92	28	1	0	29	**3**	122	0	125	246
05:45 PM	**114**	2	0	**116**	24	1	0	25	1	**135**		**136**	**277**
Total Volume	388	23	2	413	101	5	0	106	6	517	0	523	1042
% App. Total	93.9	5.6	0.5		95.3	4.7	0		1.1	98.9	0		
PHF	.851	.639	.500	.890	.902	.625	.000	.883	.500	.957	.000	.961	.940
Cars	370	23	2	395	97	5	0	102	6	497	0	503	1000
% Cars	95.4	100	100	95.6	96.0	100	0	96.2	100	96.1	0	96.2	96.0
Heavy Vehicles	18	0	0	18	4	0	0	4	0	20	0	20	42
% Heavy Vehicles	4.6	0	0	4.4	4.0	0	0	3.8	0	3.9	0	3.8	4.0



N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 Q
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	52	0	0	1	0	1	0	3	66	0	0	31	2	16	0	172
07:15 AM	0	61	0	0	0	0	2	0	0	90	0	0	28	1	10	0	192
07:30 AM	0	47	2	0	1	0	1	0	2	113	0	0	33	5	19	0	223
07:45 AM	0	54	1	0	2	0	1	0	0	131	0	0	28	1	17	0	235
Total	0	214	3	0	4	0	5	0	5	400	0	0	120	9	62	0	822
08:00 AM	0	62	1	0	1	0	1	0	4	114	0	0	47	3	11	0	244
08:15 AM	0	66	0	0	2	0	1	0	1	125	0	0	49	0	12	0	256
08:30 AM	0	69	3	0	0	0	2	0	3	112	0	0	41	4	17	0	251
08:45 AM	0	70	1	0	3	0	2	0	6	143	0	0	39	5	12	0	281
Total	0	267	5	0	6	0	6	0	14	494	0	0	176	12	52	0	1032
Grand Total	0	481	8	0	10	0	11	0	19	894	0	0	296	21	114	0	1854
Apprch %	0	98.4	1.6	0	47.6	0	52.4	0	2.1	97.9	0	0	68.7	4.9	26.5	0	
Total %	0	25.9	0.4	0	0.5	0	0.6	0	1	48.2	0	0	16	1.1	6.1	0	
Cars	0	436	6	0	10	0	9	0	19	805	0	0	258	20	105	0	1668
% Cars	0	90.6	75	0	100	0	81.8	0	100	90	0	0	87.2	95.2	92.1	0	90
Heavy Vehicles	0	45	2	0	0	0	2	0	0	89	0	0	38	1	9	0	186
% Heavy Vehicles	0	9.4	25	0	0	0	18.2	0	0	10	0	0	12.8	4.8	7.9	0	10

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	62	1	0	63	1	0	1	0	2	4	114	0	0	118	47	3	11	0	61	244
08:15 AM	0	66	0	0	66	2	0	1	0	3	1	125	0	0	126	**49**	**0**	**12**	**0**	**61**	**256**
08:30 AM	**0**	**69**	**3**	**0**	**72**	0	0	**2**	**0**	**2**	**3**	**112**	**0**	**0**	**115**	**41**	**4**	**17**	**0**	**62**	251
08:45 AM	0	**70**	1	0	71	**3**	0	2	0	**5**	**6**	**143**			**149**	39	**5**	12	0	56	**281**
Total Volume	0	267	5	0	272	6	0	6	0	12	14	494	0	0	508	176	12	52	0	240	1032
% App. Total	0	98.2	1.8	0		50	0	50	0		2.8	97.2	0	0		73.3	5	21.7	0		
PHF	.000	.954	.417	.000	.944	.500	.000	.750	.000	.600	.583	.864	.000	.000	.852	.898	.600	.765	.000	.968	.918
Cars	0	252	5	0	257	6	0	4	0	10	14	458	0	0	472	150	12	50	0	212	951
% Cars	0	94.4	100	0	94.5	100	0	66.7	0	83.3	100	92.7	0	0	92.9	85.2	100	96.2	0	88.3	92.2
Heavy Vehicles	0	15	0	0	15	0	0	2	0	2	0	36	0	0	36	26	0	2	0	28	81
% Heavy Vehicles	0	5.6	0	0	5.5	0	0	33.3	0	16.7	0	7.3	0	0	7.1	14.8	0	3.8	0	11.7	7.8

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 Q
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	44	0	0	1	0	1	0	3	54	0	0	28	2	13	0	146
07:15 AM	0	51	0	0	0	0	2	0	0	73	0	0	26	1	10	0	163
07:30 AM	0	44	0	0	1	0	1	0	2	100	0	0	28	5	15	0	196
07:45 AM	0	45	1	0	2	0	1	0	0	120	0	0	26	0	17	0	212
Total	0	184	1	0	4	0	5	0	5	347	0	0	108	8	55	0	717
08:00 AM	0	57	1	0	1	0	0	0	4	110	0	0	41	3	11	0	228
08:15 AM	0	63	0	0	2	0	0	0	1	112	0	0	44	0	12	0	234
08:30 AM	0	66	3	0	0	0	2	0	3	103	0	0	36	4	16	0	233
08:45 AM	0	66	1	0	3	0	2	0	6	133	0	0	29	5	11	0	256
Total	0	252	5	0	6	0	4	0	14	458	0	0	150	12	50	0	951
Grand Total	0	436	6	0	10	0	9	0	19	805	0	0	258	20	105	0	1668
Apprch %	0	98.6	1.4	0	52.6	0	47.4	0	2.3	97.7	0	0	67.4	5.2	27.4	0	
Total %	0	26.1	0.4	0	0.6	0	0.5	0	1.1	48.3	0	0	15.5	1.2	6.3	0	

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	57	1	0	58	1	0	0	0	1	4	110	0	0	114	41	3	11	0	55	228
08:15 AM	0	63	0	0	63	2	0	0	0	2	1	112	0	0	113	**44**	**0**	**12**	**0**	**56**	234
08:30 AM	0	**66**	**3**		**69**	0	0	**2**										**16**			
08:45 AM	**0**	**66**	**1**	**0**	**67**	**3**	0	2	0	**5**	**6**	**133**	**0**	**0**	**139**	29	**5**	11	0	45	**256**
Total Volume	0	252	5	0	257	6	0	4	0	10	14	458	0	0	472	150	12	50	0	212	951
% App. Total	0	98.1	1.9	0		60	0	40	0		3	97	0	0		70.8	5.7	23.6	0		
PHF	.000	.955	.417	.000	.931	.500	.000	.500	.000	.500	.583	.861	.000	.000	.849	.852	.600	.781	.000	.946	.929

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 Q
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	8	0	0	0	0	0	0	0	12	0	0	3	0	3	0	26
07:15 AM	0	10	0	0	0	0	0	0	0	17	0	0	2	0	0	0	29
07:30 AM	0	3	2	0	0	0	0	0	0	13	0	0	5	0	4	0	27
07:45 AM	0	9	0	0	0	0	0	0	0	11	0	0	2	1	0	0	23
Total	0	30	2	0	0	0	0	0	0	53	0	0	12	1	7	0	105
08:00 AM	0	5	0	0	0	0	1	0	0	4	0	0	6	0	0	0	16
08:15 AM	0	3	0	0	0	0	1	0	0	13	0	0	5	0	0	0	22
08:30 AM	0	3	0	0	0	0	0	0	0	9	0	0	5	0	1	0	18
08:45 AM	0	4	0	0	0	0	0	0	0	10	0	0	10	0	1	0	25
Total	0	15	0	0	0	0	2	0	0	36	0	0	26	0	2	0	81
Grand Total	0	45	2	0	0	0	2	0	0	89	0	0	38	1	9	0	186
Apprch %	0	95.7	4.3	0	0	0	100	0	0	100	0	0	79.2	2.1	18.8	0	
Total %	0	24.2	1.1	0	0	0	1.1	0	0	47.8	0	0	20.4	0.5	4.8	0	

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	8	0	0	8	0	0	0	0	0	0	12	0	0	12	3	0	3	0	6	26
07:15 AM	0	**10**	0	0	**10**	0	0	0	0	0	0	**17**	**0**	**0**	**17**	2	0	0	0	2	**29**
07:30 AM	0	3	**2**													**5**		**4**		**9**	27
07:45 AM	0	9	0	0	9	0	0	0	0	0	0	11	0	0	11	2	**1**	0	0	3	23
Total Volume	0	30	2	0	32	0	0	0	0	0	0	53	0	0	53	12	1	7	0	20	105
% App. Total	0	93.8	6.2	0		0	0	0	0		0	100	0	0		60	5	35	0		
PHF	.000	.750	.250	.000	.800	.000	.000	.000	.000	.000	.000	.779	.000	.000	.779	.600	.250	.438	.000	.556	.905

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 Q
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	0	0	0	0	11	0	2	0	1	0	0	0	3	17
07:15 AM	0	6	0	0	0	0	0	9	0	5	0	6	0	0	0	13	39
07:30 AM	0	2	0	0	0	0	0	16	0	9	0	4	0	0	0	8	39
07:45 AM	0	4	0	0	0	0	0	24	0	7	0	2	0	0	0	13	50
Total	0	12	0	0	0	0	0	60	0	23	0	13	0	0	0	37	145
08:00 AM	0	6	0	0	0	0	0	11	1	8	0	2	0	0	0	14	42
08:15 AM	0	8	0	0	0	0	0	25	0	14	0	6	0	0	0	25	78
08:30 AM	0	4	0	0	0	0	0	16	0	10	0	2	0	0	0	19	51
08:45 AM	0	3	0	3	0	0	0	22	1	12	0	3	0	0	0	16	60
Total	0	21	0	3	0	0	0	74	2	44	0	13	0	0	0	74	231
Grand Total	0	33	0	3	0	0	0	134	2	67	0	26	0	0	0	111	376
Apprch %	0	91.7	0	8.3	0	0	0	100	2.1	70.5	0	27.4	0	0	0	100	
Total %	0	8.8	0	0.8	0	0	0	35.6	0.5	17.8	0	6.9	0	0	0	29.5	

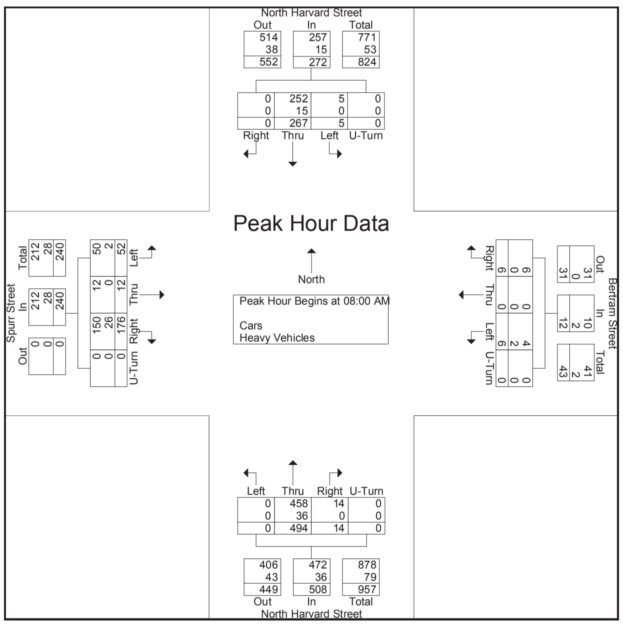
	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	6	0	0	6	0	0	0	11	11	**1**	**8**	**0**	**2**	**11**	**0**	**0**	**0**	**14**	**14**	**42**
08:15 AM	**0**	**8**	0	0	**8**	0	0	0	**25**	**25**	0	**14**	**0**	**6**	**20**	0	0	0	**25**	**25**	**78**
08:30 AM	0	4	0	0	4	0	0	0	16	16	0	10	0	2	12	0	0	0	19	19	51
08:45 AM	0	3	0	**3**																	
Total Volume	0	21	0	3	24	0	0	0	74	74	2	44	0	13	59	0	0	0	74	74	231
% App. Total	0	87.5	0	12.5		0	0	0	100		3.4	74.6	0	22		0	0	0	100		
PHF	.000	.656	.000	.250	.750	.000	.000	.000	.740	.740	.500	.786	.000	.542	.738	.000	.000	.000	.740	.740	.740

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 Q
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	62	1	0	63	1	0	1	0	2	4	114	0	0	118	47	3	11	0	61	244
08:15 AM	0	66	0	0	66	2	0	1	0	3	1	125	0	0	126	**49**	**0**	**12**	**0**	**61**	**256**
08:30 AM	**0**	**69**	**3**	**0**	**72**	0	0	**2**	**0**	**2**	**3**	**112**	**0**	**0**	**115**	**41**	**4**	**17**	**0**	**62**	251
08:45 AM	0	**70**	1	0	71	**3**	0	2	0	**5**	**6**	**143**			**149**	39	**5**	12	0	56	**281**
Total Volume	0	267	5	0	272	6	0	6	0	12	14	494	0	0	508	176	12	52	0	240	1032
% App. Total	0	98.2	1.8	0		50	0	50	0		2.8	97.2	0	0		73.3	5	21.7	0		
PHF	.000	.954	.417	.000	.944	.500	.000	.750	.000	.600	.583	.864	.000	.000	.852	.898	.600	.765	.000	.968	.918
Cars	0	252	5	0	257	6	0	4	0	10	14	458	0	0	472	150	12	50	0	212	951
% Cars	0	94.4	100	0	94.5	100	0	66.7	0	83.3	100	92.7	0	0	92.9	85.2	100	96.2	0	88.3	92.2
Heavy Vehicles	0	15	0	0	15	0	0	2	0	2	0	36	0	0	36	26	0	2	0	28	81
% Heavy Vehicles	0	5.6	0	0	5.5	0	0	33.3	0	16.7	0	7.3	0	0	7.1	14.8	0	3.8	0	11.7	7.8



N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 QQ
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	75	0	0	4	0	2	0	2	100	0	0	58	1	3	0	245
04:15 PM	0	76	0	0	1	0	2	0	1	83	0	0	53	0	5	0	221
04:30 PM	0	73	3	0	5	0	2	0	4	105	0	0	56	2	2	0	252
04:45 PM	0	82	1	0	3	0	4	0	2	117	0	0	45	0	4	0	258
Total	0	306	4	0	13	0	10	0	9	405	0	0	212	3	14	0	976
05:00 PM	0	82	2	0	3	0	4	0	1	115	0	0	50	2	4	0	263
05:15 PM	0	98	1	0	5	0	1	0	1	140	0	0	58	1	6	0	311
05:30 PM	0	74	0	0	4	0	3	0	3	118	0	0	50	1	4	0	257
05:45 PM	0	85	0	0	1	0	0	0	6	137	0	0	46	2	3	0	280
Total	0	339	3	0	13	0	8	0	11	510	0	0	204	6	17	0	1111
Grand Total	0	645	7	0	26	0	18	0	20	915	0	0	416	9	31	0	2087
Apprch %	0	98.9	1.1	0	59.1	0	40.9	0	2.1	97.9	0	0	91.2	2	6.8	0	
Total %	0	30.9	0.3	0	1.2	0	0.9	0	1	43.8	0	0	19.9	0.4	1.5	0	
Cars	0	613	7	0	26	0	17	0	20	863	0	0	396	9	31	0	1982
% Cars	0	95	100	0	100	0	94.4	0	100	94.3	0	0	95.2	100	100	0	95
Heavy Vehicles	0	32	0	0	0	0	1	0	0	52	0	0	20	0	0	0	105
% Heavy Vehicles	0	5	0	0	0	0	5.6	0	0	5.7	0	0	4.8	0	0	0	5

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	82	**2**	**0**	**84**	**3**	**0**	**4**	**0**	**7**	1	115	0	0	116	50	**2**	4	0	56	263
05:15 PM	0	**98**	1	0	**99**	**5**	0	1	0	6	1	**140**				**58**		**6**		**65**	**311**
05:30 PM	0	74	0	0	74	4	0	3	0	7	3	118	0	0	121	50	1	4	0	55	257
05:45 PM	0	85	0	0	85	1	0	0	0	1	**6**				**143**	46	2	3	0	51	280
Total Volume	0	339	3	0	342	13	0	8	0	21	11	510	0	0	521	204	6	17	0	227	1111
% App. Total	0	99.1	0.9	0		61.9	0	38.1	0		2.1	97.9	0	0		89.9	2.6	7.5	0		
PHF	.000	.865	.375	.000	.864	.650	.000	.500	.000	.750	.458	.911	.000	.000	.911	.879	.750	.708	.000	.873	.893
Cars	0	322	3	0	325	13	0	8	0	21	11	486	0	0	497	199	6	17	0	222	1065
% Cars	0	95.0	100	0	95.0	100	0	100	0	100	100	95.3	0	0	95.4	97.5	100	100	0	97.8	95.9
Heavy Vehicles	0	17	0	0	17	0	0	0	0	0	0	24	0	0	24	5	0	0	0	5	46
% Heavy Vehicles	0	5.0	0	0	5.0	0	0	0	0	0	0	4.7	0	0	4.6	2.5	0	0	0	2.2	4.1

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 QQ
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	70	0	0	4	0	1	0	2	90	0	0	53	1	3	0	224
04:15 PM	0	72	0	0	1	0	2	0	1	78	0	0	50	0	5	0	209
04:30 PM	0	69	3	0	5	0	2	0	4	99	0	0	51	2	2	0	237
04:45 PM	0	80	1	0	3	0	4	0	2	110	0	0	43	0	4	0	247
Total	0	291	4	0	13	0	9	0	9	377	0	0	197	3	14	0	917
05:00 PM	0	77	2	0	3	0	4	0	1	108	0	0	47	2	4	0	248
05:15 PM	0	95	1	0	5	0	1	0	1	135	0	0	58	1	6	0	303
05:30 PM	0	70	0	0	4	0	3	0	3	111	0	0	49	1	4	0	245
05:45 PM	0	80	0	0	1	0	0	0	6	132	0	0	45	2	3	0	269
Total	0	322	3	0	13	0	8	0	11	486	0	0	199	6	17	0	1065
Grand Total	0	613	7	0	26	0	17	0	20	863	0	0	396	9	31	0	1982
Apprch %	0	98.9	1.1	0	60.5	0	39.5	0	2.3	97.7	0	0	90.8	2.1	7.1	0	
Total %	0	30.9	0.4	0	1.3	0	0.9	0	1	43.5	0	0	20	0.5	1.6	0	

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	77	**2**	**0**	**79**	**3**	**0**	**4**	**0**	**7**	1	108	0	0	109	47	**2**	4	0	53	248
05:15 PM	0	**95**	1	0	**96**	**5**	0	1	0	6	1	**135**				**58**		**6**		**65**	**303**
05:30 PM	0	70	0	0	70	4	0	3	0	7	3	111	0	0	114	49	1	4	0	54	245
05:45 PM	0	80	0	0	80	1	0	0	0	1	**6**				**138**	45	2	3	0	50	269
Total Volume	0	322	3	0	325	13	0	8	0	21	11	486	0	0	497	199	6	17	0	222	1065
% App. Total	0	99.1	0.9	0		61.9	0	38.1	0		2.2	97.8	0	0		89.6	2.7	7.7	0		
PHF	.000	.847	.375	.000	.846	.650	.000	.500	.000	.750	.458	.900	.000	.000	.900	.858	.750	.708	.000	.854	.879

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 QQ
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	5	0	0	0	0	1	0	0	10	0	0	5	0	0	0	21
04:15 PM	0	4	0	0	0	0	0	0	0	5	0	0	3	0	0	0	12
04:30 PM	0	4	0	0	0	0	0	0	0	6	0	0	5	0	0	0	15
04:45 PM	0	2	0	0	0	0	0	0	0	7	0	0	2	0	0	0	11
Total	0	15	0	0	0	0	1	0	0	28	0	0	15	0	0	0	59
05:00 PM	0	5	0	0	0	0	0	0	0	7	0	0	3	0	0	0	15
05:15 PM	0	3	0	0	0	0	0	0	0	5	0	0	0	0	0	0	8
05:30 PM	0	4	0	0	0	0	0	0	0	7	0	0	1	0	0	0	12
05:45 PM	0	5	0	0	0	0	0	0	0	5	0	0	1	0	0	0	11
Total	0	17	0	0	0	0	0	0	0	24	0	0	5	0	0	0	46
Grand Total	0	32	0	0	0	0	1	0	0	52	0	0	20	0	0	0	105
Apprch %	0	100	0	0	0	0	100	0	0	100	0	0	100	0	0	0	
Total %	0	30.5	0	0	0	0	1	0	0	49.5	0	0	19	0	0	0	

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	**5**	0	0	**5**	0	0	**1**	**0**	**1**	0	**10**	**0**	**0**	**10**	**5**	**0**	**0**	**0**	**5**	**21**
04:15 PM	0	4	0	0	4	0	0	0	0	0	0	5	0	0	5	3	0	0	0	3	12
04:30 PM	0	4	0	0	4	0	0	0	0	0	0	6	0	0	6	5	0	0	0	5	15
04:45 PM	0	2	0	0	2	0	0	0	0	0	0	7	0	0	7	2	0	0	0	2	11
Total Volume	0	15	0	0	15	0	0	1	0	1	0	28	0	0	28	15	0	0	0	15	59
% App. Total	0	100	0	0		0	0	100	0		0	100	0	0		100	0	0	0		
PHF	.000	.750	.000	.000	.750	.000	.000	.250	.000	.250	.000	.700	.000	.000	.700	.750	.000	.000	.000	.750	.702

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 QQ
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Bertram Street From East				North Harvard Street From South				Spurr Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	5	0	0	0	0	1	9	0	6	0	0	0	0	0	13	34
04:15 PM	0	11	0	0	0	0	0	14	0	6	0	4	0	0	0	20	55
04:30 PM	0	8	0	0	0	0	0	8	0	7	0	2	0	0	0	20	45
04:45 PM	0	6	0	0	0	0	0	5	0	6	0	4	1	0	0	28	50
Total	0	30	0	0	0	0	1	36	0	25	0	10	1	0	0	81	184
05:00 PM	0	12	0	2	0	0	0	14	0	9	0	2	0	0	0	10	49
05:15 PM	0	9	0	0	0	0	0	8	0	5	0	2	0	0	0	18	42
05:30 PM	0	11	0	0	0	0	0	19	0	8	0	3	0	0	0	18	59
05:45 PM	0	11	0	0	0	0	0	16	0	7	0	2	0	0	0	26	62
Total	0	43	0	2	0	0	0	57	0	29	0	9	0	0	0	72	212
Grand Total	0	73	0	2	0	0	1	93	0	54	0	19	1	0	0	153	396
Apprch %	0	97.3	0	2.7	0	0	1.1	98.9	0	74	0	26	0.6	0	0	99.4	
Total %	0	18.4	0	0.5	0	0	0.3	23.5	0	13.6	0	4.8	0.3	0	0	38.6	

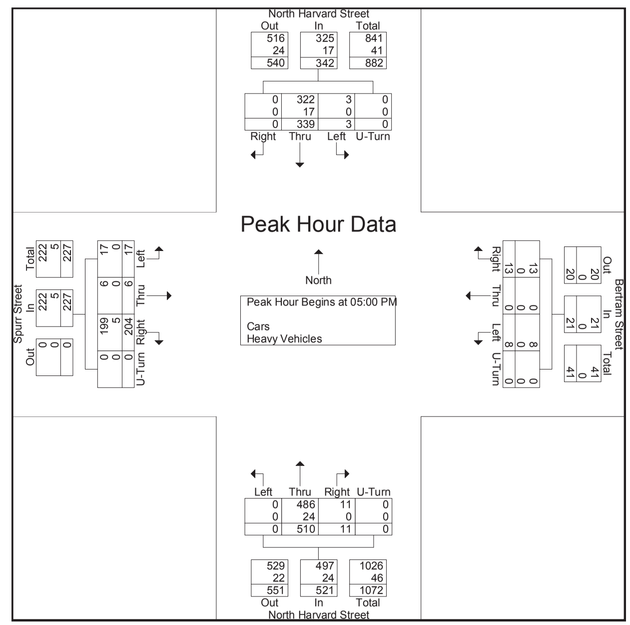
	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	**12**	0	**2**	**14**	0	0	0	14	14	0	**9**	**0**	**2**	**11**	0	0	0	10	10	49
05:15 PM	0	9	0	0	9	0	0	0	8	8	0	5	0	2	7	0	0	0	18	18	42
05:30 PM	0	11	0	0	11	0	0	0	**19**	**19**	0	8	0	**3**							
05:45 PM	**0**	**11**	**0**	**0**	**11**	**0**	**0**	**0**	**16**	**16**	**0**	**7**	**0**	**2**	**9**	**0**	**0**	**0**	**26**	**26**	**62**
Total Volume	0	43	0	2	45	0	0	0	57	57	0	29	0	9	38	0	0	0	72	72	212
% App. Total	0	95.6	0	4.4		0	0	0	100		0	76.3	0	23.7		0	0	0	100		
PHF	.000	.896	.000	.250	.804	.000	.000	.000	.750	.750	.000	.806	.000	.750	.864	.000	.000	.000	.692	.692	.855

N/S: North Harvard Street
E/W: Bertram Street/ Spurr Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 QQ
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	North Harvard Street From North					Bertram Street From East					North Harvard Street From South					Spurr Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	82	**2**	**0**	**84**	**3**	**0**	**4**	**0**	**7**	1	115	0	0	116	50	**2**	4	0	56	263
05:15 PM	0	**98**	1	0	**99**	**5**	0	1	0	6	1	**140**				**58**		**6**		**65**	**311**
05:30 PM	0	74	0	0	74	4	0	3	0	7	3	118	0	0	121	50	1	4	0	55	257
05:45 PM	0	85	0	0	85	1	0	0	0	1	**6**				**143**	46	2	3	0	51	280
Total Volume	0	339	3	0	342	13	0	8	0	21	11	510	0	0	521	204	6	17	0	227	1111
% App. Total	0	99.1	0.9	0		61.9	0	38.1	0		2.1	97.9	0	0		89.9	2.6	7.5	0		
PHF	.000	.865	.375	.000	.864	.650	.000	.500	.000	.750	.458	.911	.000	.000	.911	.879	.750	.708	.000	.873	.893
Cars	0	322	3	0	325	13	0	8	0	21	11	486	0	0	497	199	6	17	0	222	1065
% Cars	0	95.0	100	0	95.0	100	0	100	0	100	100	95.3	0	0	95.4	97.5	100	100	0	97.8	95.9
Heavy Vehicles	0	17	0	0	17	0	0	0	0	0	0	24	0	0	24	5	0	0	0	5	46
% Heavy Vehicles	0	5.0	0	0	5.0	0	0	0	0	0	0	4.7	0	0	4.6	2.5	0	0	0	2.2	4.1



N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 R
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	3	80	0	0	2	1	2	0	0	65	2	0	11	0	11	0	177
07:15 AM	12	81	0	0	0	0	3	0	0	77	3	0	5	0	19	0	200
07:30 AM	3	85	0	0	2	0	3	0	0	95	2	0	5	0	13	0	208
07:45 AM	3	75	0	0	2	1	2	0	0	115	7	0	11	0	23	0	239
Total	21	321	0	0	6	2	10	0	0	352	14	0	32	0	66	0	824
08:00 AM	23	92	0	0	2	2	1	0	0	100	5	0	12	0	15	0	252
08:15 AM	11	96	0	0	0	2	0	0	0	115	9	0	2	0	20	0	255
08:30 AM	13	89	0	0	2	1	5	0	0	96	3	0	11	0	14	0	234
08:45 AM	8	105	0	0	1	1	2	0	0	134	4	0	10	0	19	0	284
Total	55	382	0	0	5	6	8	0	0	445	21	0	35	0	68	0	1025
Grand Total	76	703	0	0	11	8	18	0	0	797	35	0	67	0	134	0	1849
Apprch %	9.8	90.2	0	0	29.7	21.6	48.6	0	0	95.8	4.2	0	33.3	0	66.7	0	
Total %	4.1	38	0	0	0.6	0.4	1	0	0	43.1	1.9	0	3.6	0	7.2	0	
Cars	69	621	0	0	11	7	18	0	0	717	28	0	64	0	130	0	1665
% Cars	90.8	88.3	0	0	100	87.5	100	0	0	90	80	0	95.5	0	97	0	90
Heavy Vehicles	7	82	0	0	0	1	0	0	0	80	7	0	3	0	4	0	184
% Heavy Vehicles	9.2	11.7	0	0	0	12.5	0	0	0	10	20	0	4.5	0	3	0	10

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	23	92	0	0	115	2	2	1	0	5	0	100	5	0	105	12	0	15	0	27	252
08:15 AM	11	96	0	0	107	0	2	0	0	2	0	115	9	0	124	2	0	20	0	22	255
08:30 AM	13	89	0	0	102	2	1	5	0	8	0	96	3	0	99	11	0	14	0	25	234
08:45 AM	8	105	0	0	113	1	1	2	0	4	0	134			138	10	0	19	0	29	284
Total Volume	55	382	0	0	437	5	6	8	0	19	0	445	21	0	466	35	0	68	0	103	1025
% App. Total	12.6	87.4	0	0		26.3	31.6	42.1	0		0	95.5	4.5	0		34	0	66	0		
PHF	.598	.910	.000	.000	.950	.625	.750	.400	.000	.594	.000	.830	.583	.000	.844	.729	.000	.850	.000	.888	.902
Cars	52	342	0	0	394	5	5	8	0	18	0	411	15	0	426	32	0	66	0	98	936
% Cars	94.5	89.5	0	0	90.2	100	83.3	100	0	94.7	0	92.4	71.4	0	91.4	91.4	0	97.1	0	95.1	91.3
Heavy Vehicles	3	40	0	0	43	0	1	0	0	1	0	34	6	0	40	3	0	2	0	5	89
% Heavy Vehicles	5.5	10.5	0	0	9.8	0	16.7	0	0	5.3	0	7.6	28.6	0	8.6	8.6	0	2.9	0	4.9	8.7

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 R
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	2	69	0	0	2	1	2	0	0	55	2	0	11	0	10	0	154
07:15 AM	10	71	0	0	0	0	3	0	0	61	3	0	5	0	19	0	172
07:30 AM	2	74	0	0	2	0	3	0	0	86	2	0	5	0	12	0	186
07:45 AM	3	65	0	0	2	1	2	0	0	104	6	0	11	0	23	0	217
Total	17	279	0	0	6	2	10	0	0	306	13	0	32	0	64	0	729
08:00 AM	22	80	0	0	2	1	1	0	0	95	4	0	11	0	15	0	231
08:15 AM	10	89	0	0	0	2	0	0	0	101	6	0	2	0	20	0	230
08:30 AM	13	81	0	0	2	1	5	0	0	88	2	0	10	0	14	0	216
08:45 AM	7	92	0	0	1	1	2	0	0	127	3	0	9	0	17	0	259
Total	52	342	0	0	5	5	8	0	0	411	15	0	32	0	66	0	936
Grand Total	69	621	0	0	11	7	18	0	0	717	28	0	64	0	130	0	1665
Apprch %	10	90	0	0	30.6	19.4	50	0	0	96.2	3.8	0	33	0	67	0	
Total %	4.1	37.3	0	0	0.7	0.4	1.1	0	0	43.1	1.7	0	3.8	0	7.8	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	22	80	0	0	102	2	1	1	0	4	0	95	4	0	99	11	0	15	0	26	231
08:15 AM	10	89	0	0	99	0	2						6	0	107	2	0	20			
08:30 AM	13	81	0	0	94	2	1	5	0	8	0	88	2	0	90	10	0	14	0	24	216
08:45 AM	7	92	0	0	99	1	1	2	0	4	0	127			130	9	0	17	0	26	259
Total Volume	52	342	0	0	394	5	5	8	0	18	0	411	15	0	426	32	0	66	0	98	936
% App. Total	13.2	86.8	0	0		27.8	27.8	44.4	0		0	96.5	3.5	0		32.7	0	67.3	0		
PHF	.591	.929	.000	.000	.966	.625	.625	.400	.000	.563	.000	.809	.625	.000	.819	.727	.000	.825	.000	.942	.903

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 R
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	1	11	0	0	0	0	0	0	0	10	0	0	0	0	1	0	23
07:15 AM	2	10	0	0	0	0	0	0	0	16	0	0	0	0	0	0	28
07:30 AM	1	11	0	0	0	0	0	0	0	9	0	0	0	0	1	0	22
07:45 AM	0	10	0	0	0	0	0	0	0	11	1	0	0	0	0	0	22
Total	4	42	0	0	0	0	0	0	0	46	1	0	0	0	2	0	95
08:00 AM	1	12	0	0	0	1	0	0	0	5	1	0	1	0	0	0	21
08:15 AM	1	7	0	0	0	0	0	0	0	14	3	0	0	0	0	0	25
08:30 AM	0	8	0	0	0	0	0	0	0	8	1	0	1	0	0	0	18
08:45 AM	1	13	0	0	0	0	0	0	0	7	1	0	1	0	2	0	25
Total	3	40	0	0	0	1	0	0	0	34	6	0	3	0	2	0	89
Grand Total	7	82	0	0	0	1	0	0	0	80	7	0	3	0	4	0	184
Apprch %	7.9	92.1	0	0	0	100	0	0	0	92	8	0	42.9	0	57.1	0	
Total %	3.8	44.6	0	0	0	0.5	0	0	0	43.5	3.8	0	1.6	0	2.2	0	

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	1	11	0	0	12	0	0	0	0	0	0	10	0	0	10	0	0	1	0	1	23
07:15 AM	2											16			16	0	0	0	0	0	28
07:30 AM	1	11	0	0	12	0	0	0	0	0	0	9	0	0	9	0	0	1	0	1	22
07:45 AM	0	10	0	0	10	0	0	0	0	0	0	11	1	0	12	0	0	0	0	0	22
Total Volume	4	42	0	0	46	0	0	0	0	0	0	46	1	0	47	0	0	2	0	2	95
% App. Total	8.7	91.3	0	0		0	0	0	0		0	97.9	2.1	0		0	0	100	0		
PHF	.500	.955	.000	.000	.958	.000	.000	.000	.000	.000	.000	.719	.250	.000	.734	.000	.000	.500	.000	.500	.848

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 R
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	1	1	0	2	0	0	0	3	0	2	0	3	0	0	0	5	17
07:15 AM	5	0	0	0	0	0	0	8	0	0	0	1	0	0	2	10	26
07:30 AM	3	1	0	0	0	1	0	12	0	0	0	4	0	0	7	10	38
07:45 AM	3	2	0	2	0	0	0	15	0	1	0	6	0	0	4	12	45
Total	12	4	0	4	0	1	0	38	0	3	0	14	0	0	13	37	126
08:00 AM	5	1	0	2	0	0	0	7	0	1	1	6	0	0	8	11	42
08:15 AM	7	1	0	2	0	0	0	16	0	4	0	6	0	0	10	19	65
08:30 AM	4	2	0	1	0	1	0	6	0	7	0	5	0	0	6	9	41
08:45 AM	4	1	0	6	0	0	0	11	0	4	0	4	0	0	11	6	47
Total	20	5	0	11	0	1	0	40	0	16	1	21	0	0	35	45	195
Grand Total	32	9	0	15	0	2	0	78	0	19	1	35	0	0	48	82	321
Apprch %	57.1	16.1	0	26.8	0	2.5	0	97.5	0	34.5	1.8	63.6	0	0	36.9	63.1	
Total %	10	2.8	0	4.7	0	0.6	0	24.3	0	5.9	0.3	10.9	0	0	15	25.5	

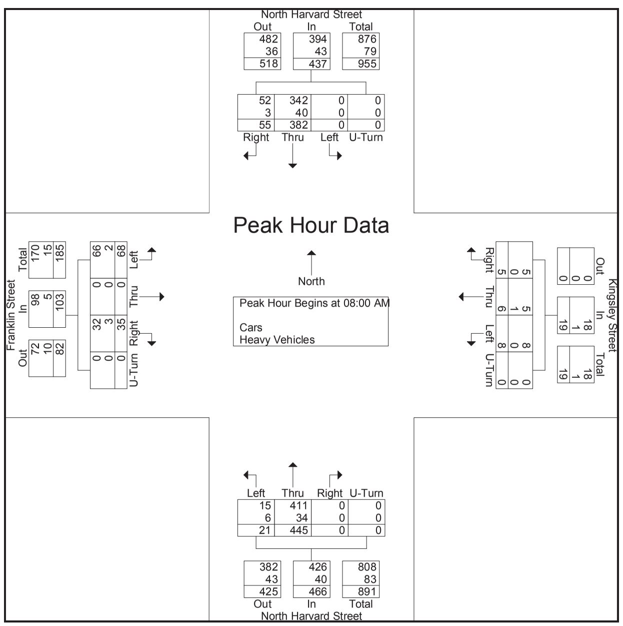
	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	5	1	0	2	8	0	0	0	7	7	0	1	1	6	8	0	0	8	11	19	42
08:15 AM	7	1	0	2	10	0	0	0	16	16	0	4	0	6	10	0	0	10	19	29	65
08:30 AM	4	2	0	1	7	0	1					7			12	0	0	6	9	15	41
08:45 AM	4	1	0	6	11	0	0	0	11	11	0	4	0	4	8	0	0	11			
Total Volume	20	5	0	11	36	0	1	0	40	41	0	16	1	21	38	0	0	35	45	80	195
% App. Total	55.6	13.9	0	30.6		0	2.4	0	97.6		0	42.1	2.6	55.3		0	0	43.8	56.2		
PHF	.714	.625	.000	.458	.818	.000	.250	.000	.625	.641	.000	.571	.250	.875	.792	.000	.000	.795	.592	.690	.750

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 R
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	**23**	**92**	**0**	**0**	**115**	**2**	**2**	**1**	**0**	**5**	**0**	**100**	**5**	**0**	**105**	**12**	**0**	**15**	**0**	**27**	**252**
08:15 AM	**11**	**96**	**0**	**0**	**107**	**0**	**2**	**0**	**0**	**2**	**0**	**115**	**9**	0	124	2	0	**20**	**0**	**22**	**255**
08:30 AM	**13**	**89**	**0**	**0**	**102**	**2**	**1**	**5**	**0**	**8**	0	96	3	0	99	11	0	14	0	25	234
08:45 AM	8	**105**	0	0	113	1	1	2	0	4	0	**134**			**138**	10	0	19	0	**29**	**284**
Total Volume	55	382	0	0	437	5	6	8	0	19	0	445	21	0	466	35	0	68	0	103	1025
% App. Total	12.6	87.4	0	0		26.3	31.6	42.1	0		0	95.5	4.5	0		34	0	66	0		
PHF	.598	.910	.000	.000	.950	.625	.750	.400	.000	.594	.000	.830	.583	.000	.844	.729	.000	.850	.000	.888	.902
Cars	52	342	0	0	394	5	5	8	0	18	0	411	15	0	426	32	0	66	0	98	936
% Cars	94.5	89.5	0	0	90.2	100	83.3	100	0	94.7	0	92.4	71.4	0	91.4	91.4	0	97.1	0	95.1	91.3
Heavy Vehicles	3	40	0	0	43	0	1	0	0	1	0	34	6	0	40	3	0	2	0	5	89
% Heavy Vehicles	5.5	10.5	0	0	9.8	0	16.7	0	0	5.3	0	7.6	28.6	0	8.6	8.6	0	2.9	0	4.9	8.7



N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 RR
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	15	124	0	0	2	0	2	0	0	85	5	0	9	0	12	0	254
04:15 PM	13	117	0	0	3	2	5	0	0	73	4	0	11	0	10	0	238
04:30 PM	11	132	0	0	0	1	1	0	0	108	8	0	9	0	6	0	276
04:45 PM	19	121	0	0	0	1	1	0	0	110	3	0	10	0	5	0	270
Total	58	494	0	0	5	4	9	0	0	376	20	0	39	0	33	0	1038
05:00 PM	5	131	0	0	1	1	3	0	0	105	6	0	5	0	13	0	270
05:15 PM	14	145	0	0	1	2	4	0	0	115	2	0	7	0	15	0	305
05:30 PM	9	123	0	0	0	3	4	0	0	116	5	0	7	0	9	0	276
05:45 PM	14	126	0	0	1	1	7	0	0	138	3	0	8	0	11	0	309
Total	42	525	0	0	3	7	18	0	0	474	16	0	27	0	48	0	1160
Grand Total	100	1019	0	0	8	11	27	0	0	850	36	0	66	0	81	0	2198
Apprch %	8.9	91.1	0	0	17.4	23.9	58.7	0	0	95.9	4.1	0	44.9	0	55.1	0	
Total %	4.5	46.4	0	0	0.4	0.5	1.2	0	0	38.7	1.6	0	3	0	3.7	0	
Cars	97	968	0	0	8	10	27	0	0	798	36	0	65	0	77	0	2086
% Cars	97	95	0	0	100	90.9	100	0	0	93.9	100	0	98.5	0	95.1	0	94.9
Heavy Vehicles	3	51	0	0	0	1	0	0	0	52	0	0	1	0	4	0	112
% Heavy Vehicles	3	5	0	0	0	9.1	0	0	0	6.1	0	0	1.5	0	4.9	0	5.1

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	5	131	0	0	136	**1**	1	3	0	5	0	105	**6**	0	111	5	0	13	0	18	270
05:15 PM	**14**	**145**	0	0	**159**	1	2	4	0	7	0	115	2	0	117	7	0	**15**		**22**	305
05:30 PM	9	123	0	0	132	0	**3**														
05:45 PM	**14**	**126**	**0**	**0**	**140**	**1**	**1**	**7**	**0**	**9**	0	**138**	**3**	**0**	**141**	**8**	**0**	**11**	**0**	**19**	**309**
Total Volume	42	525	0	0	567	3	7	18	0	28	0	474	16	0	490	27	0	48	0	75	1160
% App. Total	7.4	92.6	0	0		10.7	25	64.3	0		0	96.7	3.3	0		36	0	64	0		
PHF	.750	.905	.000	.000	.892	.750	.583	.643	.000	.778	.000	.859	.667	.000	.869	.844	.000	.800	.000	.852	.939
Cars	41	505	0	0	546	3	6	18	0	27	0	452	16	0	468	26	0	46	0	72	1113
% Cars	97.6	96.2	0	0	96.3	100	85.7	100	0	96.4	0	95.4	100	0	95.5	96.3	0	95.8	0	96.0	95.9
Heavy Vehicles	1	20	0	0	21	0	1	0	0	1	0	22	0	0	22	1	0	2	0	3	47
% Heavy Vehicles	2.4	3.8	0	0	3.7	0	14.3	0	0	3.6	0	4.6	0	0	4.5	3.7	0	4.2	0	4.0	4.1

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 RR
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Cars

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	15	114	0	0	2	0	2	0	0	75	5	0	9	0	11	0	233
04:15 PM	12	112	0	0	3	2	5	0	0	67	4	0	11	0	9	0	225
04:30 PM	10	123	0	0	0	1	1	0	0	102	8	0	9	0	6	0	260
04:45 PM	19	114	0	0	0	1	1	0	0	102	3	0	10	0	5	0	255
Total	56	463	0	0	5	4	9	0	0	346	20	0	39	0	31	0	973
05:00 PM	5	125	0	0	1	0	3	0	0	99	6	0	4	0	12	0	255
05:15 PM	13	141	0	0	1	2	4	0	0	110	2	0	7	0	15	0	295
05:30 PM	9	118	0	0	0	3	4	0	0	109	5	0	7	0	9	0	264
05:45 PM	14	121	0	0	1	1	7	0	0	134	3	0	8	0	10	0	299
Total	41	505	0	0	3	6	18	0	0	452	16	0	26	0	46	0	1113
Grand Total	97	968	0	0	8	10	27	0	0	798	36	0	65	0	77	0	2086
Apprch %	9.1	90.9	0	0	17.8	22.2	60	0	0	95.7	4.3	0	45.8	0	54.2	0	
Total %	4.7	46.4	0	0	0.4	0.5	1.3	0	0	38.3	1.7	0	3.1	0	3.7	0	

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	5	125	0	0	130	**1**	0	3	0	4	0	99	**6**	0	105	4	0	12	0	16	255
05:15 PM	13	**141**	0	0	**154**	1	2	4	0	7	0	110	2	0	112	7	0	**15**		**22**	295
05:30 PM	9	118	0	0	127	0	**3**														
05:45 PM	**14**	**121**	**0**	**0**	**135**	**1**	**1**	**7**	**0**	**9**	0	**134**	**3**	**0**	**137**	**8**	**0**	**10**	**0**	**18**	**299**
Total Volume	41	505	0	0	546	3	6	18	0	27	0	452	16	0	468	26	0	46	0	72	1113
% App. Total	7.5	92.5	0	0		11.1	22.2	66.7	0		0	96.6	3.4	0		36.1	0	63.9	0		
PHF	.732	.895	.000	.000	.886	.750	.500	.643	.000	.750	.000	.843	.667	.000	.854	.813	.000	.767	.000	.818	.931

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 RR
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Heavy Vehicles

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	10	0	0	0	0	0	0	0	10	0	0	0	0	1	0	21
04:15 PM	1	5	0	0	0	0	0	0	0	6	0	0	0	0	1	0	13
04:30 PM	1	9	0	0	0	0	0	0	0	6	0	0	0	0	0	0	16
04:45 PM	0	7	0	0	0	0	0	0	0	8	0	0	0	0	0	0	15
Total	2	31	0	0	0	0	0	0	0	30	0	0	0	0	2	0	65
05:00 PM	0	6	0	0	0	1	0	0	0	6	0	0	1	0	1	0	15
05:15 PM	1	4	0	0	0	0	0	0	0	5	0	0	0	0	0	0	10
05:30 PM	0	5	0	0	0	0	0	0	0	7	0	0	0	0	0	0	12
05:45 PM	0	5	0	0	0	0	0	0	0	4	0	0	0	0	1	0	10
Total	1	20	0	0	0	1	0	0	0	22	0	0	1	0	2	0	47
Grand Total	3	51	0	0	0	1	0	0	0	52	0	0	1	0	4	0	112
Apprch %	5.6	94.4	0	0	0	100	0	0	0	100	0	0	20	0	80	0	
Total %	2.7	45.5	0	0	0	0.9	0	0	0	46.4	0	0	0.9	0	3.6	0	

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	**10**	0	0	**10**	0	0	0	0	0	0	**10**	**0**	**0**	**10**	0	0	**1**	**0**	**1**	**21**
04:15 PM	**1**																				
04:30 PM	**1**	**9**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**16**
04:45 PM	**0**	**7**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**15**
Total Volume	2	31	0	0	33	0	0	0	0	0	0	30	0	0	30	0	0	2	0	2	65
% App. Total	6.1	93.9	0	0		0	0	0	0		0	100	0	0		0	0	100	0		
PHF	.500	.775	.000	.000	.825	.000	.000	.000	.000	.000	.000	.750	.000	.000	.750	.000	.000	.500	.000	.500	.774

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
DATA
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 RR
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Kingsley Street From East				North Harvard Street From South				Franklin Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	1	4	0	2	0	0	0	9	0	2	1	2	0	0	2	4	27
04:15 PM	7	4	0	0	0	0	0	14	0	2	0	6	0	0	3	15	51
04:30 PM	2	5	0	1	0	1	0	6	0	3	0	1	0	0	5	14	38
04:45 PM	3	5	0	3	0	1	0	7	0	3	0	1	1	0	4	15	43
Total	13	18	0	6	0	2	0	36	0	10	1	10	1	0	14	48	159
05:00 PM	0	5	0	1	0	0	0	11	0	5	0	8	0	0	4	19	53
05:15 PM	1	3	0	7	0	0	0	2	0	3	0	4	1	0	2	19	42
05:30 PM	1	7	0	4	0	0	0	13	0	5	0	4	1	0	3	13	51
05:45 PM	0	2	0	3	0	0	0	5	0	1	0	2	0	0	2	25	40
Total	2	17	0	15	0	0	0	31	0	14	0	18	2	0	11	76	186
Grand Total	15	35	0	21	0	2	0	67	0	24	1	28	3	0	25	124	345
Apprch %	21.1	49.3	0	29.6	0	2.9	0	97.1	0	45.3	1.9	52.8	2	0	16.4	81.6	
Total %	4.3	10.1	0	6.1	0	0.6	0	19.4	0	7	0.3	8.1	0.9	0	7.2	35.9	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:45 PM

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:45 PM	**3**	**5**	**0**	**3**	**11**	**0**	**1**	**0**	**7**	**8**	**0**	**3**	**0**	**1**	**4**	**1**	**0**	**4**	**15**	**20**	**43**
05:00 PM	**0**	**5**	**0**	**1**	**6**	**0**	**0**	**0**	**11**	**11**	**0**	**5**	**0**	**8**	**13**	0	0	4	**19**	**23**	**53**
05:15 PM	1	3	0	**7**																	
05:30 PM	**1**	**7**	0	4	**12**	0	0	0	**13**	**13**	0	5	0	4	9	1	0	3	13	17	51
Total Volume	5	20	0	15	40	0	1	0	33	34	0	16	0	17	33	3	0	13	66	82	189
% App. Total	12.5	50	0	37.5		0	2.9	0	97.1		0	48.5	0	51.5		3.7	0	15.9	80.5		
PHF	.417	.714	.000	.536	.833	.000	.250	.000	.635	.654	.000	.800	.000	.531	.635	.750	.000	.813	.868	.891	.892

N/S: North Harvard Street
E/W: Kingsley Street/ Franklin Street
City, State: Boston, MA
Client: VHB/ K. Keen

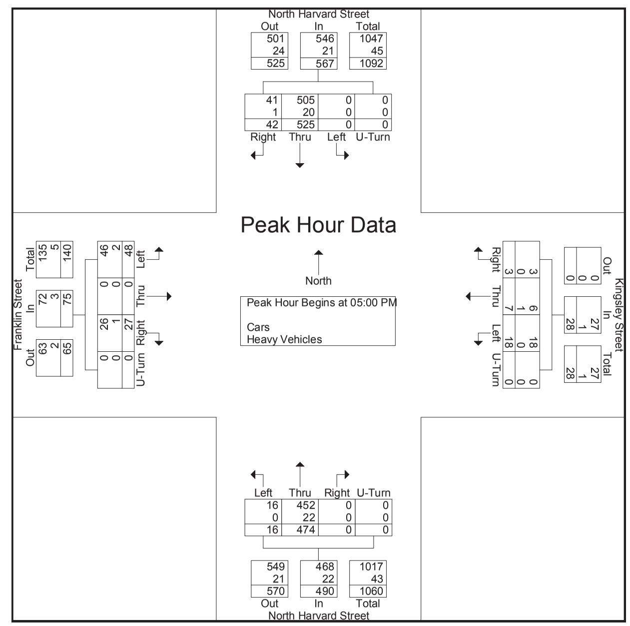
PRECISION
DATA
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 RR
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Kingsley Street From East					North Harvard Street From South					Franklin Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
05:00 PM	5	131	0	0	136	**1**	1	3	0	5	0	105	**6**	0	111	5	0	13	0	18	270
05:15 PM	**14**	**145**	0	0	**159**	1	2	4	0	7	0	115	2	0	117	7	0	**15**		**22**	305
05:30 PM	9	123	0	0	132	0	**3**														
05:45 PM	**14**	**126**	**0**	**0**	**140**	**1**	**1**	**7**	**0**	**9**	0	**138**	**3**	**0**	**141**	**8**	**0**	**11**	**0**	**19**	**309**
Total Volume	42	525	0	0	567	3	7	18	0	28	0	474	16	0	490	27	0	48	0	75	1160
% App. Total	7.4	92.6	0	0		10.7	25	64.3	0		0	96.7	3.3	0		36	0	64	0		
PHF	.750	.905	.000	.000	.892	.750	.583	.643	.000	.778	.000	.859	.667	.000	.869	.844	.000	.800	.000	.852	.939
Cars	41	505	0	0	546	3	6	18	0	27	0	452	16	0	468	26	0	46	0	72	1113
% Cars	97.6	96.2	0	0	96.3	100	85.7	100	0	96.4	0	95.4	100	0	95.5	96.3	0	95.8	0	96.0	95.9
Heavy Vehicles	1	20	0	0	21	0	1	0	0	1	0	22	0	0	22	1	0	2	0	3	47
% Heavy Vehicles	2.4	3.8	0	0	3.7	0	14.3	0	0	3.6	0	4.6	0	0	4.5	3.7	0	4.2	0	4.0	4.1



N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 S
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	94	1	0	0	0	0	0	1	66	0	0	4	0	2	0	168
07:15 AM	0	85	3	0	0	0	0	0	0	79	0	0	4	0	0	0	171
07:30 AM	0	95	1	1	0	0	0	0	2	90	0	0	4	0	1	0	194
07:45 AM	0	92	1	0	1	0	0	0	3	128	0	0	1	1	2	0	229
Total	0	366	6	1	1	0	0	0	6	363	0	0	13	1	5	0	762
08:00 AM	0	107	2	0	0	0	0	0	3	97	0	0	5	0	0	0	214
08:15 AM	0	96	2	0	0	0	0	0	1	123	0	0	6	0	1	0	229
08:30 AM	0	103	1	0	0	0	0	0	5	106	0	0	5	0	2	0	222
08:45 AM	0	116	2	0	0	0	0	0	2	135	0	0	5	0	0	0	260
Total	0	422	7	0	0	0	0	0	11	461	0	0	21	0	3	0	925
□rand Total	0	788	13	1	1	0	0	0	17	824	0	0	34	1	8	0	1687
Apprch %	0	98.3	1.6	0.1	100	0	0	0	2	98	0	0	79.1	2.3	18.6	0	
Total %	0	46.7	0.8	0.1	0.1	0	0	0	1	48.8	0	0	2	0.1	0.5	0	
Cars	0	708	13	1	1	0	0	0	17	736	0	0	34	1	8	0	1519
% Cars	0	89.8	100	100	100	0	0	0	100	89.3	0	0	100	100	100	0	90
Heavy Vehicles	0	80	0	0	0	0	0	0	0	88	0	0	0	0	0	0	168
% Heavy Vehicles	0	10.2	0	0	0	0	0	0	0	10.7	0	0	0	0	0	0	10

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	0	107	2	0	109	0	0	0	0	0	3	97	0	0	100	5	0	0	0	5	214
08:15 □M	0	96	2	0	98	0	0	0	0	0	1	123	0	0	124	6	0	1	0	7	229
08:30 AM	0	103	1	0	104	0	0	0	0	0	5							2			
08:45 □M	0	116	2	0	118	0	0	0	0	0	2	135	0	0	137	5	0	0	0	5	260
Total Volume	0	422	7	0	429	0	0	0	0	0	11	461	0	0	472	21	0	3	0	24	925
% App. Total	0	98.4	1.6	0		0	0	0	0		2.3	97.7	0	0		87.5	0	12.5	0		
PHF	.000	.909	.875	.000	.909	.000	.000	.000	.000	.000	.550	.854	.000	.000	.861	.875	.000	.375	.000	.857	.889
Cars	0	381	7	0	388	0	0	0	0	0	11	419	0	0	430	21	0	3	0	24	842
% Cars	0	90.3	100	0	90.4	0	0	0	0	0	100	90.9	0	0	91.1	100	0	100	0	100	91.0
Heavy Vehicles	0	41	0	0	41	0	0	0	0	0	0	42	0	0	42	0	0	0	0	0	83
% Heavy Vehicles	0	9.7	0	0	9.6	0	0	0	0	0	0	9.1	0	0	8.9	0	0	0	0	0	9.0

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 S
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Cars

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	84	1	0	0	0	0	0	1	55	0	0	4	0	2	0	147
07:15 AM	0	76	3	0	0	0	0	0	0	64	0	0	4	0	0	0	147
07:30 AM	0	84	1	1	0	0	0	0	2	81	0	0	4	0	1	0	174
07:45 AM	0	83	1	0	1	0	0	0	3	117	0	0	1	1	2	0	209
Total	0	327	6	1	1	0	0	0	6	317	0	0	13	1	5	0	677
08:00 AM	0	95	2	0	0	0	0	0	3	92	0	0	5	0	0	0	197
08:15 AM	0	89	2	0	0	0	0	0	1	105	0	0	6	0	1	0	204
08:30 AM	0	94	1	0	0	0	0	0	5	96	0	0	5	0	2	0	203
08:45 AM	0	103	2	0	0	0	0	0	2	126	0	0	5	0	0	0	238
Total	0	381	7	0	0	0	0	0	11	419	0	0	21	0	3	0	842
□rand Total	0	708	13	1	1	0	0	0	17	736	0	0	34	1	8	0	1519
Apprch %	0	98.1	1.8	0.1	100	0	0	0	2.3	97.7	0	0	79.1	2.3	18.6	0	
Total %	0	46.6	0.9	0.1	0.1	0	0	0	1.1	48.5	0	0	2.2	0.1	0.5	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 08:00 AM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
08:00 AM	0	95	2	0	97	0	0	0	0	0	3	92	0	0	95	5	0	0	0	5	197
08:15 □M	0	89	2	0	91	0	0	0	0	0	1	105	0	0	106	6	0	1	0	7	204
08:30 AM	0	94	1	0	95	0	0	0	0	0	5							2			
08:45 □M	0	103	2	0	105	0	0	0	0	0	2	126	0	0	128	5	0	0	0	5	238
Total Volume	0	381	7	0	388	0	0	0	0	0	11	419	0	0	430	21	0	3	0	24	842
% App. Total	0	98.2	1.8	0		0	0	0	0		2.6	97.4	0	0		87.5	0	12.5	0		
PHF	.000	.925	.875	.000	.924	.000	.000	.000	.000	.000	.550	.831	.000	.000	.840	.875	.000	.375	.000	.857	.884

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

File Name : 122864 S
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Heavy Vehicles

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	0	10	0	0	0	0	0	0	0	11	0	0	0	0	0	0	21
07:15 AM	0	9	0	0	0	0	0	0	0	15	0	0	0	0	0	0	24
07:30 AM	0	11	0	0	0	0	0	0	0	9	0	0	0	0	0	0	20
07:45 AM	0	9	0	0	0	0	0	0	0	11	0	0	0	0	0	0	20
Total	0	39	0	0	0	0	0	0	0	46	0	0	0	0	0	0	85
08:00 AM	0	12	0	0	0	0	0	0	0	5	0	0	0	0	0	0	17
08:15 AM	0	7	0	0	0	0	0	0	0	18	0	0	0	0	0	0	25
08:30 AM	0	9	0	0	0	0	0	0	0	10	0	0	0	0	0	0	19
08:45 AM	0	13	0	0	0	0	0	0	0	9	0	0	0	0	0	0	22
Total	0	41	0	0	0	0	0	0	0	42	0	0	0	0	0	0	83
□rand Total	0	80	0	0	0	0	0	0	0	88	0	0	0	0	0	0	168
Apprch %	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0	0	
Total %	0	47.6	0	0	0	0	0	0	0	52.4	0	0	0	0	0	0	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:00 AM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	0	10	0	0	10	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	21
07:15 AM	0	9	0	0	9	0	0	0	0	0	0	**15**	**0**	**0**	**15**	0	0	0	0	0	**24**
07:30 AM	0	**11**	0	0	**11**	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	20
07:45 AM	0	9	0	0	9	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	20
Total Volume	0	39	0	0	39	0	0	0	0	0	0	46	0	0	46	0	0	0	0	0	85
% App. Total	0	100	0	0		0	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.886	.000	.000	.886	.000	.000	.000	.000	.000	.000	.767	.000	.000	.767	.000	.000	.000	.000	.000	.885

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

File Name : 122864 S
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Peds and Bicycles

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	1	0	1	0	0	0	3	0	2	0	0	0	0	0	1	8
07:15 AM	0	1	0	0	0	0	0	5	0	4	0	0	0	0	0	5	15
07:30 AM	0	1	0	0	0	0	0	9	0	4	0	0	0	0	0	9	23
07:45 AM	0	3	0	1	0	0	0	10	1	1	0	0	0	1	0	12	29
Total	0	6	0	2	0	0	0	27	1	11	0	0	0	1	0	27	75
08:00 AM	0	1	0	2	0	0	0	7	0	2	0	0	0	0	0	6	18
08:15 AM	0	1	0	0	0	0	0	6	0	1	0	0	0	0	0	11	19
08:30 AM	0	1	0	0	0	0	0	4	0	9	0	0	0	0	0	9	23
08:45 AM	0	1	0	0	0	0	0	5	0	4	0	0	0	3	0	6	19
Total	0	4	0	2	0	0	0	22	0	16	0	0	0	3	0	32	79
□rand Total	0	10	0	4	0	0	0	49	1	27	0	0	0	4	0	59	154
Apprch %	0	71.4	0	28.6	0	0	0	100	3.6	96.4	0	0	0	6.3	0	93.7	
Total %	0	6.5	0	2.6	0	0	0	31.8	0.6	17.5	0	0	0	2.6	0	38.3	

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:30 AM

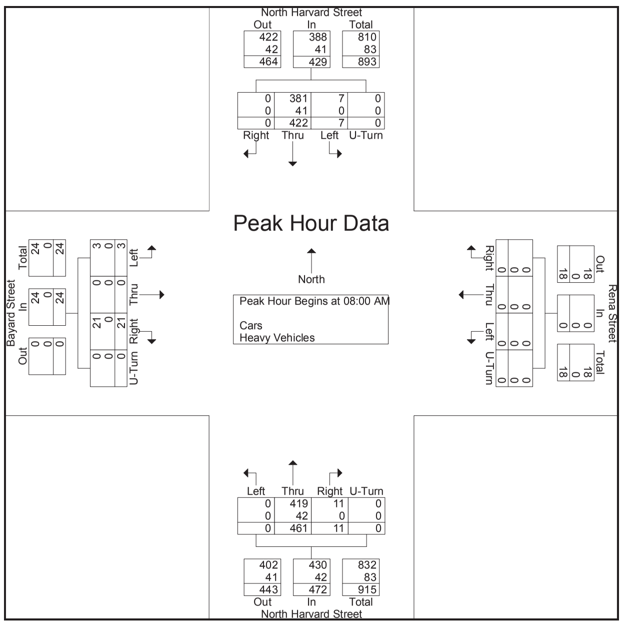
	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:30 AM	0	1	0	0	1	0	0	0	9	9	0	**4**	**0**	**0**	**4**	0	0	0	9	9	23
07:45 AM	0	**3**	0	1	**4**	0	0	0	**10**	**10**	**1**						**1**	0	**12**	**13**	**29**
08:00 AM	0	1	0	**2**																	
08:15 □M	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**6**	**6**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**11**	**11**	**19**
Total Volume	0	6	0	3	9	0	0	0	32	32	1	8	0	0	9	0	1	0	38	39	89
% App. Total	0	66.7	0	33.3		0	0	0	100		11.1	88.9	0	0		0	2.6	0	97.4		
PHF	.000	.500	.000	.375	.563	.000	.000	.000	.800	.800	.250	.500	.000	.000	.563	.000	.250	.000	.792	.750	.767

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 S
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	107	**2**	**0**	**109**	**0**	**0**	**0**	**0**	**0**	**3**	**97**	**0**	**0**	**100**	**5**	**0**	**0**	**0**	**5**	**214**
08:15 □M	**0**	**96**	**2**	**0**	**98**	**0**	**0**	**0**	**0**	**0**	**1**	**123**	**0**	**0**	**124**	**6**	**0**	**1**	**0**	**7**	229
08:30 AM	0	103	1	0	104	0	0	0	0	0	**5**							**2**			
08:45 □M	**0**	**116**	2	0	**118**	0	0	0	0	0	2	**135**	**0**	**0**	**137**	5	0	0	0	5	**260**
Total Volume	0	422	7	0	429	0	0	0	0	0	11	461	0	0	472	21	0	3	0	24	925
% App. Total	0	98.4	1.6	0		0	0	0	0		2.3	97.7	0	0		87.5	0	12.5	0		
PHF	.000	.909	.875	.000	.909	.000	.000	.000	.000	.000	.550	.854	.000	.000	.861	.875	.000	.375	.000	.857	.889
Cars	0	381	7	0	388	0	0	0	0	0	11	419	0	0	430	21	0	3	0	24	842
% Cars	0	90.3	100	0	90.4	0	0	0	0	0	100	90.9	0	0	91.1	100	0	100	0	100	91.0
Heavy Vehicles	0	41	0	0	41	0	0	0	0	0	0	42	0	0	42	0	0	0	0	0	83
% Heavy Vehicles	0	9.7	0	0	9.6	0	0	0	0	0	0	9.1	0	0	8.9	0	0	0	0	0	9.0



N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 SS
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Cars - Heavy Vehicles

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	138	1	0	0	0	0	0	0	94	0	0	6	0	1	0	240
04:15 PM	0	133	3	0	0	0	0	0	1	86	0	0	6	0	0	0	229
04:30 PM	0	141	0	0	0	0	0	0	4	109	0	0	7	0	2	0	263
04:45 PM	0	132	0	0	0	0	0	0	4	116	0	1	4	0	3	0	260
Total	0	544	4	0	0	0	0	0	9	405	0	1	23	0	6	0	992
05:00 PM	0	133	2	0	0	0	0	0	1	122	0	0	1	0	0	0	259
05:15 PM	0	157	1	1	0	0	0	0	4	117	0	0	4	0	1	0	285
05:30 PM	0	132	1	0	0	0	0	0	3	132	0	0	1	0	0	0	269
05:45 PM	0	139	2	0	1	1	0	0	0	128	0	0	3	0	1	0	275
Total	0	561	6	1	1	1	0	0	8	499	0	0	9	0	2	0	1088
□rand Total	0	1105	10	1	1	1	0	0	17	904	0	1	32	0	8	0	2080
Apprch %	0	99	0.9	0.1	50	50	0	0	1.8	98	0	0.1	80	0	20	0	
Total %	0	53.1	0.5	0	0	0	0	0	0.8	43.5	0	0	1.5	0	0.4	0	
Cars	0	1052	10	1	1	1	0	0	17	853	0	1	32	0	8	0	1976
% Cars	0	95.2	100	100	100	100	0	0	100	94.4	0	100	100	0	100	0	95
Heavy Vehicles	0	53	0	0	0	0	0	0	0	51	0	0	0	0	0	0	104
% Heavy Vehicles	0	4.8	0	0	0	0	0	0	0	5.6	0	0	0	0	0	0	5

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	133	**2**	**0**	**135**	**0**	**0**	**0**	**0**	**0**	**1**	**122**	**0**	**0**	**123**	**1**	**0**	**0**	**0**	**1**	**259**
05:15 PM	**0**	**157**	1	**1**	**159**	0	0	0	0	0	**4**	**117**	**0**	**0**	**121**	**4**	**0**	**1**	**0**	**5**	**285**
05:30 PM	0	132	1	0	133	0	0	0	0	0	3	**132**			**135**	1	0	0	0	1	269
05:45 PM	0	139	2	0	141	**1**	**1**			**2**	0	128	0	0	128	3	0	1	0	4	275
Total Volume	0	561	6	1	568	1	1	0	0	2	8	499	0	0	507	9	0	2	0	11	1088
% App. Total	0	98.8	1.1	0.2		50	50	0	0		1.6	98.4	0	0		81.8	0	18.2	0		
PHF	.000	.893	.750	.250	.893	.250	.250	.000	.000	.250	.500	.945	.000	.000	.939	.563	.000	.500	.000	.550	.954
Cars	0	539	6	1	546	1	1	0	0	2	8	477	0	0	485	9	0	2	0	11	1044
% Cars	0	96.1	100	100	96.1	100	100	0	0	100	100	95.6	0	0	95.7	100	0	100	0	100	96.0
Heavy Vehicles	0	22	0	0	22	0	0	0	0	0	0	22	0	0	22	0	0	0	0	0	44
% Heavy Vehicles	0	3.9	0	0	3.9	0	0	0	0	0	0	4.4	0	0	4.3	0	0	0	0	0	4.0

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 SS
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Cars

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	128	1	0	0	0	0	0	0	83	0	0	6	0	1	0	219
04:15 PM	0	128	3	0	0	0	0	0	1	80	0	0	6	0	0	0	218
04:30 PM	0	132	0	0	0	0	0	0	4	103	0	0	7	0	2	0	248
04:45 PM	0	125	0	0	0	0	0	0	4	110	0	1	4	0	3	0	247
Total	0	513	4	0	0	0	0	0	9	376	0	1	23	0	6	0	932
05:00 PM	0	126	2	0	0	0	0	0	1	116	0	0	1	0	0	0	246
05:15 PM	0	152	1	1	0	0	0	0	4	112	0	0	4	0	1	0	275
05:30 PM	0	127	1	0	0	0	0	0	3	125	0	0	1	0	0	0	257
05:45 PM	0	134	2	0	1	1	0	0	0	124	0	0	3	0	1	0	266
Total	0	539	6	1	1	1	0	0	8	477	0	0	9	0	2	0	1044
□rand Total	0	1052	10	1	1	1	0	0	17	853	0	1	32	0	8	0	1976
Apprch %	0	99	0.9	0.1	50	50	0	0	2	97.9	0	0.1	80	0	20	0	
Total %	0	53.2	0.5	0.1	0.1	0.1	0	0	0.9	43.2	0	0.1	1.6	0	0.4	0	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
05:00 PM	0	126	2	0	128	0	0	0	0	0	1	116	0	0	117	1	0	0	0	1	246
05:15 PM	0	152	1	1	154	0	0	0	0	0	4	112	0	0	116	4	0	1	0	5	275
05:30 PM	0	127	1	0	128	0	0	0	0	0	3	125			128	1	0	0	0	1	257
05:45 PM	0	134	2	0	136	1	1			2	0	124	0	0	124	3	0	1	0	4	266
Total Volume	0	539	6	1	546	1	1	0	0	2	8	477	0	0	485	9	0	2	0	11	1044
% App. Total	0	98.7	1.1	0.2		50	50	0	0		1.6	98.4	0	0		81.8	0	18.2	0		
PHF	.000	.887	.750	.250	.886	.250	.250	.000	.000	.250	.500	.954	.000	.000	.947	.563	.000	.500	.000	.550	.949

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 SS
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

□roups Printed- Heavy Vehicles

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	10	0	0	0	0	0	0	0	11	0	0	0	0	0	0	21
04:15 PM	0	5	0	0	0	0	0	0	0	6	0	0	0	0	0	0	11
04:30 PM	0	9	0	0	0	0	0	0	0	6	0	0	0	0	0	0	15
04:45 PM	0	7	0	0	0	0	0	0	0	6	0	0	0	0	0	0	13
Total	0	31	0	0	0	0	0	0	0	29	0	0	0	0	0	0	60
05:00 PM	0	7	0	0	0	0	0	0	0	6	0	0	0	0	0	0	13
05:15 PM	0	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	10
05:30 PM	0	5	0	0	0	0	0	0	0	7	0	0	0	0	0	0	12
05:45 PM	0	5	0	0	0	0	0	0	0	4	0	0	0	0	0	0	9
Total	0	22	0	0	0	0	0	0	0	22	0	0	0	0	0	0	44
□rand Total	0	53	0	0	0	0	0	0	0	51	0	0	0	0	0	0	104
Apprch %	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0	0	
Total %	0	51	0	0	0	0	0	0	0	49	0	0	0	0	0	0	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:00 PM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
04:00 PM	0	10	0	0	10	0	0	0	0	0	0	11	0	0	11	0	0	0	0	0	21
04:15 PM	0	5	0	0	5	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	11
04:30 PM	0	9	0	0	9	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	15
04:45 PM	0	7	0	0	7	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	13
Total Volume	0	31	0	0	31	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	60
% App. Total	0	100	0	0		0	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.775	.000	.000	.775	.000	.000	.000	.000	.000	.000	.659	.000	.000	.659	.000	.000	.000	.000	.000	.714

N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 SS
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Groups Printed- Peds and Bicycles

	North Harvard Street From North				Rena Street From East				North Harvard Street From South				Bayard Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	4	0	1	0	0	0	5	0	2	0	0	3	0	0	2	17
04:15 PM	0	4	0	4	0	0	0	10	0	0	0	0	0	0	0	11	29
04:30 PM	1	5	0	1	0	0	0	5	0	1	1	0	0	0	0	9	23
04:45 PM	1	6	0	1	0	0	0	8	0	0	0	0	0	0	0	10	26
Total	2	19	0	7	0	0	0	28	0	3	1	0	3	0	0	32	95
05:00 PM	0	4	0	0	0	0	0	4	0	0	0	0	0	0	0	10	18
05:15 PM	0	4	0	2	0	0	0	9	0	3	0	0	0	0	0	13	31
05:30 PM	1	6	0	1	0	0	0	6	0	1	0	0	0	0	1	9	25
05:45 PM	0	2	0	0	0	0	0	6	0	1	0	0	0	0	0	23	32
Total	1	16	0	3	0	0	0	25	0	5	0	0	0	0	1	55	106
Grand Total	3	35	0	10	0	0	0	53	0	8	1	0	3	0	1	87	201
Apprch %	6.2	72.9	0	20.8	0	0	0	100	0	88.9	11.1	0	3.3	0	1.1	95.6	
Total %	1.5	17.4	0	5	0	0	0	26.4	0	4	0.5	0	1.5	0	0.5	43.3	

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 PM	0	4	0	0	4	0	0	0	4	4	0	0	0	0	0	0	0	0	10	10	18
05:15 PM	0	4	0	**2**	**6**	**0**	**0**	**0**	**9**	**9**	0	**3**	**0**	**0**	**3**	0	0	0	13	13	31
05:30 PM	**1**	**6**	0	1	**8**	0	0	0	6	6	0	1	0	0	1	0	0	**1**			
05:45 PM	**0**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**6**	**6**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**23**	**23**	**32**
Total Volume	1	16	0	3	20	0	0	0	25	25	0	5	0	0	5	0	0	1	55	56	106
% App. Total	5	80	0	15		0	0	0	100		0	100	0	0		0	0	1.8	98.2		
PHF	.250	.667	.000	.375	.625	.000	.000	.000	.694	.694	.000	.417	.000	.000	.417	.000	.000	.250	.598	.609	.828

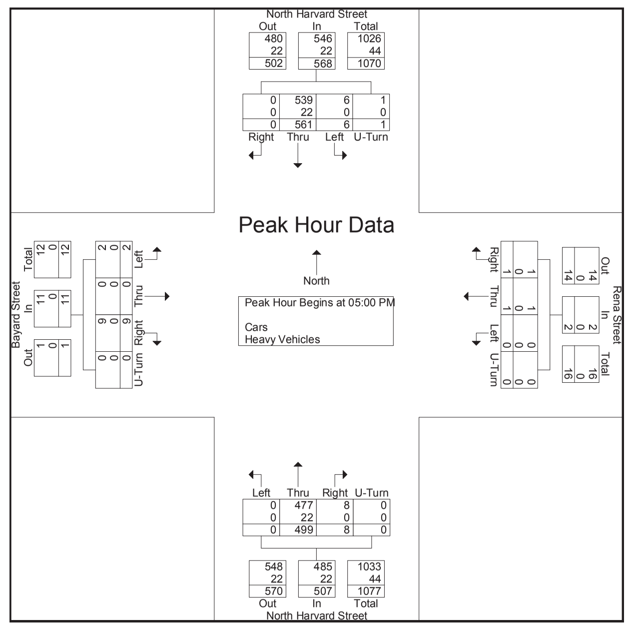
N/S: North Harvard Street
E/W: Rena Street/ Bayard Street
City, State: Boston, MA
Client: VHB/ K. Keen

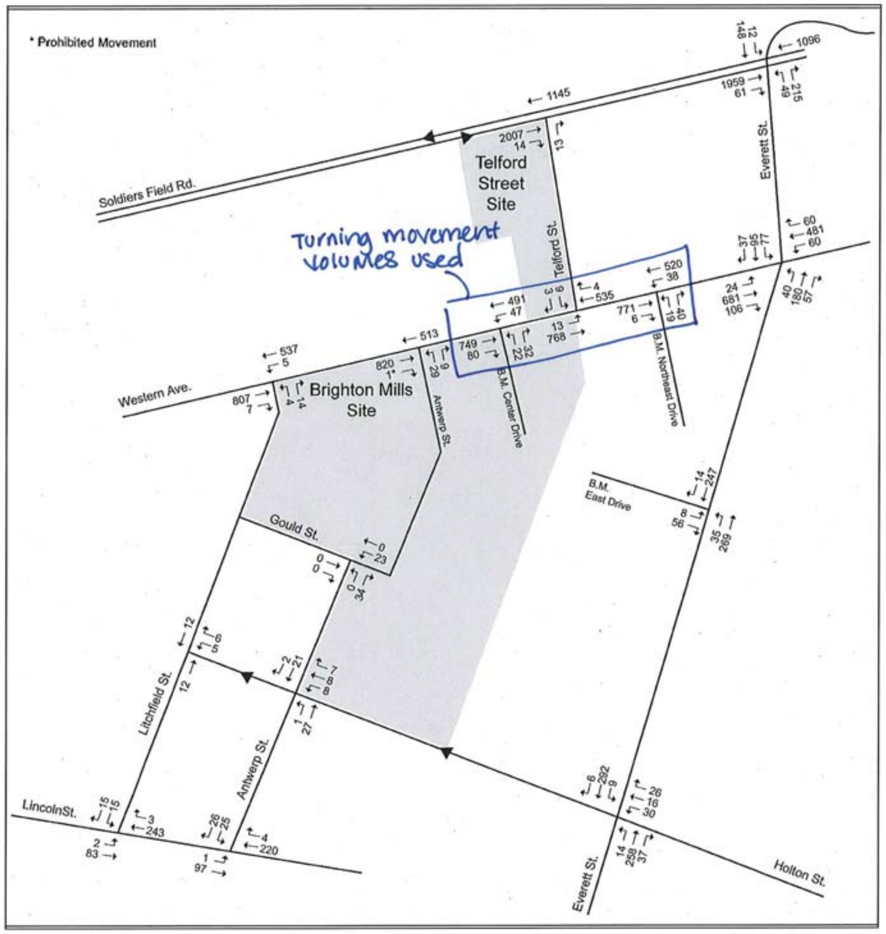
PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 122864 SS
Site Code : 10463.00
Start Date : 4/5/2012
Page No : 1

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 05:00 PM

	North Harvard Street From North					Rena Street From East					North Harvard Street From South					Bayard Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
05:00 PM	0	133	**2**	**0**	**135**	**0**	**0**	**0**	**0**	**0**	**1**	**122**	**0**	**0**	**123**	**1**	**0**	**0**	**0**	**1**	**259**
05:15 PM	**0**	**157**	1	**1**	**159**	0	0	0	0	0	**4**	**117**	**0**	**0**	**121**	**4**	**0**	**1**	**0**	**5**	**285**
05:30 PM	0	132	1	0	133	0	0	0	0	0	3	**132**			**135**	1	0	0	0	1	269
05:45 PM	0	139	2	0	141	**1**	**1**			**2**	0	128	0	0	128	3	0	1	0	4	275
Total Volume	0	561	6	1	568	1	1	0	0	2	8	499	0	0	507	9	0	2	0	11	1088
% App. Total	0	98.8	1.1	0.2		50	50	0	0		1.6	98.4	0	0		81.8	0	18.2	0		
PHF	.000	.893	.750	.250	.893	.250	.250	.000	.000	.250	.500	.945	.000	.000	.939	.563	.000	.500	.000	.550	.954
Cars	0	539	6	1	546	1	1	0	0	2	8	477	0	0	485	9	0	2	0	11	1044
% Cars	0	96.1	100	100	96.1	100	100	0	0	100	100	95.6	0	0	95.7	100	0	100	0	100	96.0
Heavy Vehicles	0	22	0	0	22	0	0	0	0	0	0	22	0	0	22	0	0	0	0	0	44
% Heavy Vehicles	0	3.9	0	0	3.9	0	0	0	0	0	0	4.4	0	0	4.3	0	0	0	0	0	4.0

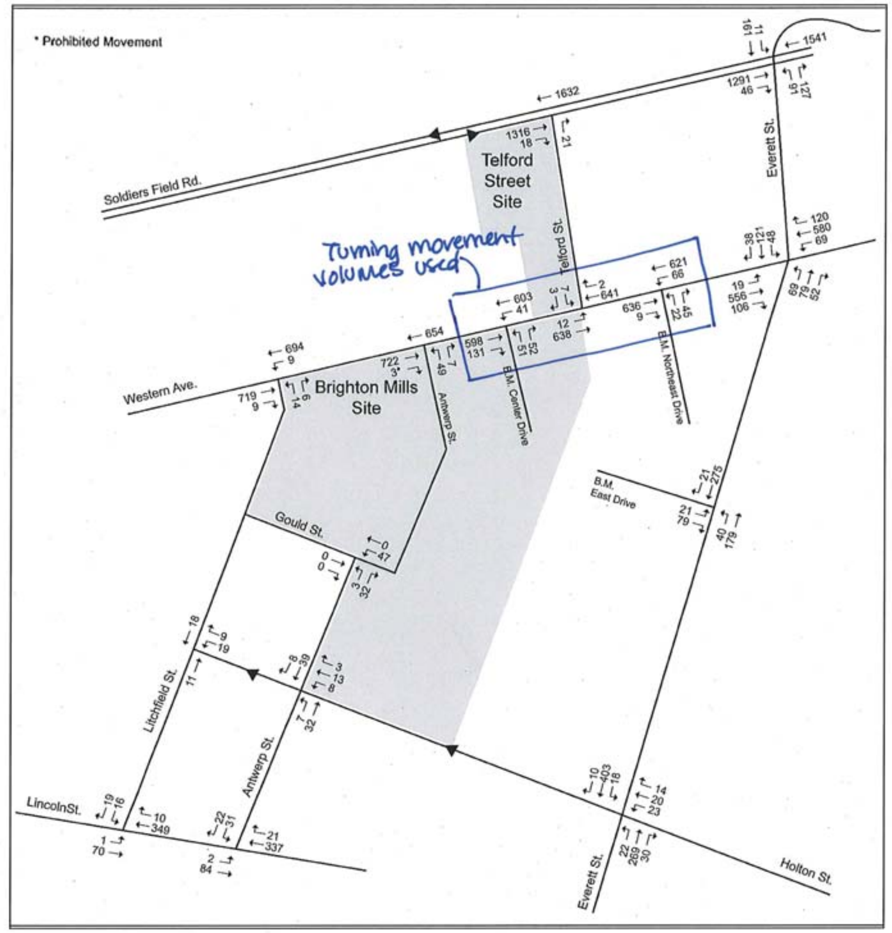




Charlesview Redevelopment DPIR Allston, Massachusetts

The Community Builders, Inc. Epsilon Howard/Stein-Hudson Associates, Inc. A TRANSPORTATION CONSULTING FIRM

Figure 3-2
Existing Conditions (2009) Turning Movement Volumes, a.m. Peak Hour (7:45-8:45 a.m.)



Charlesview Redevelopment DPIR Allston, Massachusetts

The Community Builders, Inc. Epsilon Howard/Stein-Hudson Associates, Inc. A TRANSPORTATION CONSULTING FIRM

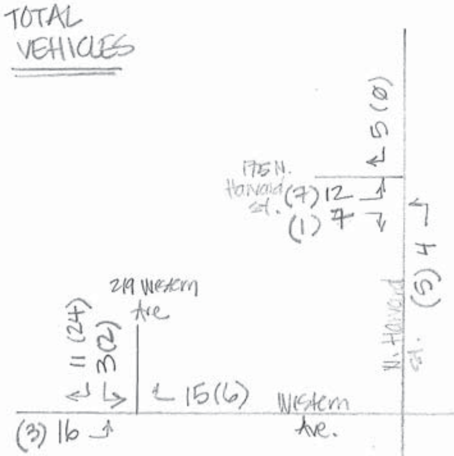
Figure 3-3
Existing Conditions (2009) Turning Movement Volumes, p.m. Peak Hour (5:00-6:00 p.m.)

VHB *Computations*

Project:		Project #	10467.00
Location:		Sheet	of
Calculated by:	NLH	Date:	9.6.12
Checked by:		Date:	
Title	2012 Driveway Counts		

↑ N

TOTAL VEHICLES



XX = AM (8-9)
(XX) = PM (5-6)

CARS ONLY

XX = AM (8-9)
(XX) = PM (5-6)

MASSACHUSETTS HIGHWAY DEPARTMENT - STATEWIDE TRAFFIC DATA COLLECTION

2008 WEEKDAY SEASONAL FACTORS *

* Note: These are weekday factors. The average of the factors for the year will not equal 1, as weekend data are not considered.

FACTOR GROUP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GROUP 1 - WEST INTERSTATE	0.96	0.94	0.89	0.88	0.87	0.85	0.91	0.92	0.90	0.90	0.91	0.93
Use group 2 for R5, R6, & R0												
GROUP 2 - RURAL MAJOR COLLECTOR (R-5)	1.10	1.09	1.07	1.00	0.91	0.87	0.88	0.88	0.89	0.91	1.02	1.06
GROUP 3A - RECREATIONAL **(1-4) See below	1.25	1.21	1.17	1.06	0.96	0.86	0.78	0.79	0.93	1.00	1.08	1.14
GROUP 3B - RECREATIONAL ***(5) See below	1.26	1.23	1.17	1.08	0.97	0.87	0.74	0.74	0.94	0.99	1.11	1.15
GROUP 4 - I-495 INTERSTATE	1.03	1.02	1.01	0.96	0.95	0.89	0.87	0.84	0.91	0.93	0.98	1.01
GROUP 5 - EAST INTERSTATE	1.02	1.00	0.98	0.94	0.95	0.91	0.91	0.89	0.93	0.94	0.98	1.01
Use group 6 for U2, U3, U5, U6, U0, R2, & R3												
GROUP 6 - URBAN ARTERIALS, COLLECTORS & RURAL ARTERIALS (R-2, R-3)	1.02	1.00	0.96	0.93	0.91	0.90	0.92	0.91	0.92	0.93	0.96	0.98
GROUP 7 - I-84 PROXIMITY (STA. 17)	0.84	1.15	1.17	1.08	1.10	1.02	1.01	0.96	1.06	1.06	1.11	1.15
GROUP 8 - I-295 PROXIMITY (STA. 6590)	0.95	1.01	0.95	0.92	0.88	0.88	0.91	0.86	0.91	0.93	0.94	0.94
GROUP 9 - I-195 PROXIMITY (STA. 7)	1.09	1.04	1.01	0.96	0.91	0.86	0.83	0.82	0.89	0.94	1.02	1.00

RECREATIONAL: (ALL YEARS)

****GROUP 3A:**

1. CAPE COD (ALL TOWNS)
2. PLYMOUTH(SOUTH OF RTE.3A)

7014, 7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108,7178

3. MARTHA'S VINEYARD
4. NANTUCKET

*****GROUP 3B:**

5. PERMANENTS 2 & 189

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,
1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,
1105,1106,1107,1108,1113,1114,1116,2196,2197,2198

2008 AXLE CORRECTION FACTORS

ROAD INVENTORY FUNCTIONAL CLASSIFICATION	AXLE CORRECTION FACTOR
RURAL	
1	0.91
2	0.94
3	0.97
0,5,6	0.98
URBAN	
1	0.96
2,3	0.97
5	0.99
0,6	0.99
I-84	0.83

Apply I-84 factor to stations: 3290,3921,3929

ROUND OFF

0 - 999.............10
> 1,000..........100

Vehicle Crash Data
MassDOT Crash Data
MassDOT Crash Rate Worksheets

MassDOT Crash Data

Intersection	Crash ID	Town	Year	Crash Date	Crash Time	Crash Severity	Total Vehicles	Total Injured	Total Fatals	Collision manner	Road Surface	Lighting	Weather	Street	Intersection	Distance From Nearest Intersection	Vehicles Travel Directions	Most Harmful Events	Vehicle Action Prior to Crash	Vehicle Configuration	Non Motorist Type	X Coordinate	Y Coordinate
1	2558966	BOSTON (BRIGHTON)	2009	12/31/2009	12:40 PM	Not Reported	2	0	0	Not reported	Snow	Daylight	Snow/Sleet, hail (freezing rain or drizzle)			360 WESTERN AVENUE	V1:Not reported / V2:Not reported	V1: Collision with parked motor vehicle / V2: Not reported	V1: Not reported / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car		229876.7601	901443.711
1	2714585	BOSTON (BRIGHTON)	2010	(Wed)10/13/2010	9:10 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear/Clear			365 WESTERN AVENUE	V1:Westbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires		229850.5958	901439.0127
2	2497046	BOSTON (BRIGHTON)	2008	7/19/2008	11:11 PM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	Dry	Dawn	Clear			WESTERN AVENUE / EVERETT STREET	V1:Northbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Not reported	V1: Not reported / V2:Not reported		230039.6252	901472.5
2	2530961	BOSTON (BRIGHTON)	2008	7/18/2008	6:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	SOLDIERS FIELD PARK / EVERETT STREET / WESTERN AVENUE	SOLDIERS FIELD PARK / EVERETT STREET / WESTERN AVENUE		V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Motorcycle		230039.6252	901472.5
2	2517007	BOSTON	2008	6/8/2008	4:45 AM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	Dry	Daylight	Clear	WESTERN AVENUE / EVERETT STREET	WESTERN AVENUE / EVERETT STREET		V1:Westbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car		230039.6252	901472.5
2	2457823	BOSTON (BRIGHTON)	2008	4/11/2008	7:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear			WESTERN AVENUE / EVERETT STREET	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car		230039.6252	901472.5
2	2483998	BOSTON (ALLSTON)	2008	6/13/2008	10:20 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear			305 WESTERN AVENUE	V1:Not reported / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Parked / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car		230046.4502	901473.8095
2	2438238	BOSTON (ALLSTON)	2008	5/13/2008	5:15 AM	Non-fatal injury	2	1	0	Rear-end	Dry	Daylight	Clear			100 feet E from Intersection 252 WESTERN AVENUE / EVERETT STREET	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires		230069.5591	901478.2435
2	2533102	BOSTON (BRIGHTON)	2009	10/19/2009	1:11 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear	WESTERN AVENUE / EVERETT STREET	WESTERN AVENUE / EVERETT STREET		V1:Eastbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Not reported	V1: Overtaking/passing / V2:Turning right	V1: Not reported / V2:Not reported		230039.6252	901472.5
2	2617468	BOSTON (ALLSTON)	2009	5/21/2009	9:20 AM	Property damage only (none injured)	2	0	0	Not reported	Wet	Daylight	Cloudy	EVERETT STREET / WESTERN AVENUE	EVERETT STREET / WESTERN AVENUE		V1:Southbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Entering traffic lane	V1: Not reported / V2:Not reported		230039.6252	901472.5
2	2603619	BOSTON (BRIGHTON)	2009	4/21/2009	8:30 PM	Property damage only (none injured)	2	0	0	Rear-end	Wet	Dark - lighted roadway	Rain			312 WESTERN AVENUE / EVERETT STREET	V1:Westbound / V2:Westbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Slowing or stopped in traffic	V1: Passenger car / V2:Passenger car		230039.6252	901472.5
2	2565011	BOSTON (ALLSTON)	2010	1/5/2010	11:00 AM	Not Reported	2	0	0	Rear-end	Wet	Daylight	Snow/Other	WESTERN AVENUE / EVERETT STREET	WESTERN AVENUE / EVERETT STREET		V1:Not reported / V2:Not reported	V1: Not reported / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car		230039.6252	901472.5
5	2484403	BOSTON (ALLSTON)	2008	9/17/2008	1:30 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	WESTERN AVENUE / NORTH HARVARD STREET	WESTERN AVENUE / NORTH HARVARD STREET		V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires		230498.9685	901476.9375
5	2462799	BOSTON (ALLSTON)	2008	7/24/2008	6:05 AM	Property damage only (none injured)	1	0	0	Sideswipe, opposite direction	Wet	Daylight	Rain	WESTERN AVENUE / NORTH HARVARD STREET	WESTERN AVENUE / NORTH HARVARD STREET		V1:Southbound	V1: Not reported	V1: Turning left	V1: Not reported	P2:Pedalcyclist (bicycle, tricycle, unicycle, pedal car)	230498.9685	901476.9375
5	2511552	BOSTON (ALLSTON)	2008	7/11/2008	4:15 PM	Not Reported	2	0	0	Sideswipe, same direction	Dry	Daylight	Clear			NORTH HARVARD STREET / WESTERN AVENUE	V1:Northbound / V2:Northbound	V1: Not reported / V2: Not reported	V1: Turning right / V2:Travelling straight ahead	V1: Not reported / V2:Not reported		230498.9685	901476.9375
5	2297388	BOSTON	2008	2/15/2008	11:10 PM	Non-fatal injury	2	2	0	Angle	Dry	Dark - lighted roadway	Clear	NORTH HARVARD STREET / WESTERN AVENUE	NORTH HARVARD STREET / WESTERN AVENUE		V1:Northbound / V2:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Travelling straight ahead / V2:Travelling straight ahead	V1: Passenger car / V2:Passenger car		230498.9685	901476.9375
5	2454831	BOSTON (ALLSTON)	2008	1/29/2008	7:22 AM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Clear	WESTERN AVENUE / NORTH HARVARD STREET	WESTERN AVENUE / NORTH HARVARD STREET		V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Not reported	V1: Passenger car / V2:Passenger car		230498.9685	901476.9375
5	2454729	BOSTON (ALLSTON)	2008	1/29/2008	7:15 PM	Non-fatal injury	2	1	0	Head-on	Dry	Dusk	Clear	WESTERN AVENUE / NORTH HARVARD STREET	WESTERN AVENUE / NORTH HARVARD STREET		V1:Northbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Not reported		230498.9685	901476.9375
5	2644667	BOSTON (ALLSTON)	2010	9/1/2010	4:15 PM	Non-fatal injury	3	1	0	Rear-end	Dry	Daylight	Clear/Clear	NORTH HARVARD STREET / WESTERN AVENUE	NORTH HARVARD STREET / WESTERN AVENUE		V1:Northbound / V2:Northbound / V3:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	V1: Turning left / V2:Turning left / V3:Slowing or stopped in traffic	V1: Truck/trailer / V2:Passenger car / V3:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires		230498.9685	901476.9375
5	2599600	BOSTON (ALLSTON)	2010	5/11/2010	6:05 PM	Non-fatal injury	2	1	0	Angle	Dry	Daylight	Clear/Clear			219 WESTERN AVENUE / NORTH HARVARD STREET	V1:Westbound / V2:Eastbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Turning left	V1: Passenger car / V2:Passenger car		230498.9685	901476.9375
5	2628465	BOSTON (ALLSTON)	2010	3/7/2010	7:25 PM	Unknown	1	0	0	Head-on	Dry	Dark - lighted roadway	Clear/Clear	NORTH HARVARD STREET / WESTERN AVENUE	NORTH HARVARD STREET / WESTERN AVENUE		V1:Eastbound	V1: Collision with pedestrian	V1: Travelling straight ahead	V1: Passenger car	P3:Pedestrian	230498.9685	901476.9375
5	2721481	BOSTON (ALLSTON)	2010	1/15/2010	6:20 AM	Property damage only (none injured)	1	0	0	Sideswipe, opposite direction	Dry	Dark - lighted roadway	Clear	WESTERN AVENUE / WESTERN AVENUE / NORTH HARVARD STREET	WESTERN AVENUE / WESTERN AVENUE / NORTH HARVARD STREET		V1:Northbound	V1: Not reported	V1: Turning left	V1: Passenger car	P2:Pedestrian	230498.9685	901476.9375
5	2733653	BOSTON (BRIGHTON)	2010	1/14/2010	7:30 AM	Non-fatal injury	2	1	0	Angle	Dry	Dark - lighted roadway	Clear	WESTERN AVENUE / NORTH HARVARD STREET	WESTERN AVENUE / NORTH HARVARD STREET		V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning left / V2:Not reported	V1: Passenger car / V2:Not reported		230498.9685	901476.9375
8	2653382	BOSTON (ALLSTON)	2010	10/10/2010	2:50 PM	Not Reported	1	0	0	Unknown	Dry	Daylight	Clear			65 NORTH HARVARD STREET	V1:Not reported	V1: Not reported	V1: Not reported	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	P3:Pedalcyclist (bicycle, tricycle, unicycle, pedal car)	230854.4908	901852.14
10	2597385	BOSTON (ALLSTON)	2010	5/9/2010	5:00 PM	Not Reported	2	0	0	Rear-end	Dry	Dusk	Clear/Clear	NORTH HARVARD STREET / FRANKLIN STREET	NORTH HARVARD STREET / FRANKLIN STREET		V1:Not reported / V2:Not reported	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Passenger car / V2:Light truck(van, mini-van, panel, pickup, sport utility) with only four tires		230445.0155	901338.9376
11	2478252	BOSTON (ALLSTON)	2008	12/24/2008	1:00 PM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	STORROW DRIVE / NORTH HARVARD STREET / BAYARD STREET	STORROW DRIVE / NORTH HARVARD STREET / BAYARD STREET		V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1: Not reported / V2:Passenger car		230498.9214	901240.8824
11	2441837	BOSTON (ALLSTON)	2008	4/1/2008	9:45 AM	Not Reported	2	0	0	Angle	Dry	Daylight	Clear	BAYARD STREET / NORTH HARVARD STREET	BAYARD STREET / NORTH HARVARD STREET		V1:Eastbound / V2:Not reported	V1: Not reported / V2: Not reported	V1: Turning right / V2:Parked	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car		230498.9214	901240.8824
11	2610766	BOSTON (ALLSTON)	2009	3/1/2009	11:15 AM	Property damage only (none injured)	2	0	0	Rear-end	Dry	Daylight	Clear	NORTH HARVARD STREET / BAYARD STREET	NORTH HARVARD STREET / BAYARD STREET		V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	V1: Travelling straight ahead / V2:Making U-turn	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Not reported		230498.9214	901240.8824

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston (Brighton), MA COUNT DATE : 4/3/2012 & 4/5/2012

DISTRICT : 6 UNSIGNALIZED : [ ] SIGNALIZED : [X]

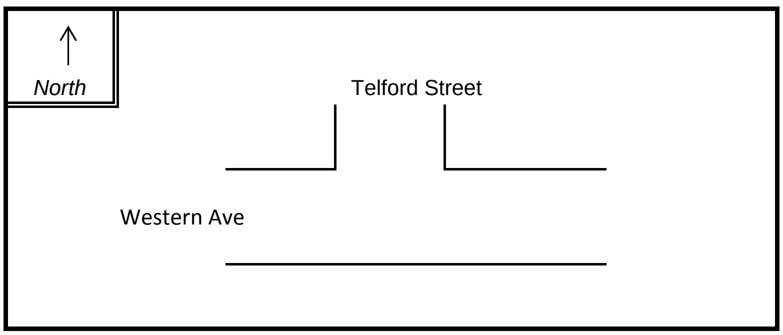
0.57 0.77

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : Telford Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (PM) :	100	10	740	800		1,650

" K " FACTOR : 0.077 INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : 21,429

TOTAL # OF CRASHES : 2 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : 0.67

CRASH RATE CALCULATION : 0.09 RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$ (

Comments : 2007 - 2009 MassDOT Crash Data

Project Title & Date: 10463.00 Samuels Barrys Corner

massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston (Brighton), MA   COUNT DATE : 4/3/2012 & 4/5/2012

DISTRICT : 6   UNSIGNALIZED : [ ]   SIGNALIZED : X

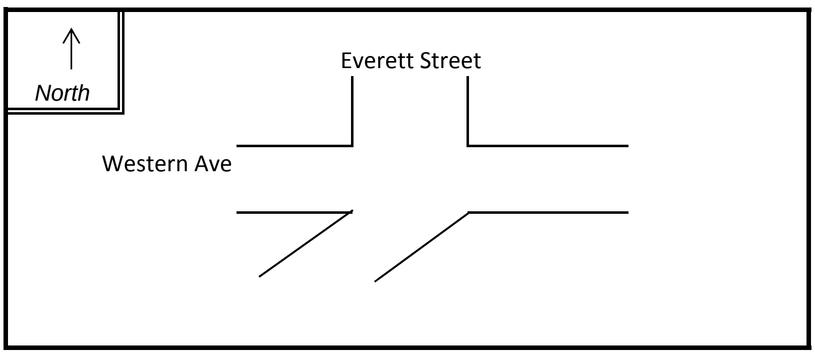
0.57   0.77

~ INTERSECTION DATA ~

MAJOR STREET : Western Ave

MINOR STREET(S) : Everett Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (PM) :	299	251	741	741		**2,032**

" K " FACTOR : **0.090**   INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **22,578**

TOTAL # OF CRASHES : 10   # OF YEARS : 3   AVERAGE # OF CRASHES PER YEAR (**A**) : **3.33**

CRASH RATE CALCULATION : **0.40**   RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2008 - 2010 MassDOT Crash Data

Project Title & Date: 10463.00 Samuels Barrys Corner

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston (Allston), MA COUNT DATE : 4/3/2012 & 4/5/2012

DISTRICT : 6 UNSIGNALIZED : [ ] SIGNALIZED : [X]

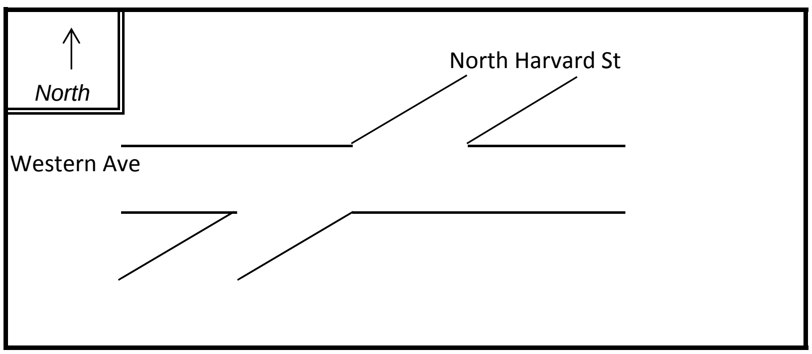
0.57 0.77

~ INTERSECTION DATA ~

MAJOR STREET : Western Ave

MINOR STREET(S) : North Harvard Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

	1	2	3	4	5	Total Peak Hourly Approach Volume
APPROACH :	1	2	3	4	5	
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (PM) :	526	412	537	462		**1,937**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **21,522**

TOTAL # OF CRASHES : 11 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **3.67**

CRASH RATE CALCULATION : **0.47** RATE = $\frac{(A * 1,000,000)}{(V * 365)}$

Comments : 2008 - 2010 MassDOT Crash Data

Project Title & Date: 10463.00 Samuels Barrys Corner

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston (Allston), MA COUNT DATE : 4/3/2012 &4/5/2012

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

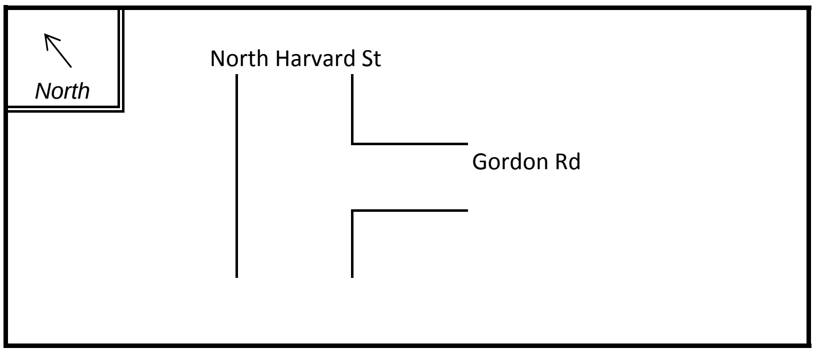
0.57 0.77

~ INTERSECTION DATA ~

MAJOR STREET : North Harvard Street

MINOR STREET(S) : Gordon Road

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (PM) :	523	413	106			**1,042**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **11,578**

TOTAL # OF CRASHES : 1 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.33**

CRASH RATE CALCULATION : **0.08** RATE = $\frac{(A * 1{,}000{,}000)}{V * 365)}$ (

Comments : 2008 - 2010 MassDOT Crash Data

Project Title & Date: 10463.00 Samuels Barrys Corner

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston (Allston), MA COUNT DATE : 4/3/2012 & 4/5/2012

DISTRICT : 6 UNSIGNALIZED : [ ] 0.57 SIGNALIZED : [X] 0.77

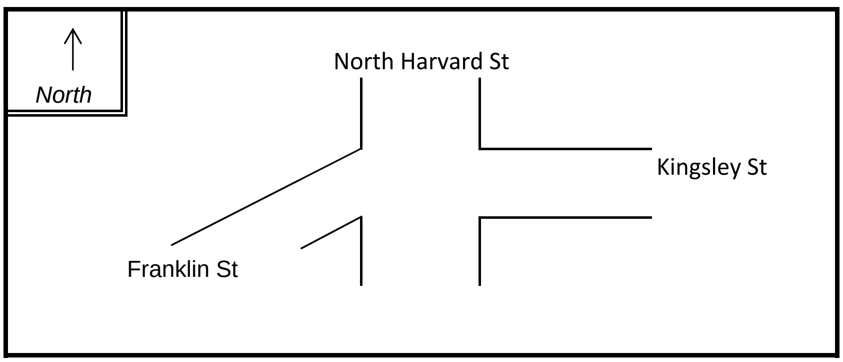
~ INTERSECTION DATA ~

MAJOR STREET : North Harvard Street

MINOR STREET(S) : Franklin Street

Kingsley Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	**Total Peak Hourly Approach Volume**
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (PM) :	490	567	28	75		**1,160**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **12,889**

TOTAL # OF CRASHES : 1 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.33**

CRASH RATE CALCULATION : **0.07** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2008 - 2010 MassDOT Crash Data

Project Title & Date: 10463.00 Samuels Barrys Corner

massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Boston (Allston), MA   COUNT DATE : 4/3/2012 & 4/5/2012

DISTRICT : 6   UNSIGNALIZED : X (0.57)   SIGNALIZED : (0.77)

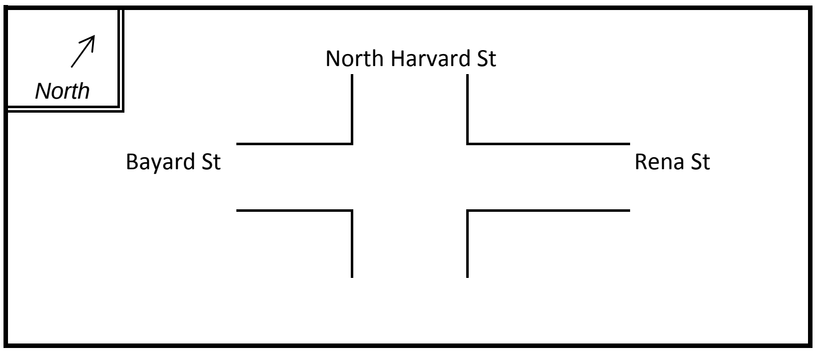
~ INTERSECTION DATA ~

MAJOR STREET : North Harvard Street

MINOR STREET(S) : Bayard Street

Rena Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (PM) :	507	568	2	11		**1,088**

" K " FACTOR : **0.090**   INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **12,089**

TOTAL # OF CRASHES : 3   # OF YEARS : 3   AVERAGE # OF CRASHES PER YEAR (**A**) : **1.00**

CRASH RATE CALCULATION : **0.23**   RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2008 - 2010 MassDOT Crash Data

Project Title & Date: 10463.00 Samuels Barrys Corner

Transit

MBTA Bus Schedules and Ridership

66 WEEKDAY

INBOUND				OUTBOUND			
Leave Harvard/ Dawes Island	Lv/Arrive Union Square	Arrive Brookline Village	Arrive Dudley Station	Leave Dudley Station	Arrive Brookline Village	Arrive Union Square	Arrive Harvard/ Dawes Island
5:00A	5:08A	5:19A	5:28A	4:45A	4:52A	5:01A	5:19A
5:30	5:38	5:49	5:58	5:15	5:22	5:31	5:49
5:45	5:53	6:06	6:20	5:30	5:37	5:46	6:04
6:00	6:10	6:24	6:38	5:45	5:52	6:01	6:19
6:17	6:27	6:41	6:55	6:00	6:10	6:21	6:39
6:28	6:38	6:52	7:08	★	★	★	★
6:39	6:49	7:04	7:22	8:45	9:01	9:19	9:35
6:48	6:58	7:16	7:34	8:54	9:08	9:26	9:42
6:55	7:05	7:23	7:41	9:04	9:17	9:35	9:51
★	★	★	★	9:14	9:27	9:45	10:01
9:15	9:25	9:41	9:56	9:29	9:42	10:00	10:16
9:24	9:34	9:50	10:05	9:44	9:57	10:15	10:31
9:35	9:45	10:01	10:16	10:00	10:13	10:31	10:47
9:47	9:57	10:13	10:28	10:16	10:29	10:47	11:03
9:59	10:09	10:25	10:40	10:32	10:45	11:03	11:19
10:12	10:22	10:38	10:53	10:48	11:01	11:19	11:35
10:25	10:35	10:51	11:07	11:04	11:17	11:35	11:51
10:41	10:51	11:09	11:26	11:20	11:33	11:51	12:07P
10:57	11:08	11:28	11:45	11:36	11:49	12:07P	12:23
11:13	11:24	11:44	12:01P	11:52	12:05P	12:23	12:39
11:29	11:40	12:00N	12:17				
11:45	11:56	12:16P	12:33	12:08P	12:21P	12:39P	12:55P
				12:24	12:37	12:55	1:13
12:01P	12:12P	12:32P	12:49P	12:40	12:53	1:12	1:31
12:17	12:28	12:48	1:05	12:54	1:08	1:27	1:46
12:33	12:44	1:04	1:21	1:08	1:23	1:42	2:01
12:49	1:00	1:20	1:37	1:20	1:35	1:54	2:13
1:05	1:16	1:36	1:53	1:30	1:45	2:04	2:23
1:20	1:31	1:51	2:08	1:40	1:55	2:14	2:33
1:35	1:46	2:06	2:23	1:50	2:05	2:24	2:43
1:50	2:01	2:21	2:38	2:00	2:15	2:34	2:53
2:00	2:11	2:31	2:48	2:10	2:25	2:44	3:03
2:10	2:21	2:41	2:58	2:20	2:35	2:54	3:13
2:20	2:31	2:51	3:08	2:30	2:45	3:04	3:23
2:30	2:41	3:01	3:18	2:40	2:55	3:14	3:33
2:40	2:51	3:11	3:28	2:50	3:05	3:24	3:43
2:50	3:01	3:21	3:38	3:00	3:15	3:34	3:53
3:00	3:11	3:31	3:48	★	★	★	★
★	★	★	★	5:30	5:47	6:05	6:22
6:00	6:12	6:31	6:45	5:40	5:57	6:14	6:31
6:10	6:22	6:41	6:55	5:50	6:04	6:21	6:38
6:20	6:32	6:51	7:05	6:00	6:12	6:29	6:46
6:30	6:42	7:01	7:13	6:10	6:22	6:39	6:56
6:40	6:52	7:09	7:21	6:20	6:32	6:49	7:06
6:50	7:02	7:17	7:29	6:30	6:42	6:59	7:16
7:00	7:12	7:27	7:39	6:40	6:52	7:09	7:26
7:15	7:27	7:42	7:54	6:50	7:02	7:19	7:36
7:30	7:42	7:57	8:09	7:00	7:12	7:29	7:46
7:45	7:57	8:12	8:24	7:20	7:32	7:49	8:05
8:00	8:12	8:27	8:39	7:40	7:52	8:07	8:22
8:15	8:27	8:42	8:54	8:00	8:10	8:24	8:39
8:30	8:42	8:57	9:09	8:20	8:30	8:44	8:59
8:45	8:57	9:11	9:22	8:40	8:50	9:04	9:19
9:05	9:16	9:30	9:41	9:00	9:10	9:24	9:39
9:25	9:36	9:50	10:01	9:20	9:30	9:44	9:59
9:45	9:56	10:10	10:21	9:40	9:50	10:04	10:18
10:05	10:16	10:30	10:41	10:00	10:09	10:20	10:34
10:20	10:31	10:45	10:56	10:20	10:29	10:40	10:54
10:40	10:51	11:04	11:14	10:40	10:49	11:00	11:14
11:00	11:08	11:20	11:30	11:00	11:09	11:20	11:34
11:20	11:28	11:40	11:50	11:20	11:29	11:40	11:54
11:40	11:48	12:00M	12:10A	11:40	11:49	12:00M	12:14A
12:00M	12:08A	12:20A	12:30	12:05A	12:12A	12:22A	12:36
12:30	12:38	12:50	1:00	12:35	12:42	12:52	1:06
w 1:00	1:08	1:20	1:30	w 1:05	1:12	1:22	1:36

66 SATURDAY

INBOUND			OUTBOUND		
Leave Harvard/ Dawes Island	Arrive Union Square	Arrive Dudley Station	Leave Dudley Station	Arrive Union Square	Arrive Harvard/ Dawes Island
4:40A	4:47A	5:03A	4:42A	4:58A	5:10A
5:12	5:19	5:35	5:12	5:28	5:40
5:42	5:49	6:06	5:42	5:58	6:11
6:00	6:08	6:29	6:12	6:31	6:44
6:15	6:23	6:44	6:32	6:51	7:04
6:30	6:38	6:59	6:47	7:07	7:21
6:48	6:56	7:17	7:02	7:22	7:36
7:06	7:14	7:35	7:15	7:35	7:49
7:19	7:27	7:48	7:30	7:50	8:04
7:32	7:40	8:01	7:45	8:05	8:19
7:45	7:53	8:15	8:00	8:20	8:34
8:00	8:09	8:33	8:15	8:35	8:49
Every	*15 Mins.*	*Until*	*Every*	*15 Mins.*	*Until*
10:30	10:40	11:08	10:30	10:56	11:15
10:45	10:55	11:26	10:45	11:16	11:35
11:00	11:11	11:42	11:00	11:32	11:51
11:15	11:26	11:57	11:15	11:47	12:07P
11:30	11:41	12:15P	11:30	12:03P	12:24
11:45	11:56	12:31	11:45	12:18	12:39
12:05P	12:17P	12:53P	12:00N	12:33P	12:54P
12:20	12:32	1:08	12:15P	12:48	1:09
12:35	12:47	1:23	12:30	1:03	1:24
12:45	12:57	1:33	12:45	1:18	1:39
1:00	1:12	1:48	1:00	1:33	1:54
1:15	1:27	2:03	1:15	1:48	2:09
1:30	1:42	2:18	1:30	2:03	2:24
Every	*15 Mins.*	*Until*	*Every*	*15 Mins.*	*Until*
4:30	4:42	5:18	4:45	5:14	5:35
4:50	5:02	5:38	5:00	5:29	5:50
5:10	5:22	5:58	5:15	5:44	6:05
5:30	5:42	6:18	5:35	6:04	6:25
5:50	6:02	6:38	5:55	6:24	6:45
6:10	6:22	6:58	6:15	6:44	7:04
6:30	6:42	7:15	6:35	7:03	7:20
6:50	7:02	7:32	6:55	7:20	7:37
7:10	7:22	7:52	7:15	7:40	7:57
7:30	7:42	8:12	7:35	8:00	8:17
7:50	8:02	8:32	7:55	8:20	8:37
8:10	8:22	8:52	8:15	8:40	8:57
8:30	8:42	9:11	8:35	9:00	9:17
8:50	9:02	9:28	8:55	9:20	9:37
9:10	9:22	9:48	9:15	9:40	9:57
9:30	9:42	10:08	9:35	10:00	10:15
9:50	10:02	10:28	9:55	10:17	10:32
10:08	10:20	10:46	10:13	10:35	10:50
10:26	10:38	11:04	10:31	10:53	11:08
10:44	10:56	11:20	10:49	11:11	11:26
11:02	11:13	11:37	11:07	11:29	11:44
11:20	11:31	11:55	11:25	11:47	12:02A
11:38	11:49	12:13A	11:43	12:05A	12:19
11:56	12:07A	12:31	12:01A	12:20	12:34
12:14A	12:25	12:49	12:19	12:38	12:52
12:32	12:43	1:07	12:40	12:59	1:13
w 1:00	1:11	1:35	w 1:10	1:29	1:37

w - Waits for last Red Line or Silver Line vehicle to arrive at station.

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Route 66
Harvard Square - Dudley Station
via Allston & Brookline Village

66 SUNDAY

INBOUND			OUTBOUND		
Leave Harvard/ Dawes Island	Arrive Union Square	Arrive Dudley Station	Leave Dudley Station	Arrive Union Square	Arrive Harvard/ Dawes Island
6:23A	6:30A	6:49A	5:50A	6:09A	6:20A
6:45	6:52	7:13	6:10	6:29	6:40
7:05	7:12	7:33	6:30	6:49	7:00
7:25	7:32	7:53	6:45	7:04	7:15
7:45	7:52	8:14	7:05	7:24	7:35
8:00	8:09	8:31	7:20	7:39	7:50
8:15	8:24	8:46	7:40	7:59	8:10
8:35	8:44	9:06	8:00	8:19	8:30
8:55	9:04	9:30	8:20	8:39	8:50
9:10	9:19	9:45	8:35	8:54	9:06
Every	*20 Mins.*	*Until*	8:50	9:11	9:24
11:30	11:40	12:09P	9:10	9:32	9:45
11:50	12:00N	12:33	9:30	9:52	10:05
			9:45	10:10	10:24
12:10P	12:22P	12:55P	10:00	10:29	10:43
12:30	12:42	1:15	*Every*	*20 Mins.*	*Until*
12:50	1:02	1:35	11:40	12:10P	12:27P
1:08	1:20	1:53			
1:26	1:38	2:11	12:00N	12:31P	12:48P
1:44	1:56	2:29	12:20P	12:51	1:08
2:02	2:14	2:47	12:40	1:11	1:28
2:20	2:32	3:05	1:00	1:31	1:48
2:38	2:50	3:23	1:20	1:51	2:08
2:56	3:08	3:41	1:40	2:11	2:28
3:14	3:26	3:59	1:59	2:30	2:47
3:31	3:43	4:16	2:18	2:49	3:05
3:48	4:00	4:31	2:36	3:07	3:22
4:05	4:16	4:47	2:54	3:23	3:38
4:22	4:33	5:04	3:12	3:40	3:55
4:40	4:51	5:22	3:30	3:58	4:13
4:58	5:09	5:40	3:48	4:16	4:31
5:15	5:26	5:57	4:06	4:34	4:49
5:32	5:43	6:14	4:24	4:52	5:07
5:50	6:01	6:32	4:42	5:10	5:25
6:10	6:21	6:52	5:00	5:28	5:43
Every	*20 Mins.*	*Until*	*Every*	*20 Mins.*	*Until*
10:10	10:18	10:40	8:40	9:01	9:12
10:30	10:38	11:00	8:55	9:15	9:26
10:50	10:58	11:20	*Every*	*20 Mins.*	*Until*
11:10	11:18	11:40	11:15	11:31	11:41
11:30	11:38	12:00M	11:35	11:51	12:01A
12:00M	12:08A	12:30A	11:55	12:11A	12:21
12:30	12:38	1:00	12:30A	12:46	12:56
w 1:00	1:08	1:30	w 1:00	1:16	1:26

★ EVERY 10 MINUTES OR LESS

FARES

PAYING WITH...	1-BUS TRIP	2-BUS TRIP	BUS + SUBWAY TRIP
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free, if using a guide, the guide rides free.

VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); and express bus, zoned, interzoned, and boat passes.

* Available to students through participating middle schools and high schools.
** Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Summer 2012 Holidays

July 4 : See Sunday **September 3 : See Sunday**

70/70A WEEKDAY

INBOUND

Leave Cedarwood	Leave North Waltham	Arrive Watertown Sq.	Arrive University Park
5:30A	.....	5:48A	6:18A
5:50	.....	6:08	6:38
6:10	.....	6:28	6:58
.....	g 6:10A	6:40	7:10
6:30	.....	6:48	7:18
d 6:45	.....	7:04	7:29
7:00	.....	7:21	7:55
.....	g 6:55	7:30	8:06
7:18	.....	7:39	8:13
7:27	.....	7:48	8:22
e 7:44	.....	7:55	8:30
.....	g 7:29	8:05	8:41
7:52	.....	8:13	8:47
8:00	.....	8:21	8:55
.....	g 7:55	8:31	9:06
8:20	.....	8:41	9:16
e 8:39	.....	8:50	9:25
.....	g 8:28	9:02	9:33
9:04	.....	9:21	9:54
9:10	.....	9:27	10:00
.....	g 9:00	9:29	10:00
9:30	.....	9:47	10:20
.....	g 9:25	9:54	10:25
9:50	.....	10:07	10:40
.....	g 9:55	10:24	10:55
10:20	.....	10:37	11:10
10:40	.....	10:57	11:30
11:05	.....	11:22	11:55
.....	g 11:05	11:38	12:10P
11:30	.....	11:47	12:19
11:55	.....	12:14P	12:48
12:15P	.....	12:34P	1:08P
.....	g 12:08P	12:41	1:13
12:45	.....	1:04	1:38
1:10	.....	1:29	2:03
.....	h 1:25	1:49	2:21
1:40	.....	1:59	2:33
2:00	.....	2:19	2:53
2:25	.....	2:44	3:18
.....	h 2:30	2:54	3:30
2:50	.....	3:09	3:43
e 3:18	.....	3:29	4:04
3:15	.....	3:34	4:07
.....	h 3:30	3:55	4:32
3:45	.....	4:04	4:39
4:05	.....	4:27	5:02
e 4:26	.....	4:38	5:16
4:28	.....	4:50	5:25
.....	h 4:30	4:58	5:35
e 4:55	.....	5:07	5:45
4:56	.....	5:18	5:53
.....	h 4:58	5:26	6:02
e 5:24	.....	5:36	6:14
5:25	.....	5:47	6:24
.....	h 5:28	5:56	6:27
5:55	.....	6:13	6:48
.....	h 6:00	6:22	6:52
6:15	.....	6:32	7:05
6:26	.....	6:43	7:13
.....	h 6:30	6:52	7:22
6:42	.....	6:59	7:28
6:55	.....	7:11	7:40
.....	h 7:00	7:22	7:52
7:15	.....	7:30	7:59
7:28	.....	7:43	8:11
.....	h 7:30	7:52	8:22
7:45	.....	8:00	8:25
8:00	.....	8:13	8:38
8:15	.....	8:28	8:53
8:30	.....	8:43	9:08
9:05	.....	9:18	9:43
9:35	.....	9:48	10:13
10:05	.....	10:18	10:43
10:40	.....	10:53	11:18
11:25	.....	11:38	12:03A
12:05A	.....	12:18A	12:43
b 12:40	.....	12:50	b 1:18

OUTBOUND

Leave University Park	Arrive Watertown Sq.	Arrive North Waltham	Arrive Cedarwood
4:50A	5:03A	.....	5:26A
5:05	5:18	.....	5:41
5:20	5:33	.....	5:56
g 5:30	5:43	6:06A	.....
5:40	5:53	.....	6:17
5:55	6:09	.....	6:33
g 6:03	6:20	6:46	.....
6:11	6:28	.....	6:52
g 6:21	6:38	7:06	.....
6:30	6:47	.....	7:14
6:34	6:51	.....	7:19
6:45	7:03	.....	7:34
g 6:53	7:13	7:48	.....
b 7:00	7:16	.....	b 7:30
7:02	7:23	.....	7:54
7:15	7:36	.....	8:07
g 7:30	7:51	8:26	.....
b 7:45	8:01	.....	b 8:15
g 8:00	8:21	8:56	.....
8:10	8:31	.....	9:02
8:20	8:41	.....	9:12
g 8:30	8:51	9:19	.....
8:45	9:06	.....	9:37
g 9:00	9:21	9:49	.....
9:15	9:36	.....	10:07
9:30	9:51	.....	10:22
9:50	10:11	.....	10:42
g 10:10	10:31	10:59	.....
10:30	10:51	.....	11:22
10:50	11:11	.....	11:42
g 11:10	11:31	12:03P	.....
11:20	11:41	.....	12:11P
11:40	12:01P	.....	12:31
12:00N	12:24P	.....	12:54P
h 12:15P	12:39	1:22P	.....
12:35	12:59	.....	1:29
12:55	1:19	.....	1:49
h 1:15	1:39	2:21	.....
1:25	1:49	.....	2:19
1:45	2:09	.....	2:39
2:08	2:32	.....	3:03
h 2:20	2:44	3:25	.....
2:30	2:54	.....	e 3:12
2:40	3:04	.....	3:38
3:00	3:26	.....	4:00
h 3:10	3:36	4:21	.....
3:22	3:48	.....	4:22
3:30	3:56	.....	e 4:15
h 3:40	4:06	4:53	.....
3:50	4:16	.....	4:50
4:00	4:26	.....	e 4:45
h 4:10	4:36	5:23	.....
4:20	4:46	.....	5:20
4:30	4:56	.....	e 5:15
h 4:40	5:06	5:53	.....
4:50	5:16	.....	5:50
5:00	5:26	.....	6:00
h 5:10	5:36	6:12	.....
5:20	5:46	.....	6:17
5:30	5:56	.....	6:26
h 5:40	6:05	6:35	.....
5:50	6:15	.....	6:44
6:05	6:29	.....	6:58
h 6:15	6:39	7:09	.....
6:25	6:49	.....	7:15
6:40	7:03	.....	7:28
7:00	7:20	.....	7:45
7:15	7:35	.....	8:00
7:35	7:55	.....	8:20
8:10	8:30	.....	8:55
8:40	9:00	.....	9:25
9:15	9:35	.....	10:00
9:50	10:10	.....	10:35
10:35	10:55	.....	11:17
11:20	11:36	.....	11:57
12:10A	12:26A	.....	e 12:38A
aw 1:04	1:29	.....	.....

Shaded trips are route 70A

Running time between Central Sq., Cambridge and University Pk. is appr. 5 mins.

70/70A SATURDAY

INBOUND

Leave Cedarwood	Leave North Waltham	Arrive Watertown Sq.	Arrive University Park
5:40A	.....	5:58A	6:17A
6:12	.....	6:30	6:49
d 7:00	.....	7:18	d 7:32
7:35	.....	7:53	8:12
.....	g 8:01A	8:32	8:51
8:35	.....	8:53	9:14
.....	g 9:05	9:35	9:58
9:45	.....	10:07	10:30
.....	g 10:02	10:32	10:55
e 10:35	.....	10:47	11:10
10:40	.....	11:02	11:25
e 11:00	.....	11:12	11:35
.....	g 10:57	11:27	11:54
e 11:25	.....	11:37	12:04P
11:25	.....	11:46	12:13
e 11:45	.....	11:56	12:23
.....	g 11:37	12:06P	12:33
e 12:05P	.....	12:16P	12:43P
12:05	.....	12:26	12:53
e 12:25	.....	12:36	1:03
.....	g 12:17P	12:46	1:13
e 12:45	.....	12:56	1:23
12:45	.....	1:06	1:33
e 1:05	.....	1:16	1:43
.....	h 1:05	1:26	1:53
e 1:25	.....	1:36	2:03
1:25	.....	1:46	2:13
e 1:45	.....	1:56	2:23
.....	h 1:45	2:06	2:33
e 2:05	.....	2:16	2:43
2:05	.....	2:26	2:53
e 2:25	.....	2:36	3:03
.....	h 2:25	2:46	3:13
e 2:45	.....	2:56	3:23
2:45	.....	3:06	3:33
e 3:05	.....	3:16	3:43
.....	h 3:05	3:26	3:53
e 3:25	.....	3:36	4:03
3:25	.....	3:46	4:13
e 3:45	.....	3:56	4:23
.....	h 3:45	4:06	4:33
b 4:05	.....	4:16	b 4:38
4:05	.....	4:26	4:53
e 4:25	.....	4:36	5:03
.....	h 4:25	4:46	5:13
e 4:45	.....	4:56	5:23
4:45	.....	5:06	5:33
e 5:05	.....	5:16	5:43
.....	h 5:05	5:26	5:53
e 5:25	.....	5:36	6:03
5:25	.....	5:46	6:13
e 5:45	.....	5:56	6:23
.....	h 5:45	6:06	6:33
e 6:05	.....	6:16	6:43
6:05	.....	6:26	6:53
e 6:25	.....	6:36	7:03
.....	h 6:21	6:42	7:09
e 6:45	.....	6:56	7:23
6:45	.....	7:06	7:33
e 7:05	.....	7:16	7:43
.....	h 7:01	7:22	7:49
e 7:25	.....	7:36	8:03
7:25	.....	7:46	8:08
b 7:45	.....	7:56	b 8:11
.....	h 7:41	8:01	8:20
7:50	.....	8:09	8:28
8:15	.....	8:33	8:52
b 8:39	.....	8:48	b 9:02
d 8:45	.....	9:03	d 9:17
b 9:20	.....	9:29	b 9:43
d 9:45	.....	10:03	d 10:17
d 10:15	.....	10:33	d 10:47
d 10:50	.....	11:08	d 11:22
d 11:50	.....	12:08A	d 12:22A
b 12:45A	.....	12:54	b 1:08

OUTBOUND

Leave University Park	Leave Watertown Sq.	Arrive North Waltham	Arrive Cedarwood
5:00A	5:18A	.....	5:39A
5:32	5:50	.....	6:11
6:20	6:38	.....	6:59
6:52	7:10	.....	7:31
g 7:20	7:38	8:00A	.....
d 7:55	8:10	.....	8:31
g 8:25	8:43	9:03	.....
8:55	9:18	.....	9:43
g 9:18	9:41	10:01	.....
9:45	10:08	.....	10:33
9:55	10:18	.....	e 10:31
g 10:05	10:28	10:48	.....
10:15	10:38	.....	e 10:51
10:25	10:48	.....	11:13
g 10:35	10:58	11:18	.....
10:45	11:08	.....	e 11:21
10:55	11:18	.....	11:43
11:05	11:28	.....	e 11:41
g 11:15	11:39	12:03P	.....
11:25	11:50	.....	e 12:03P
11:35	12:00N	.....	12:25
11:45	12:10P	.....	e 12:23
h 11:55	12:20	12:52	.....
12:05P	12:30P	.....	e 12:43P
12:15	12:40	.....	1:05
12:25	12:50	.....	e 1:03
h 12:35	1:00	1:32P	.....
12:45	1:10	.....	e 1:23
12:55	1:20	.....	1:45
1:05	1:30	.....	e 1:43
h 1:15	1:40	2:12	.....
1:25	1:50	.....	e 2:03
1:35	2:00	.....	2:25
1:45	2:10	.....	e 2:23
h 1:55	2:20	2:52	.....
2:05	2:30	.....	e 2:43
2:15	2:40	.....	3:05
2:25	2:50	.....	e 3:03
h 2:35	3:00	3:32	.....
2:45	3:10	.....	e 3:23
2:55	3:20	.....	3:45
3:05	3:30	.....	e 3:43
h 3:15	3:40	4:12	.....
3:25	3:50	.....	e 4:03
3:35	4:00	.....	4:25
3:45	4:10	.....	e 4:23
h 3:55	4:20	4:52	.....
4:05	4:30	.....	e 4:43
4:15	4:40	.....	5:05
4:25	4:50	.....	e 5:03
h 4:35	5:00	5:32	.....
4:45	5:10	.....	e 5:23
d 4:55	5:17	.....	5:42
5:05	5:30	.....	e 5:43
h 5:15	5:40	6:12	.....
5:25	5:50	.....	e 6:03
5:35	6:00	.....	6:25
5:45	6:10	.....	e 6:23
h 5:55	6:20	6:52	.....
6:05	6:30	.....	e 6:43
6:15	6:40	.....	7:05
6:25	6:50	.....	e 7:03
h 6:35	7:00	7:32	.....
6:45	7:10	.....	e 7:23
6:55	7:20	.....	7:45
7:05	7:30	.....	e 7:43
7:25	7:50	.....	8:12
7:45	8:05	.....	e 8:17
8:05	8:23	.....	8:44
8:35	8:53	.....	e 9:05
d 9:05	9:20	.....	9:41
d 9:38	9:53	.....	10:14
d 10:05	10:20	.....	10:41
d 11:10	11:25	.....	11:46
b 12:15A	12:30A	.....	b 12:42A
aw 1:10A	1:25	.....	.....

70 SUNDAY

INBOUND

Leave Cedarwood Waltham	Arrive Watertown Square	Arrive University Park
6:45A	7:02A	d 7:20A
7:45	8:04	d 8:25
8:45	9:06	d 9:27
9:55	10:16	d 10:37
10:25	10:44	11:14
11:00	11:19	11:49
11:40	11:59	12:29P
12:00N	12:19P	12:49P
12:20P	12:39	1:09
Every	*20 Mins.*	*Until*
1:40	1:59	2:29
1:55	2:14	2:44
2:10	2:29	2:59
2:30	2:49	3:19
2:50	3:09	3:39
3:10	3:29	3:59
3:30	3:49	4:19
3:45	4:04	4:34
4:00	4:19	4:49
4:20	4:39	5:09
4:40	4:59	5:29
5:00	5:19	5:49
5:20	5:39	6:07
5:35	5:54	6:21
5:50	6:08	6:34
6:05	6:22	6:48
6:25	6:42	7:08
6:45	7:02	7:28
7:05	7:22	7:48
7:20	7:37	8:03
7:35	7:52	8:18
7:50	8:07	8:33
8:05	8:22	8:48
8:40	8:53	d 9:14
9:15	9:28	d 9:49
9:43	9:56	d 10:17
10:45	10:58	d 11:19
11:47	12:00M	d 12:21A
b 12:41A	12:48A	b 1:07

OUTBOUND

Leave University Park	Arrive Watertown Square	Arrive Cedarwood Waltham
d 6:05A	6:17A	6:40A
d 7:05	7:17	7:40
d 8:05	8:17	8:40
d 9:05	9:21	9:48
d 9:35	9:51	10:18
d 10:05	10:21	10:48
d 10:45	11:01	11:28
d 11:05	11:21	11:48
11:25	11:46	12:12P
11:45	12:06P	12:32
12:05P	12:26P	12:52P
12:25	12:46	1:12
12:45	1:06	1:32
1:00	1:21	1:47
1:15	1:36	2:02
1:35	1:56	2:22
1:55	2:16	2:42
2:15	2:36	3:02
2:35	2:56	3:22
2:50	3:11	3:37
3:05	3:26	3:52
Every	*20Mins.*	*Until*
4:25	4:46	5:12
4:40	5:01	5:27
4:55	5:16	5:42
5:15	5:36	6:02
5:35	5:56	6:20
5:55	6:14	6:38
6:15	6:34	6:58
6:30	6:49	7:13
6:45	7:04	7:28
7:00	7:19	7:43
7:15	7:34	7:58
7:55	8:14	8:38
8:25	8:44	9:08
d 9:05	9:17	9:41
d 10:05	10:17	10:41
d 11:05	11:17	11:41
b 12:10A	12:22A	b 12:36A
aw 1:10	1:22	.....

a - Central Sq., Cambridge - Watertown Square.
b - To or from Central Sq., Waltham - Central Sq., Cambridge.
d - To or from Central Sq., Cambridge
e - To or from Central Sq., Waltham - University Park.
g - A.M. Route - via Totten Pond Rd. & Wyman St. outbound; via Smith St. & Trapelo Rd. inbound.
h - P.M. Route - via Smith St. & Trapelo Rd. outbound; via Totten Pond Rd. & Wyman St. inbound.
w - Waits for last train to arrive at Central Sq. Sta.

170 WEEKDAY

INBOUND Leave Central Sq. Waltham	Arrive Back Bay	Arrive Dudley Sta.	OUTBOUND Leave Dudley Sta	Arrive Back Bay	Arrive Central Sq. Waltham
3:55 P	4:48P	4:58P	6:15A	6:25A	7:18A
4:55 P	5:48P	5:58P	6:40	6:50	7:43

NO ROUTE 170 SERVICE ON WEEKENDS OR HOLIDAYS

See Route 170 Express Bus fare information on reverse.

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES

Route 70/70A
Cedarwood, No. Waltham or Central Sq. - University Park
via Central Sq., Cambridge, Arsenal St. & Western Ave.

FARES

PAYING WITH...	1-BUS TRIP	2-BUS TRIP	BUS + SUBWAY TRIP
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$.075	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free, if using a guide, the guide rides free.

VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); and express bus, zoned, interzoned, and boat passes.

* Available to students through participating middle schools and high schools.
**Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Summer 2012 Holidays

July 4 : See Sunday **September 3 : See Sunday**

86 WEEKDAY

INBOUND

Leave Sullivan Sq. Sta.	Arrive Harvard Square	Arrive Cleveland Circle
5:06A	5:15A	5:29A
5:26	5:36	5:51
5:45	5:56	6:14
6:00	6:12	6:30
6:15	6:27	6:45
6:25	6:37	6:55
6:35	6:47	7:08
6:45	6:57	7:20
7:00	7:15	7:36
7:15	7:30	7:56
7:30	7:50	8:13
7:45	8:06	8:29
8:00	8:23	8:52
8:15	8:38	9:05
8:30	8:56	9:20
8:40	9:03	.....
9:00	9:13	9:39
9:25	9:43	10:04
10:00	10:14	10:36
10:35	10:49	11:11
11:10	11:24	11:46
11:45	11:59	**12:21P**
12:20P	**12:34P**	**12:57P**
12:40	**12:54**	**1:17**
1:00	**1:14**	**1:37**
1:20	**1:34**	**1:57**
1:40	**1:54**	**2:17**
2:00	**2:14**	**2:39**
2:20	**2:33**	**2:59**
2:40	**2:56**	**3:22**
2:50	**3:06**	**3:32**
3:02	**3:18**	**3:46**
3:20	**3:37**	**4:06**
3:38	**3:54**	**4:23**
3:56	**4:12**	**4:41**
4:14	**4:30**	**4:59**
4:32	**4:48**	**5:17**
4:50	**5:06**	**5:35**
5:08	**5:24**	**5:56**
5:26	**5:44**	**6:18**
5:44	**6:03**	**6:38**
6:02	**6:21**	**6:50**
6:20	**6:37**	**7:02**
6:40	**6:54**	**7:19**
7:05	**7:20**	**7:46**
u 7:45	**7:59**	**8:24**
u 8:30	**8:42**	**9:03**
u 9:20	**9:32**	**9:53**
u 10:00	**10:12**	**10:33**
u 10:45	**10:57**	**11:16**
u 11:30	**11:38**	**11:57**
u 12:05A	12:13A	12:32A

OUTBOUND

Leave Cleveland Circle	Arrive Harvard Station	Arrive Sullivan Sq. Sta.
5:39A	5:56A	6:09A
6:01	6:21	6:33
6:23	6:43	6:55
6:38	6:58	7:15
6:53	7:15	7:32
7:08	7:30	7:49
7:23	7:49	8:08
7:38	8:06	8:25
7:50	8:18	.....
8:05	8:34	8:52
8:20	8:48	9:06
8:35	9:02	9:20
8:55	9:20	9:36
9:15	9:38	9:56
9:35	9:57	10:13
9:55	10:19	10:34
10:15	10:38	10:53
10:50	11:13	11:28
11:25	11:48	**12:03P**
12:00N	**12:23P**	**12:38P**
12:35P	**12:58**	**1:15**
1:10	**1:33**	**1:50**
1:30	**1:53**	**2:10**
1:50	**2:13**	**2:30**
2:10	**2:33**	**2:54**
2:25	**2:50**	**3:11**
2:50	**3:15**	**3:35**
3:10	**3:36**	**3:57**
3:30	**3:54**	**4:15**
3:50	**4:14**	**4:36**
4:07	**4:32**	**4:55**
4:25	**4:55**	**5:18**
4:43	**5:14**	**5:36**
5:01	**5:32**	**5:53**
5:19	**5:48**	**6:09**
5:37	**6:04**	**6:25**
5:55	**6:22**	**6:37**
6:13	**6:39**	**6:51**
6:30	**6:57**	**7:15**
6:50	**7:13**	**7:31**
7:00	**7:21**	**7:36**
7:15	**7:38**	**7:52**
7:50	**8:07**	**8:21**
8:00	**8:18**	**8:32**
8:35	**8:55**	**9:13**
9:10	**9:30**	**9:48**
10:00	**10:14**	**10:28**
10:40	**10:54**	**11:08**
11:25	**11:39**	**11:53**
12:05A	12:19A	12:33A
12:35	12:49	1:03

86 SATURDAY

INBOUND

Leave Sullivan Sq. Sta.	Arrive Harvard Square	Arrive Cleveland Circle
5:00A	5:10A	5:24A
6:05	6:16	6:31
7:15	7:27	7:45
7:45	7:57	8:15
8:25	8:37	8:55
9:05	9:17	9:37
9:50	10:07	10:29
10:30	10:44	11:06
10:55	11:09	11:31
11:25	11:39	**12:01P**
12:00N	**12:15P**	**12:43P**
12:35P	**12:50**	**1:17**
1:10	**1:26**	**1:53**
1:45	**2:01**	**2:28**
2:15	**2:31**	**2:58**
2:45	**3:01**	**3:28**
3:10	**3:26**	**3:52**
3:35	**3:51**	**4:18**
4:05	**4:21**	**4:48**
4:30	**4:46**	**5:14**
5:00	**5:16**	**5:43**
5:30	**5:47**	**6:13**
6:00	**6:14**	**6:42**
6:30	**6:45**	**7:10**
7:05	**7:21**	**7:46**
u7:50	**8:04**	**8:28**
u8:40	**8:52**	**9:12**
u9:25	**9:37**	**9:57**
u10:45	**10:54**	**11:13**
u11:55	12:04A	12:23A

OUTBOUND

Leave Cleveland Circle	Arrive Harvard Station	Arrive Sullivan Sq. Sta.
5:30A	5:44A	5:55A
6:40	6:57	7:08
7:50	8:09	8:21
8:20	8:41	8:53
9:05	9:28	9:42
9:45	10:08	10:22
10:30	10:53	11:13
11:10	11:35	11:50
11:40	**12:08P**	**12:23P**
12:15P	**12:43P**	**12:58P**
12:50	**1:18**	**1:34**
1:25	**1:51**	**2:08**
2:00	**2:27**	**2:45**
2:30	**2:57**	**3:15**
3:00	**3:29**	**3:48**
3:30	**4:00**	**4:13**
4:00	**4:25**	**4:42**
4:30	**4:55**	**5:12**
5:00	**5:26**	**5:42**
5:30	**5:55**	**6:11**
6:00	**6:25**	**6:41**
6:30	**6:55**	**7:09**
7:00	**7:23**	**7:37**
7:25	**7:48**	**8:02**
7:55	**8:18**	**8:32**
8:40	**9:02**	**9:16**
9:20	**9:41**	**9:55**
10:00	**10:21**	**10:35**
11:20	**11:37**	**11:49**
12:30A	12:47A	12:59A

Harvard Sq: Board buses to Sullivan in Harvard Station (Upper Busway). Board buses to Reservoir on Mass. Ave. at Garden St. (Dawes Island) or on Eliot St at Bennett St.

Route 86
Sullivan Sq. Sta. - Cleveland Circle via Harvard Square/Station

86 SUNDAY

INBOUND

Leave Sullivan Sq. Sta.	Arrive Harvard Square	Arrive Cleveland Circle
7:30A	7:40A	7:57A
8:40	8:52	9:12
9:50	10:02	10:22
10:20	10:32	10:53
10:50	11:02	11:23
11:20	11:34	11:57
11:55	**12:08P**	**12:34P**
12:30P	**12:42P**	**1:12P**
1:05	**1:17**	**1:46**
1:40	**1:56**	**2:20**
2:15	**2:28**	**2:52**
2:50	**3:03**	**3:26**
3:25	**3:40**	**4:04**
4:00	**4:13**	**4:38**
4:35	**4:50**	**5:17**
5:10	**5:22**	**5:44**
5:45	**5:58**	**6:20**
6:20	**6:33**	**6:54**
7:00	**7:11**	**7:33**
u 7:40	**7:53**	**8:10**
u 9:00	**9:11**	**9:30**

OUTBOUND

Leave Cleveland Circle	Arrive Harvard Station	Arrive Sullivan Sq. Sta.
8:05A	8:22A	8:33A
9:15	9:36	9:49
10:30	10:55	11:11
11:05	11:31	11:49
11:40	**12:06P**	**12:24P**
12:15P	**12:45P**	**1:00P**
12:50	**1:23**	**1:38**
1:25	**1:49**	**2:03**
2:00	**2:25**	**2:42**
2:35	**2:59**	**3:13**
3:10	**3:35**	**3:50**
3:45	**4:10**	**4:24**
4:20	**4:46**	**5:00**
4:55	**5:20**	**5:35**
5:30	**5:52**	**6:06**
6:05	**6:27**	**6:41**
6:40	**7:02**	**7:18**
7:15	**7:33**	**7:49**
7:50	**8:10**	**8:22**
8:25	**8:44**	**8:56**
9:35	**9:53**	**10:05**

u - Trip departs from Sullivan Sq. upper busway.
All other trips depart from Sullivan Sq. lower busway.

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

FARES

Paying with...	1-bus trip	2-bus trip	Bus + subway trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free, if using a guide, the guide rides free.

VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); and express bus, zoned, interzoned, and boat passes.

* Available to students through participating middle schools and high schools.
** Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Summer 2012 Holidays

July 4 : See Sunday September 3 : See Sunday

Ridership and Service Statistics

Thirteenth
Edition
2010

Massachusetts Bay Transportation Authority

Bus Ridership as of April 2010

Typical for day and direction shown

Route	Garage	Terminals	Weekday Boardings			Saturday Boardings			Sunday Boardings			Most Recent Ridecheck		
			Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total	Weekday	Sat	Sun
1	Cabot	Harvard Sq - Dudley Sta. via Mass. Ave.	5,990	6,335	12,325	4,727	4,768	9,495	2,469	2,445	4,914	FA 07	WI 03	WI 03
4	Cabot	North Station - World Trade Ctr.	176	138	314	x	x	x	x	x	x	SP 09	x	x
5	Cabot	City Point - McCormack Housing	75	63	138	35	36	71	x	x	x	SP 09	WI 08	x
6	Cabot	South Sta - Haymarket Sta	27	56	83	x	x	x	x	x	x	FA 05	x	x
7	Cabot	City Point - Otis & Summer Sts.	1,375	1,299	2,674	194	144	338	x	x	x	SP 06	WI 08	x
8	Cabot	Harbor Point /U Mass - Kenmore Sta.	1,590	1,627	3,217	507	557	1,064	328	315	643	WI 06	SP 04	SP 04
9	Cabot	City Point - Copley Sq. via Broadway Sta	2,027	2,218	4,245	916	901	1,817	527	560	1,087	SP 06	WI 08	FA 04
10	Cabot	City Point - Copley Sq. Via B.C.H.	1,338	1,598	2,936	740	873	1,613	379	360	739	FA 09	WI 08	FA 04
11	Cabot	City Point - Downtown	1,409	1,120	2,529	504	445	949	420	298	718	SP 06	WI 08	FA 06
14	Arborway	Roslindale Square - Heath Street Loop	672	619	1,291	455	434	889	x	x	x	SP 09	WI 09	x
15	Cabot	Kane Sq. - Ruggles Sta.	3,614	3,337	6,951	1,946	1,810	3,756	1,276	1,240	2,516	FA 09	WI 05	WI 05
16	Cabot	Forest Hills Sta. - U Mass.	2,219	2,131	4,350	1,218	1,138	2,356	706	670	1,376	WI 05	WI 05	WI 05
17	Cabot	Fields Corner Sta. - Andrew Sta.	1,373	1,408	2,781	1,170	962	2,132	276	255	531	WI 07	SP 00	FA 05
18	Cabot	Ashmont Sta. - Andrew Sta.	331	409	740	126	104	230	65	69	134	WI 06	WI 06	FA 05
19	Cabot	Fields Corner Sta. - Ruggles or Kenmore Sta.	1,868	1,508	3,376	x	x	x	x	x	x	FA 05	x	x
21	Arborway	Ashmont Sta. - Forest Hills Sta.	2,344	2,100	4,444	536	601	1,137	240	265	505	WI 10	SP 08	FA 08
22	Cabot	Ashmont Sta. - Ruggles Sta. Via Talbot Ave	3,615	3,432	7,047	2,638	2,322	4,960	1,261	1,293	2,554	SP 07	SP 01	WI 08
23	Cabot	Ashmont Sta. - Ruggles Sta. via Washington St.	5,657	5,485	11,142	2,722	2,869	5,591	1,479	1,507	2,986	FA 07	FA 07	SP 07
24	Arborway	Wakefield Ave. - Mattapan Sta.	621	840	1,461	402	475	877	192	231	423	SP 09	SP 09	FA 08
25	Cabot	Franklin Park - Dudley Sta. Via Grove Hall	172	31	203	NDA	NDA	NDA	NDA	NDA	NDA	SP 07		
26	Arborway	Ashmont Sta. - Norfolk & Wash. Belt	439	897	1,336	328	446	774	82	89	171	SP 09	FA 04	FA 08
27	Arborway	Mattapan Sta. - Ashmont Sta.	245	206	451	154	196	350	64	63	127	FA 04	FA 04	FA 04
28	Cabot	Mattapan Sta. - Ruggles Sta.	5,439	5,168	10,607	4,003	4,098	8,101	2,489	2,567	5,056	FA 07	SP 07	FA 07
29	Arborway	Mattapan Sta. - Jackson Sq Sta.	1,031	1,041	2,072	154	278	432	x	x	x	SP 09	FA 04	x
30	Arborway	Mattapan Sta. - Roslindale Sq.	1,038	995	2,033	504	330	834	185	193	378	SP 09	FA 09	FA 08
31	Arborway	Mattapan Sta. - Forest Hills Sta.	2,098	2,036	4,134	1,320	1,472	2,792	905	834	1,739	FA 09	FA 08	FA 04
32	Arborway	Wolcott Sq or Cleary Sq. - Forest Hills Sta.	3,563	4,170	7,733	2,067	2,300	4,367	1,349	1,429	2,778	WI 07	SP 09	SP 08
33	Arborway	River & Milton Sts. - Mattapan Sta.	538	553	1,091	98	157	255	x	x	x	FA 09	FA 09	x
34	Arborway	Dedham Line - Forest Hills Sta.	1,510	1,959	3,469	787	683	1,470	378	394	772	FA 08	WI 01	SP 08
34E	Arborway	Walpole - Forest Hills Sta.	1,754	1,872	3,626	887	1,270	2,157	714	820	1,534	FA 08	WI 01	SP 08
35	Arborway	Dedham Mall - Forest Hills Sta.	1,114	1,074	2,188	563	521	1,084	209	183	392	FA 09	FA 04	SP 08
36	Arborway	VA Hosp - Forest Hills Sta. Via Chas. River Loop	1,341	1,643	2,984	590	692	1,282	638	640	1,278	FA 09	FA 04	SP 08
37	Arborway	Baker & Vermont Sts. - Forest Hills Sta.	626	735	1,361	284	333	617	x	x	x	FA 09	FA 04	x
37/38 (37-8)	Arborway	Baker & Vermont - F Hills VIA J P Monument	x	x	x	13	36	49	112	77	189	x	FA 04	SP 08
38	Arborway	Wren St. - Forest Hills Sta.	477	574	1,051	104	131	235	x	x	x	FA 08	FA 09	x
39	Southampton	Forest Hills Sta. - Back Bay Sta.	7,482	6,923	14,405	4,600	3,676	8,276	2,451	2,262	4,713	WI 05	SP 01	WI 08
40	Arborway	Georgetowne - Forest Hills Sta.	593	646	1,239	298	205	503	113	127	240	FA 08	FA 04	FA 08
41	Arborway	Centre & Eliot Sts. - JFK U Mass Sta	1,099	1,135	2,234	414	520	934	236	284	520	SP 09	FA 09	FA 08
42	Arborway	Forest Hills Sta. - Ruggles Sta.	1,423	1,395	2,818	677	729	1,406	267	283	550	FA 09	SP 08	FA 08
43	Cabot	Ruggles Sta. - Park & Tremont Sts.	1,183	1,034	2,217	407	398	805	308	281	589	FA 07	FA 07	SP 09
44	Cabot	Jackson Sq Sta. - Ruggles Sta.	1,917	1,874	3,791	856	872	1,728	348	318	666	WI 05	SP 08	WI 06
45	Cabot	Franklin Park - Ruggles Sta.	1,901	1,699	3,600	805	881	1,686	275	300	575	WI 05	SP 08	WI 06
47	Arborway	Central Sq. Camb. - Broadway Sta.	2,343	1,998	4,341	714	557	1,271	309	321	630	SP 09	FA 00	WI 07
48	Arborway	Centre & Eliot Sts. - Jamaica Plain Loop	35	50	85	23	27	50	x	x	x	FA 05	FA 05	x
50	Arborway	Cleary Sq - Forest Hills Sta Via Metropolitan	557	505	1,062	224	154	378	x	x	x	FA 04	FA 04	x
51	Arborway	Cleveland Circle - Forest Hills Sta.	1,074	1,013	2,087	318	297	615	x	x	x	FA 04	FA 04	x
52	Arborway	Dedham Mall - Watertown Yard	330	323	653	86	57	143	x	x	x	FA 09	FA 08	x
55	Cabot	Queensberry St. - Park & Tremont Sts.	531	316	847	204	99	303	149	80	229	WI 07	FA 00	WI 07
57	Albany or Cabot	Watertown Yard - Kenmore Sta.	5,839	5,665	11,504	2,321	2,306	4,627	1,640	1,684	3,324	FA 09	FA 00	WI 06
59	Albany or Cabot	Needham Junction - Watertown Sq.	606	566	1,172	155	144	299	96	105	201	WI 06	WI06	WI 06
60	Albany or Cabot	Chestnut Hill - Kenmore Sta.	705	645	1,350	229	201	430	162	100	262	WI 10	SP 08	WI 08
62	Somerville	Bedford V.A. Hospital - Alewife Sta.	502	620	1,122	x	x	x	x	x	x	FA 02	x	x
62/76	Somerville	Bedford V.A. Hospital - Alewife Sta. Via Hanscom AFB	x	x	x	215	244	459	x	x	x	x	FA 07	x
64	Somerville	Oak Sq. - University Pk. Cambridge	768	500	1,268	275	279	554	126	115	241	WI 07	RD II	FA 02
65	Albany or Cabot	Brighton Center - Kenmore Sta.	1,242	846	2,088	159	121	280	x	x	x	WI 10	WI 01	x
66	Cabot	Harvard Sq. - Dudley Sta. via Brookline	6,942	7,734	14,676	3,548	4,054	7,602	2,371	2,374	4,745	FA 09	FA 09	WI 07
67	Somerville	Turkey Hill - Alewife Sta.	331	186	517	x	x	x	x	x	x	FA 06	x	x
68	Somerville	Harvard Sq. - Kendall MIT Sta.	260	260	520	x	x	x	x	x	x	WI 04	x	x
69	Somerville	Harvard Sq. - Lechmere Sta.	1,531	1,454	2,985	946	872	1,818	455	465	920	WI 06	RD II	SP 02
70	Somerville	Cedarwood - Central Sq. Cambridge	2,115	2,539	4,654	2,079	1,951	4,030	1,349	1,498	2,847	FA 06	SP 00	FA 07
70A	Somerville	No. Waltham - University Pk., Camb.	1,025	1,007	2,032	678	669	1,347	x	x	x	FA 06	SP 00	x

Route	Garage	Terminals	Weekday Boardings			Saturday Boardings			Sunday Boardings			Most Recent Ridecheck		
			Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total	Weekday	Sat	Sun
72/75 (72.5)	Somerville	Belmont Center - Harvard Sta via Huron Ave	x	x	x	59	85	144	163	186	349	x	FA 03	FA 04
74	Somerville	Belmont Center - Harvard Sta via Concord Ave	479	502	981	99	104	203	x	x	x	SP 04	WI 04	x
75	Somerville	Belmont Center - Harvard Sta via Fresh Pond Pkwy	235	252	487	106	139	245	x	x	x	SP 04	WI 04	x
76	Somerville	Hanscom Air Force Base - Alewife Sta.	284	342	626	x	x	x	x	x	x	FA 02	x	x
77	Somerville	Arlington Heights - Harvard Sta	3,274	3,277	6,551	2,085	2,156	4,241	1,273	1,457	2,730	FA 07	WI 05	SP 04
78	Somerville	Arlmont Village - Harvard Sta	515	634	1,149	125	203	328	97	132	229	SP 04	WI 04	WI 04
79	Somerville	Arlington Heights - Alewife Sta.	579	516	1,095	x	x	x	x	x	x	SP 04	x	x
80	Somerville	Arllington Center - Lechmere Sta.	1,009	863	1,872	681	576	1,257	303	260	563	WI 03	RD II	FA 05
83	Somerville	Rindge Ave. - Central Sq., Camb.	1,073	1,081	2,154	627	701	1,328	186	288	474	FA 04	RD II	FA 07
84	Somerville	Arlmont Loop - Alewife Sta.	152	59	211	x	x	x	x	x	x	WI 07	x	x
85	Somerville	Spring Hill - Kendall MIT Sta.	233	164	397	x	x	x	x	x	x	WI 06	x	x
86	Somerville	Sullivan Sta. - Cleveland Circle	2,469	2,670	5,139	873	1,007	1,880	557	639	1,196	FA 02	WI 03	WI 03
87	Somerville	Clarendon Hill - Lechmere Sta. via Som.	1,683	1,690	3,373	883	1,169	2,052	571	594	1,165	WI 06	FA 06	SP 02
88	Somerville	Clarendon Hill - Lechmere Sta. Via Hglnd	1,995	1,790	3,785	1,180	1,077	2,257	670	744	1,414	WI 06	RD II	SP 02
89	Charlestown	Clarendon Hill - Sullivan Sta.	1,834	1,597	3,431	731	773	1,504	308	448	756	FA 05	FA 05	WI 02
90	Charlestown	Davis Sq. Sta. - Wellington Sta.	444	476	920	240	262	502	x	x	x	WI 04	WI 04	x
91	Charlestown	Sullivan Sta. - Central Sq., Camb.	770	712	1,482	686	548	1,234	305	265	570	WI 02	FA 04	FA 04
92	Charlestown	Assembly Sq Mall - Downtown Via Main St	560	495	1,055	219	274	493	x	x	x	WI 07	WI06	x
93	Charlestown	Sullivan Sta. - Downtown Via Bunker Hill	2,196	2,014	4,210	995	974	1,969	419	374	793	WI 04	FA 04	FA 04
94	Fel or Cha	Medford Sq. - Davis Sq. Sta.	579	757	1,336	243	282	525	178	239	417	WI 09	FA 07	FA 04
95	Fel or Cha	West Medford - Sullivan Sta.	792	959	1,751	268	346	614	153	185	338	FA 08	WI06	FA 03
96	Fel or Cha	Medford Sq - Harvard Sta	949	832	1,781	516	401	917	234	205	439	WI 09	FA 05	FA 05
97	Fel or Cha	Malden Sta. - Wellington Sta.	399	343	742	176	131	307	105	85	190	WI 10	FA 02	FA 02
99	Fel or Cha	Boston Reg. Med Ctr Stoneham - Wellington Sta.	580	679	1,259	220	323	543	117	173	290	FA 08	WI06	FA 04
100	Fel or Cha	Elm St. - Wellington Sta.	463	421	884	152	178	330	80	86	166	FA 08	FA 05	FA 05
101	Charlestown	Malden Sta. - Sullivan Sta. Via Medford Sq	2,170	1,946	4,116	948	973	1,921	437	446	883	FA 05	FA 05	FA 04
104	Charlestown	Malden Sta. - Sullivan Sta. Via Ferry St	1,614	1,746	3,360	1,047	947	1,994	455	519	974	WI 02	WI 02	WI 02
105	Fel or Cha	Malden Sta. - Sullivan Sta. Via Main St	516	410	926	166	206	372	132	127	259	WI 10	FA 04	FA 04
106	Charlestown	Franklin Sq or Lebanon St. Loop - Wellington Sta.	1,177	1,140	2,317	597	514	1,111	282	349	631	FA 05	FA 07	FA 04
108	Charlestown	Linden Sq. - Wellington Sta.	1,249	1,351	2,600	714	630	1,344	214	190	404	FA 04	FA 07	FA 04
109	Charlestown	Linden Sq. - Sullivan Sta.	1,345	1,643	2,988	656	901	1,557	469	479	948	WI 02	WI 02	WI 02
110	Charlestown	Wonderland Sta. - Wellington Sta.	1,253	1,139	2,392	536	537	1,073	230	224	454	WI 03	FA 04	FA 04
111	Charlestown	Woodlawn or Bway & Park - Haymarket Sta.	4,293	4,399	8,692	3,140	2,887	6,027	1,799	1,948	3,747	WI 03	SU 04	SU 04
112	Charlestown	Wellington Sta. - Wood Island Sta.	620	593	1,213	326	346	672	168	211	379	WI 05	WI 05	WI 05
114	Lynn	Bellingham Sq - Maverick Sta	537	432	969	x	x	x	x	x	x	FA 03	x	x
114 (114.1)	Lynn	Mystic Mall - Maverick Sta	272	258	530	x	x	x	x	x	x	SP 00	x	x
116	Lynn	Wonderland Sta. - Maverick Sta. Via Revere	2,194	2,194	4,388	1,327	1,569	2,896	1,039	993	2,032	FA 03	SU 04	SU 04
117	Lynn	Wonderland Sta. - Maverick Sta. via Beach	2,086	1,972	4,058	1,407	1,388	2,795	956	1,136	2,092	FA 03	SU 04	SU 04
119	Lynn	Northgate Shopping Ctr. - Beachmont Sta.	460	324	784	151	155	306	122	114	236	WI 05	WI 05	WI 05
120	Lynn	Orient Heights Sta. - Maverick Sta.	1,179	1,539	2,718	510	678	1,188	231	303	534	WI 04	WI 04	WI 04
121	Lynn	Wood Island Sta. - Maverick Sta.	220	164	384	x	x	x	x	x	x	WI 07	x	x
130	Fel or Cha	Linwood Ave - Malden Sta. (Discontinued)	75	69	144	16	13	29	x	x	x	SP 01	FA 02	x
131	Fellsway	Melrose Highlands - Malden Sta.	280	349	629	x	x	x	x	x	x	FA 07	x	x
132	Fel or Cha	Redstone Shopping Ctr. - Malden Sta.	339	319	658	71	69	140	x	x	x	WI 10	WI06	x
134	Fel or Cha	North Woburn - Wellington Sta.	1,101	1,063	2,164	534	552	1,086	251	252	503	WI 10	FA 05	FA 05
136	Fel or Cha	Reading Depot - Malden Sta. Via Lakeside	619	453	1,072	168	191	359	NDA	NDA	NDA	WI 09	FA 04	NDA
137	Fel or Cha	Reading Depot - Malden Sta. Via North Ave	499	476	975	125	188	313	NDA	NDA	NDA	WI 09	FA 04	NDA
170	Albany	Oak Park - Dudley Sta. (Limited Service)	17	25	42	x	x	x	x	x	x	SP 09	x	x
171	Cabot	Logan Airport - Dudley Sta. Sunrise	NA	38	38	NA	28	28	NA	29	29	WI 07	WI 07	WI 07
191	Arborway	Mattapan Sta - Haymarket Sta. Sunrise	52	0	52	14	0	14	43	NA	43	FA 09	WI 07	FA 08
192	Arborway	Cleary Sq - Haymarket Sta. Sunrise	19	6	25	12	9	21	x	x	x	SP 09	WI 07	x
193	Albany or Cabot	Watertown Square - Haymarket Sta. Sunrise	13	12	25	6	4	10	x	x	x	FA 09	FA 00	x
194	Charlestown	Clarendon Hill - Haymarket Sta. Sunrise	19	NA	19	NDA	NDA	NDA	x	x	x	WI 07	NDA	x
195	Arborway	L. Shattuck Hospital - Park & Tremont Sts.	4	x	4	NDA	NDA	NDA	NDA	NDA	NDA	SU 08	NDA	NDA
197	Lynn	Wonderland Sta. - Haymarket Sta. Sunrise	28	x	28	8	x	8	72	x	72	FA 03	SP 00	SP 04
197 (197.1)	Lynn	Haymarket Sta - Logan Airport Term C Sunrise	x	0	0	NDA	NDA	NDA		Activated Sun Jan 1 2006		FA 03	NDA	NDA
201/202	Quincy	Fields Corner Sta. - Fields Corner Sta.	NA	NA	877	NA	NA	319	NA	NA	118	FA 07	FA 06	FA 06
210	Quincy	Quincy Ctr. Sta. - No. Quincy Sta or Flds Cnr Sta	337	349	686	48	131	179	x	x	x	FA 07	WI 07	x
211	Quincy	Quincy Ctr. Sta. - Squantum	348	377	725	65	77	142	35	22	57	FA 06	WI 07	WI06
212	Quincy	Quincy Ctr. Sta. - North Quincy Sta.	172	119	291	49	44	93	x	x	x	WI 09	WI 07	x
214	Quincy	Quincy Ctr. Sta. - Germantown	630	557	1,187	214	225	439		214/216 - shared routes on Sundays		WI 09	WI 07	See 216
215	Quincy	Quincy Ctr. Sta. - Ashmont Sta.	765	628	1,393	414	346	760	234	190	424	WI 09	WI 07	FA 06
216	Quincy	Quincy Ctr. Sta. - Houghs Neck	417	557	974	237	289	526	338	345	683	WI 09	WI 07	FA 06
217	Quincy	Wollaston Sta - Ashmont Sta via Wollaston Beach	120	103	223	x	x	x	x	x	x	FA 06	x	x
220	Quincy	Quincy Ctr. Sta. - Hingham	672	738	1,410	335	335	670	172	161	333	FA 06	WI 07	FA 06
221	Quincy	Quincy Ctr. Sta. - Fort Point	59	37	96	x	x	x	x	x	x	WI 09	x	x
222	Quincy	Quincy Ctr. Sta - East Weymouth	656	670	1,326	244	202	446	198	191	389	FA 06	WI 07	FA 06
225	Quincy	Quincy Ctr. Sta. - Weymouth Landing	1,228	1,329	2,557	416	379	795	195	160	355	WI 08	WI 07	WI 07
230	Quincy	Quincy Ctr. Sta. - Montello Sta.	588	717	1,305	240	201	441	156	163	319	SP 08	SP 04	WI 09

Background Traffic
Historical Annual Growth
Background Project Growth

Historical Annual Growth

Seasonal Adjustment Factor: **0.96**

Seasonal Adjustment Factor: **0.93**

2008 Count Data

Location	Daily Weekday	AM Volume	PM Volume
Western Avenue west of Hague Street	12,384	869	965
Cambridge Street east of Windom	27,072	2,026	2,266
Western Avenue east of Everett Street	17,664	1,267	1,397
Total	57,120	4,162	4,627

2012 Count Data

Location	Daily Weekday	AM Volume	PM Volume
Western Avenue west of Hague Street	11,608	834	888
Cambridge Street east of Windom	29,177	2,007	2,365
Western Avenue between East of Everett Street	18,776	1,381	1,449
Total	59,561	4,222	4,702

Comparison

Percent Increase (2008 to 2012)			Annual Increase (2008 to 2012)		
Daily	AM	PM	Daily	AM	PM
-6.3%	-4.0%	-7.9%	-1.6%	-1.0%	-2.0%
7.8%	-0.9%	4.4%	1.9%	-0.2%	1.1%
6.3%	9.0%	3.7%	1.5%	2.2%	0.9%
4.3%	1.5%	1.6%	1.1%	0.4%	0.4%

Estimated Vehicle-Trip Generation

The vehicle-trip generation for the Science Complex was estimated by applying an automobile mode share of 59 percent and a vehicle occupancy rate (VOR) of 1.10[8] to the employee person-trip generation estimate. These vehicle-trips were reduced by the displaced vehicle-trips to estimate the new vehicle-trips to the study area roadway network.

The results of the estimated vehicle-trip generation analysis are summarized in Table 3-13.

Table 3-13: Estimated Vehicle-Trip Generation

Period/Direction	Science Complex Vehicle-Trips [1]	Displaced Vehicle-Trips [2]	Net New Vehicle-Trips
Morning Peak Hour			
Entering	200	-450	-250
Exiting	30	-55	-25
Total	230	-505	-275
Evening Peak Hour			
Entering	20	-60	-40
Exiting	200	-335	-135
Total	220	-395	-175
Weekday Daily			
Total	1,480	-2,950	-1,470

1 Based on applying an automobile mode share of 59 percent and a vehicle occupancy rate (VOR) of 1.10 to the employee person-trip generation estimate.
2 Trips displaced by Science Complex development.

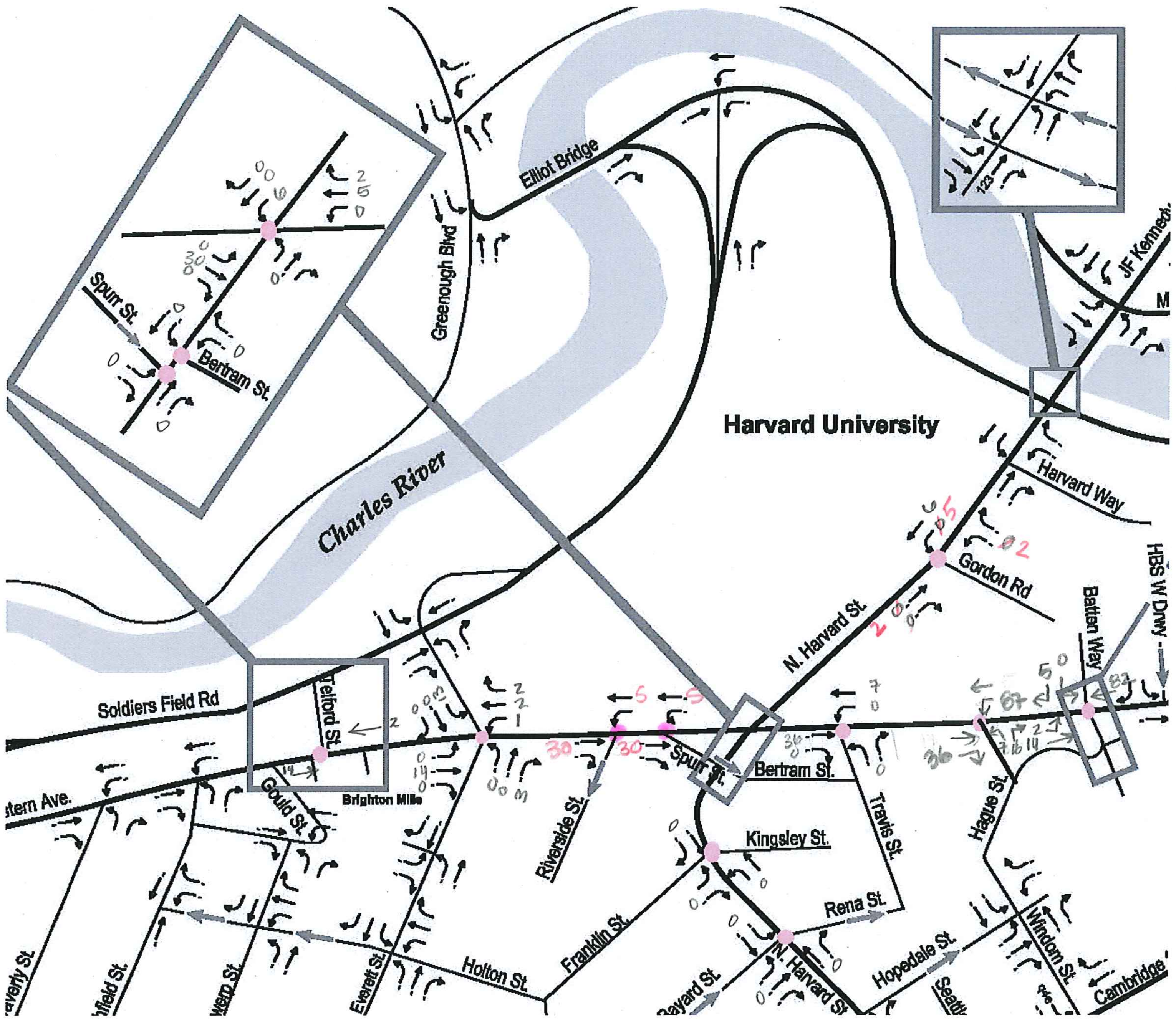
Table 3-13 indicates that with the Science Complex in place, approximately 275 and 175 net vehicle-trips are expected to be removed from the study area roadways during the morning and evening peak hours, respectively.

Estimated Transit- and Bicycle/Pedestrian-Trip Generation

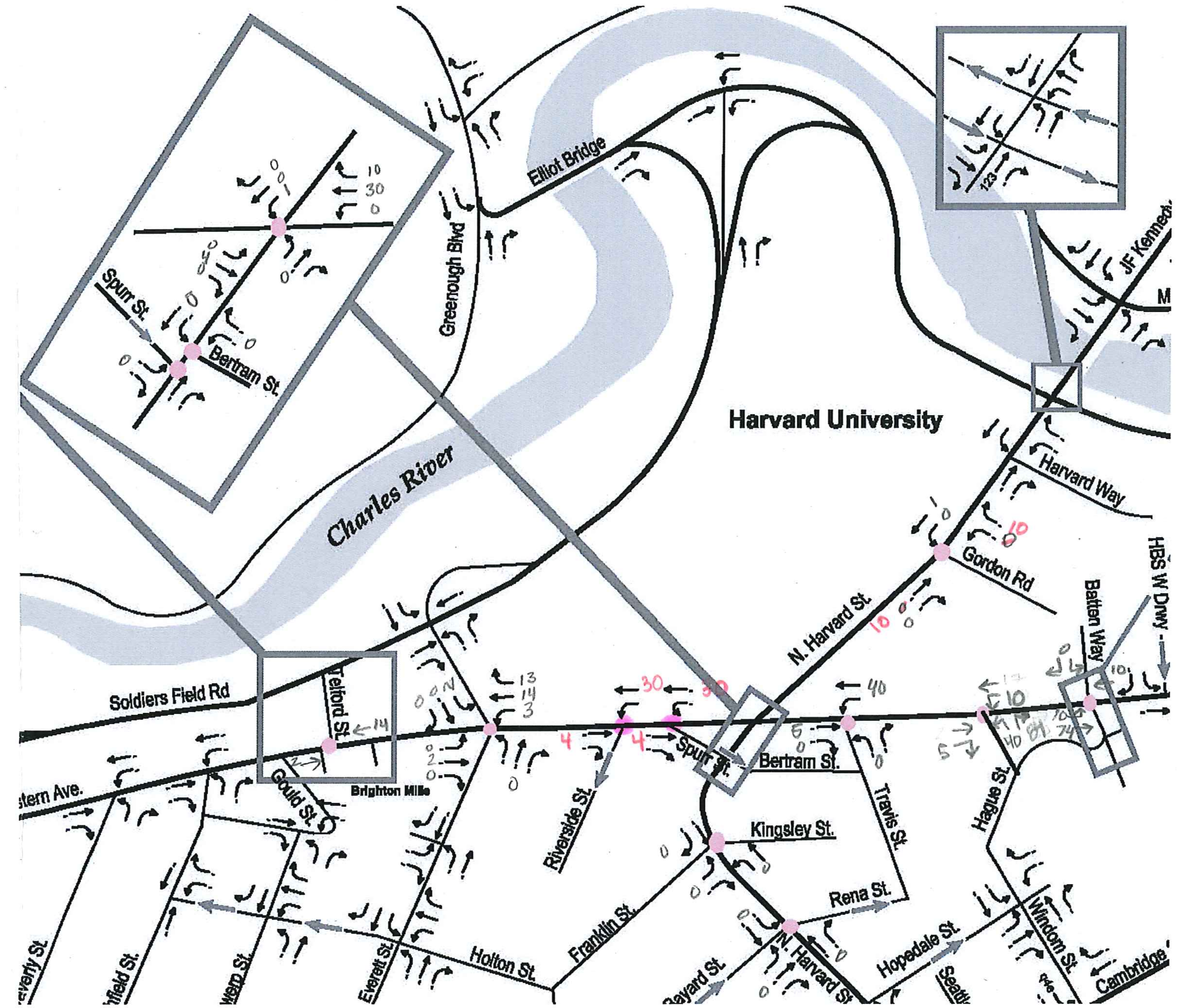
As indicated in the mode split discussion, 18 percent of the estimated person-trips would use transit to access the Science Complex, while 23 percent would ride a bicycle or walk. As such, it is estimated that 75 transit-trips would be generated by the Project during each of the morning and evening peak hours, and 100 and 95 people would ride a bicycle or walk to and from the site during each of the respective peak hours.

[8] Based on 2004 DEP Rideshare and 2000 U.S. Census data.

SCIENCE COMPLEX



AM PEAK



PM PEAK

✓ NLH 8.31.12

Charlesview Demolition

The Project will generate approximately 1,564 vehicle trips per day (782 entering vehicles and 782 exiting vehicles), including 98 vehicle trips (23 in and 75 out) during the a.m. peak hour and 132 vehicle trips (82 in and 50 out) during the p.m. peak hour.

It should be noted that not all of these trips will be new trips; the Project will replace 213 existing residential apartment units at the Charlesview complex, currently located on Western Avenue approximately 0.5-mile east of the Project site. Vehicle trips associated with the existing Charlesview are already on the adjacent roadway network and would only be displaced with the Project.

Table 3-11 compares the vehicle trip generation of the proposed Project with that of the existing Charlesview complex.

Table 3-11 Net New Vehicle Trip Generation

Period/Direction		Displaced Trips (Existing Charlesview)	Project-generated Trips (Brighton Mills and Telford Street Sites)	Net New Vehicle Trips
Daily	In	391	782	391
	Out	391	782	391
	Total	782	1564	782
a.m. Peak Hour	In	9	23	14
	Out	44	75	31
	Total	53	98	45
p.m. Peak Hour	In	44	82	38
	Out	21	50	29
	Total	65	132	67

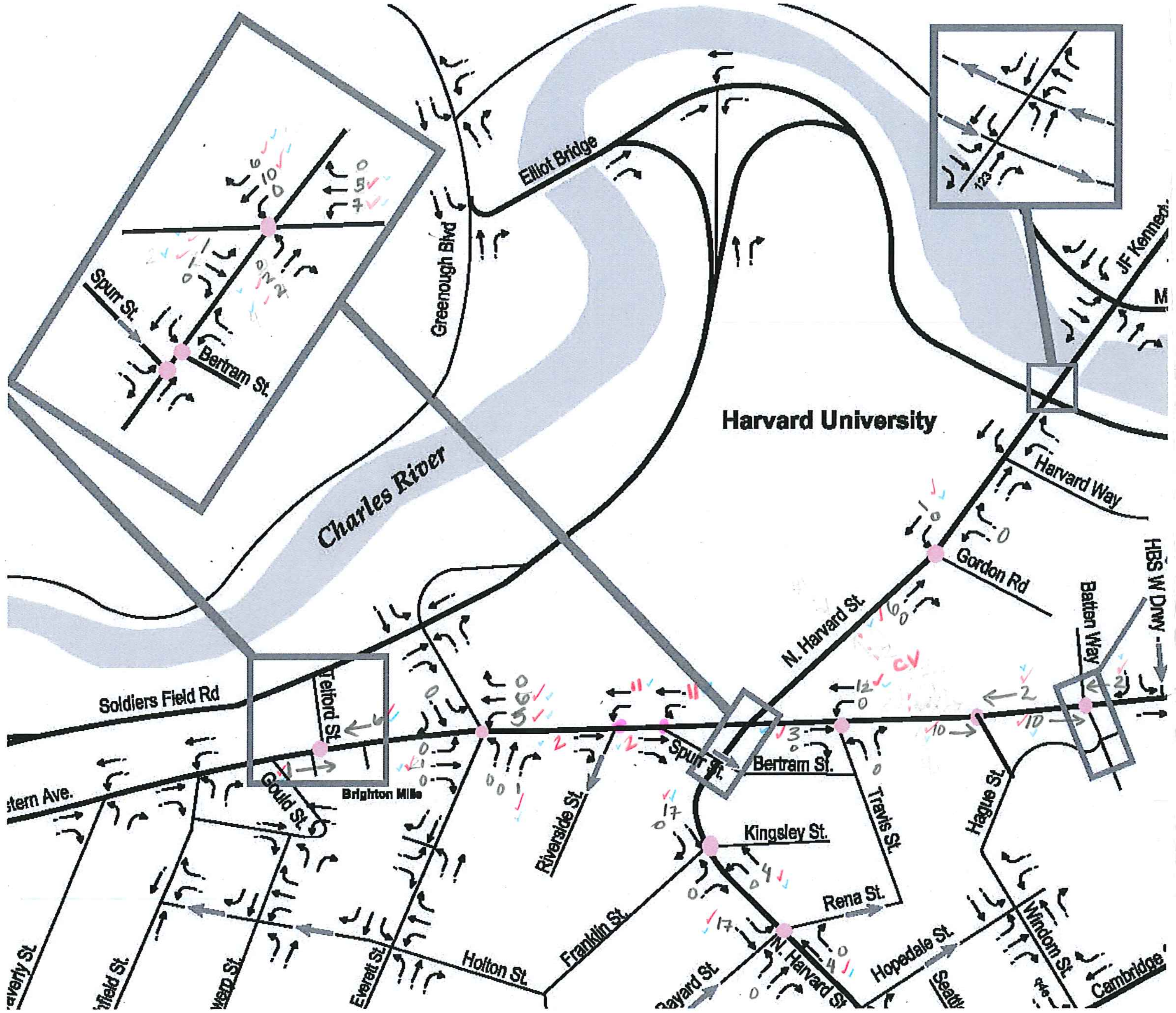
As shown in the table above, 50% of the vehicle trips associated with the Project are already traveling on the adjacent roadway network. The proposed Project will result in a net increase of only 45 vehicle trips (14 trips in and 31 trips out) during the a.m. peak hour and 67 vehicle trips (38 trips in and 29 trips out) during the p.m. peak hour. This corresponds to an increase of only approximately one new vehicle trip per minute.

However, to provide a conservative estimate, no credit was taken for the vehicle trips associated with the existing Charlesview complex for the intersection capacity analysis.

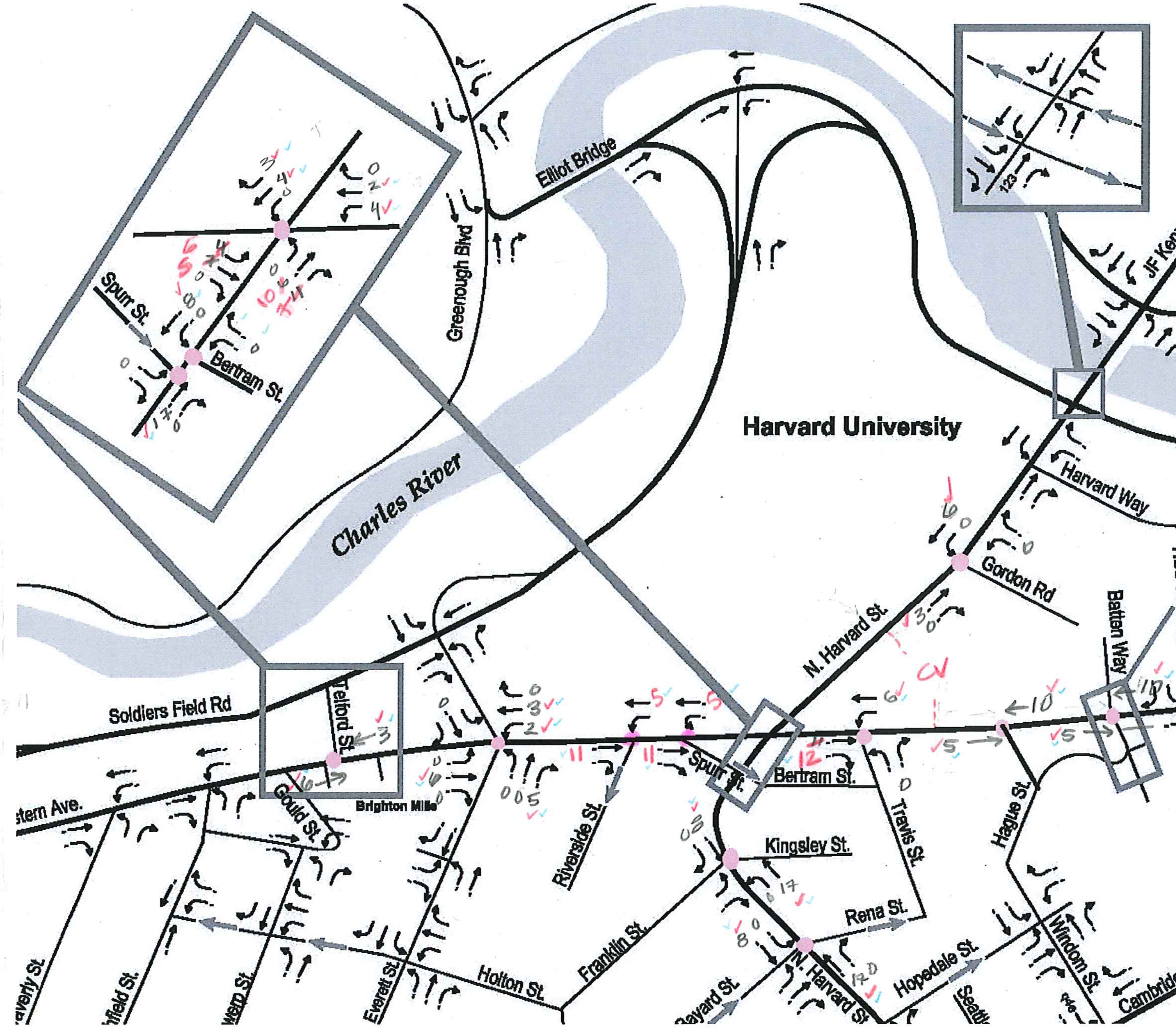
3.2.2.3 As-of-Right Use

The trip generation for the proposed Project was also compared to that of the existing as-of-right uses on-site, approximately 145,700 sf of retail space on the Brighton Mills site and approximately 18,300 sf of office space on the Telford Street site (**Table 3-12**).

CHARLESVIEW DEMOLITION



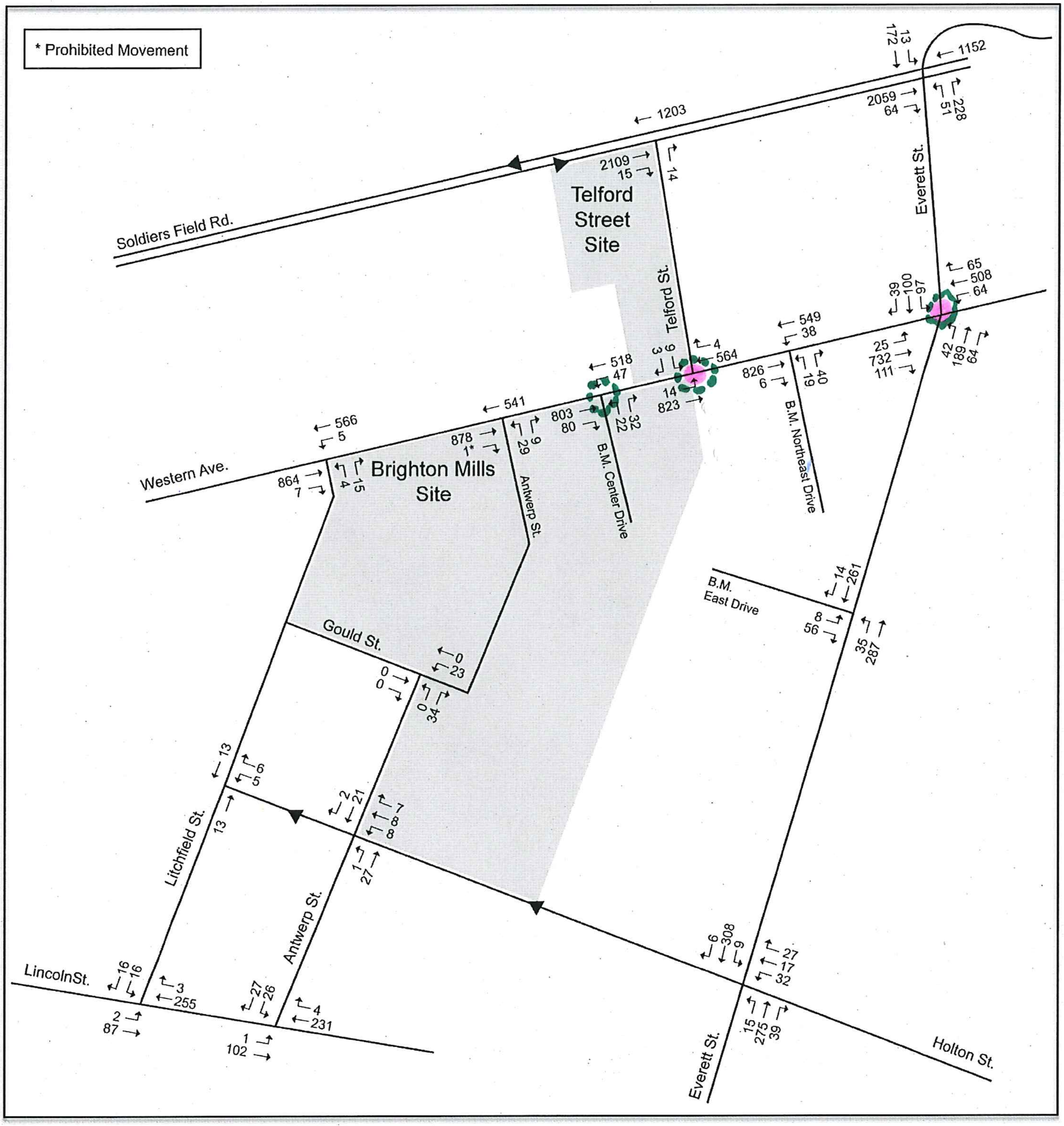
AM PEAK



PM PEAK

✓ NLH 9.4.12

Charlesview Relocation

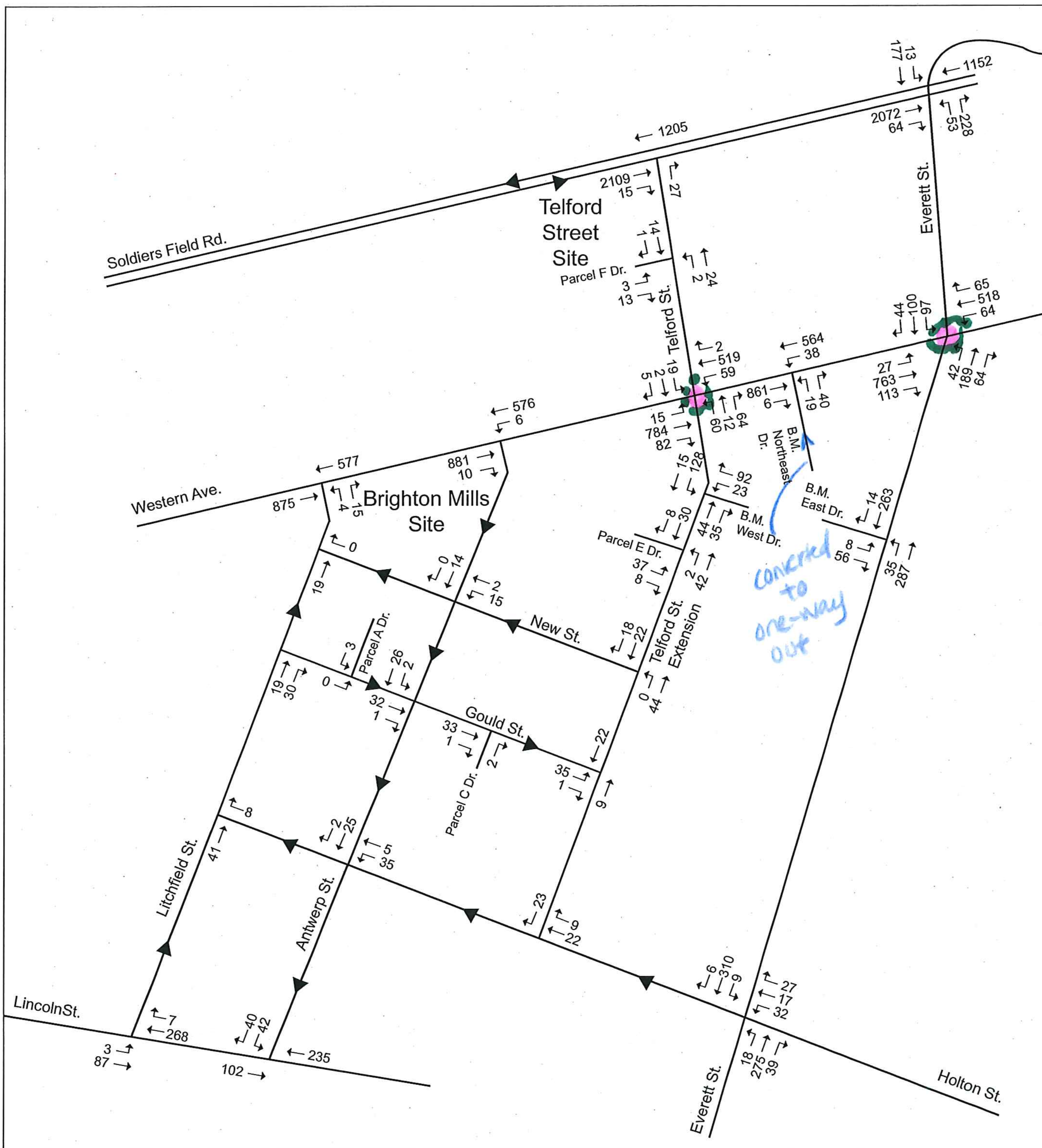


Not to Scale.

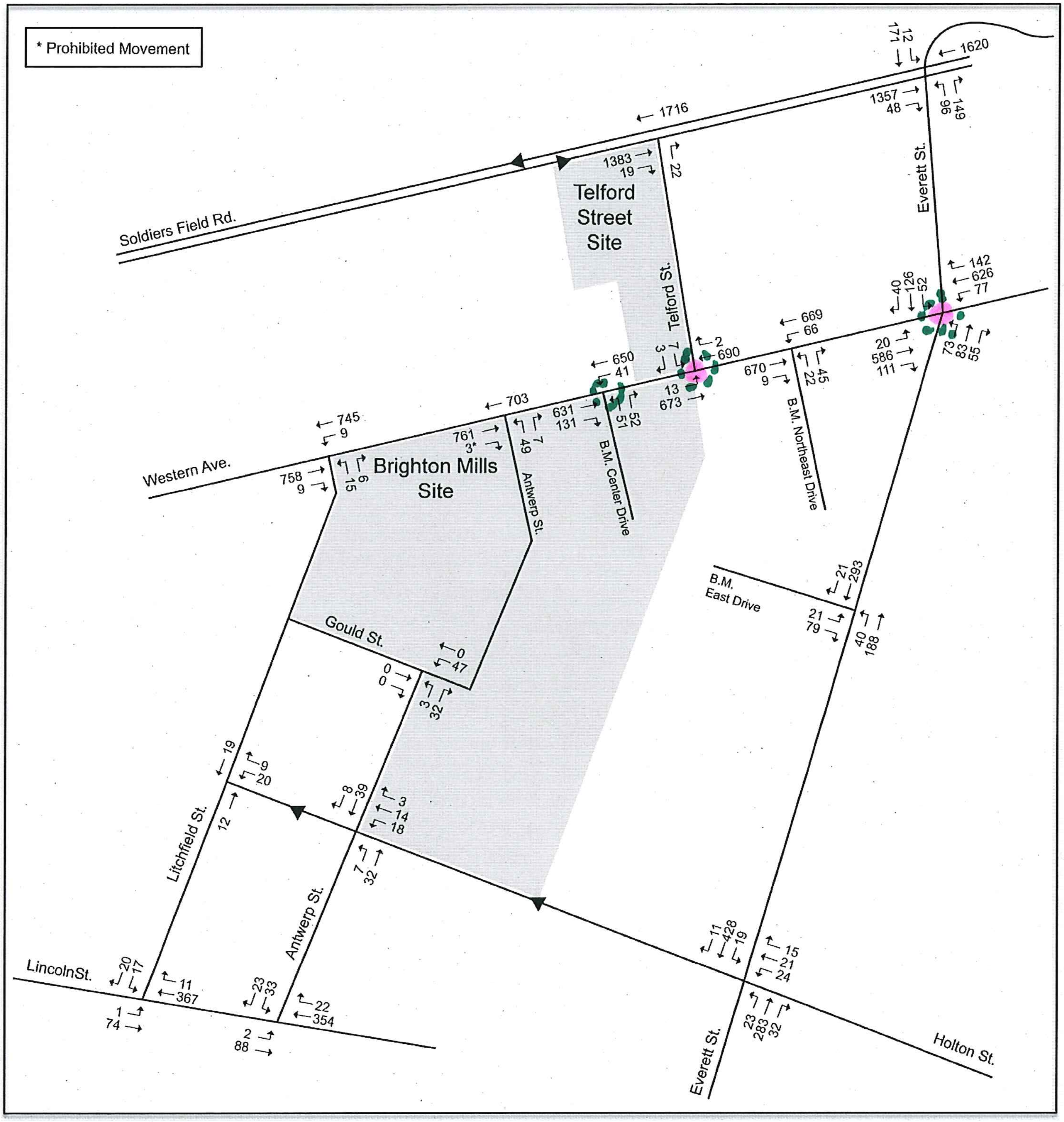
The Community Builders, Inc. Epsilon Associates Inc. Howard/Stein-Hudson Associates, Inc. A Transportation Consulting Firm

Figure 3-9
No-Build Conditions (2014) Turning Movement Volumes, a.m. Peak Hour

Figure 1. Revised Build Traffic Volumes, a.m. Peak Hour



Not to scale.



Not to Scale.

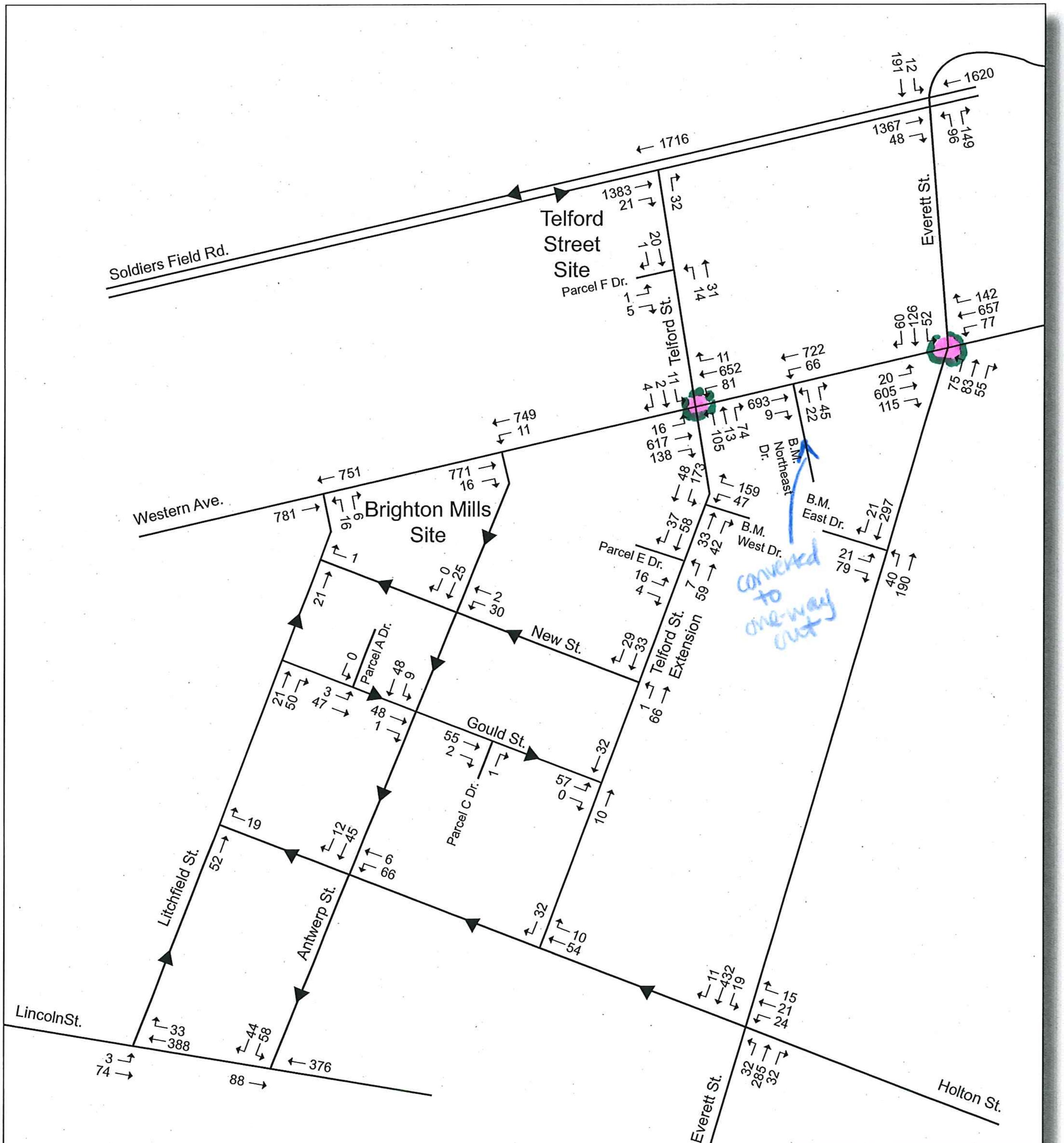
Charlesview Redevelopment DPIR Allston, Massachusetts

The Community Builders, Inc. Epsilon Associates Inc. Howard/Stein-Hudson Associates, Inc. A TRANSPORTATION CONSULTING FIRM

Figure 3-10

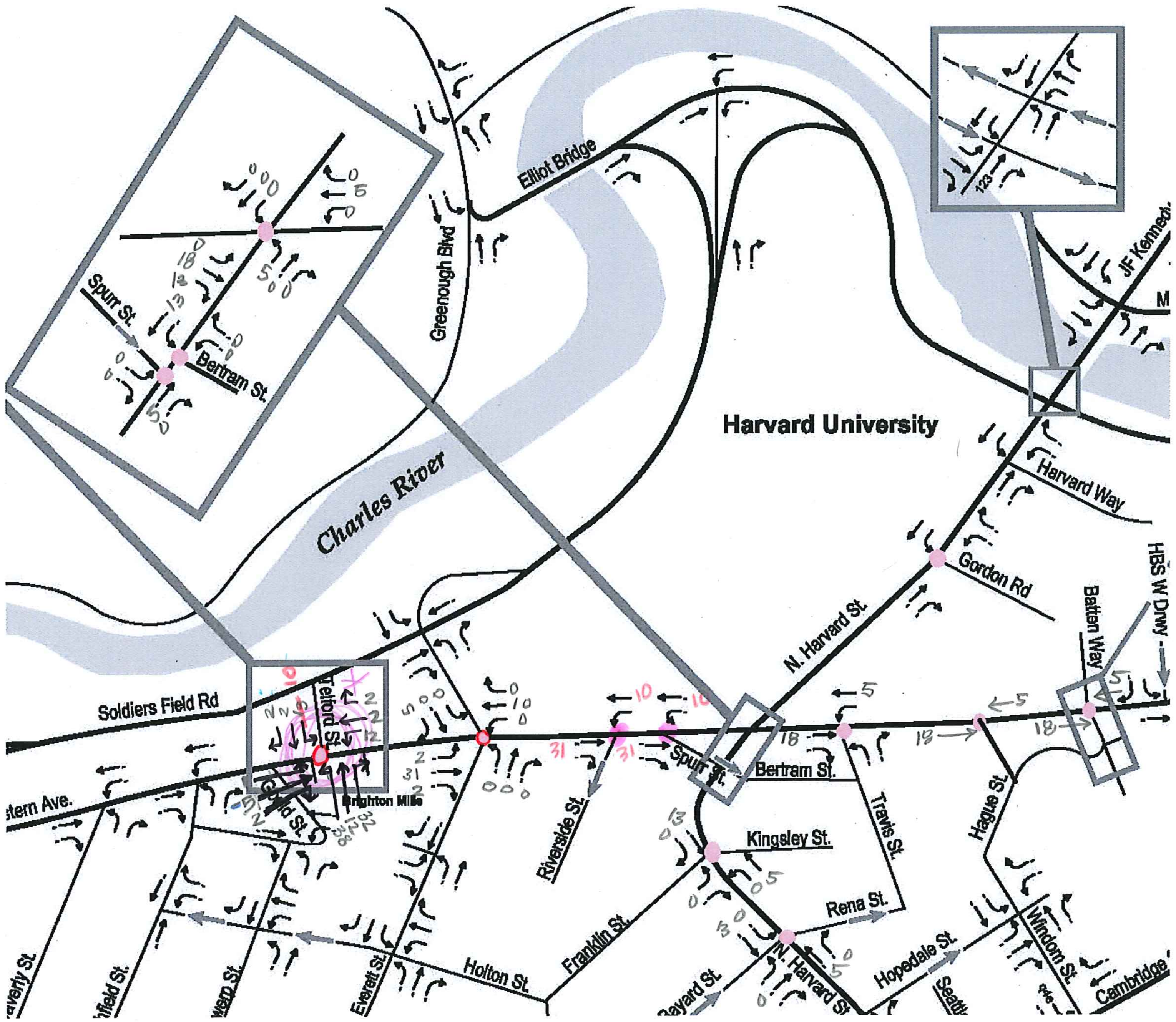
No-Build Conditions (2014) Turning Movement Volumes, p.m. Peak Hour

Figure 2. Revised Build Traffic Volumes, p.m. Peak Hour

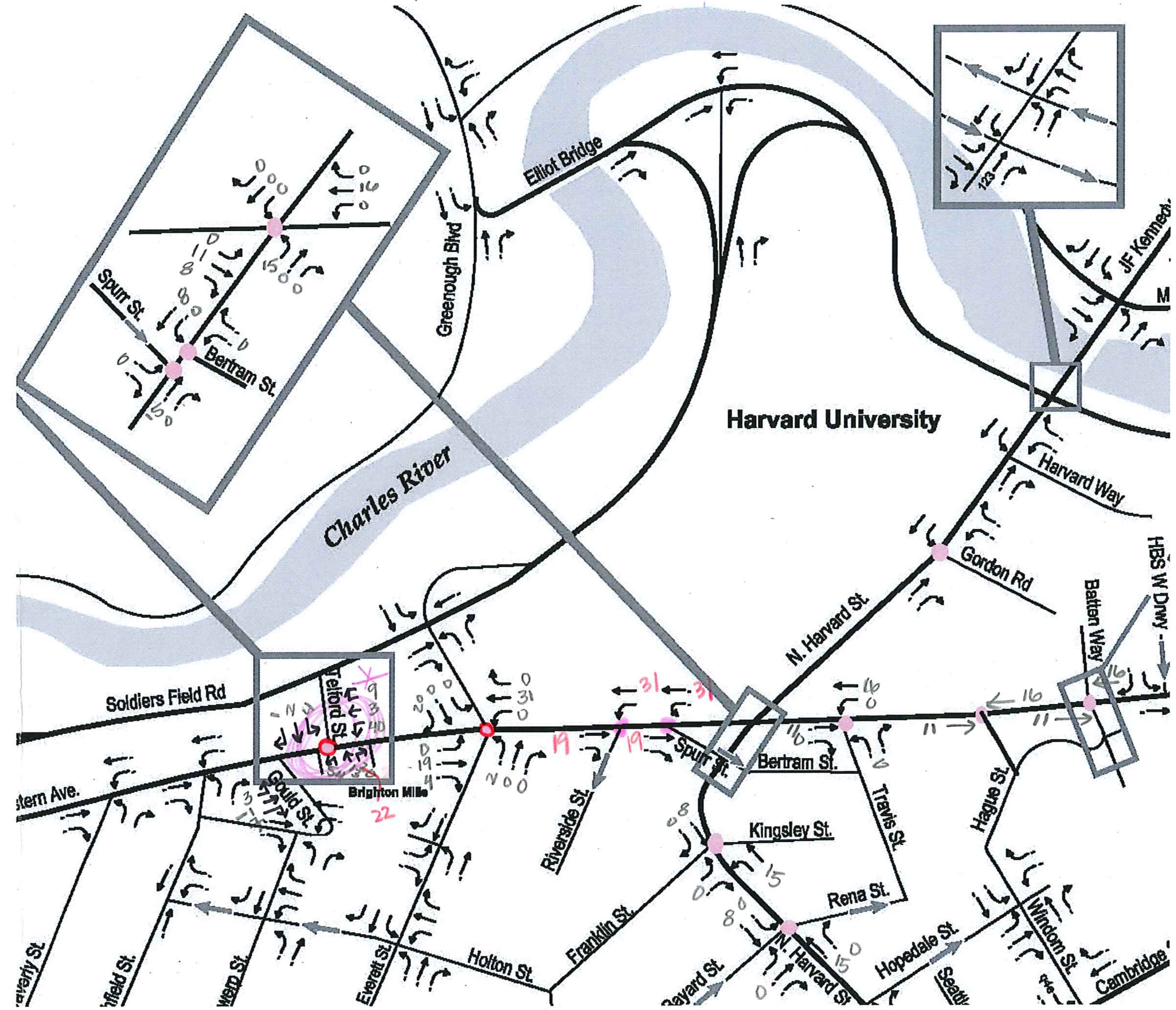


Not to scale.

CHARLESVIEW RELOCATION



AM PEAK



PM PEAK

✓ NLH 8.31.12

New Balance

Figure 11.
Year 2017 No-Build Volumes, a.m. Peak Hour

New Brighton Landing
Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

NEW BRIGHTON LANDING, LLC

Figure 25.
Year 2017 Full-Build with Mitigation Volumes, a.m. Peak Hour (outer)

Not to scale.

Not to scale.

Figure 12.
Year 2017 No-Build Volumes, p.m. Peak Hour

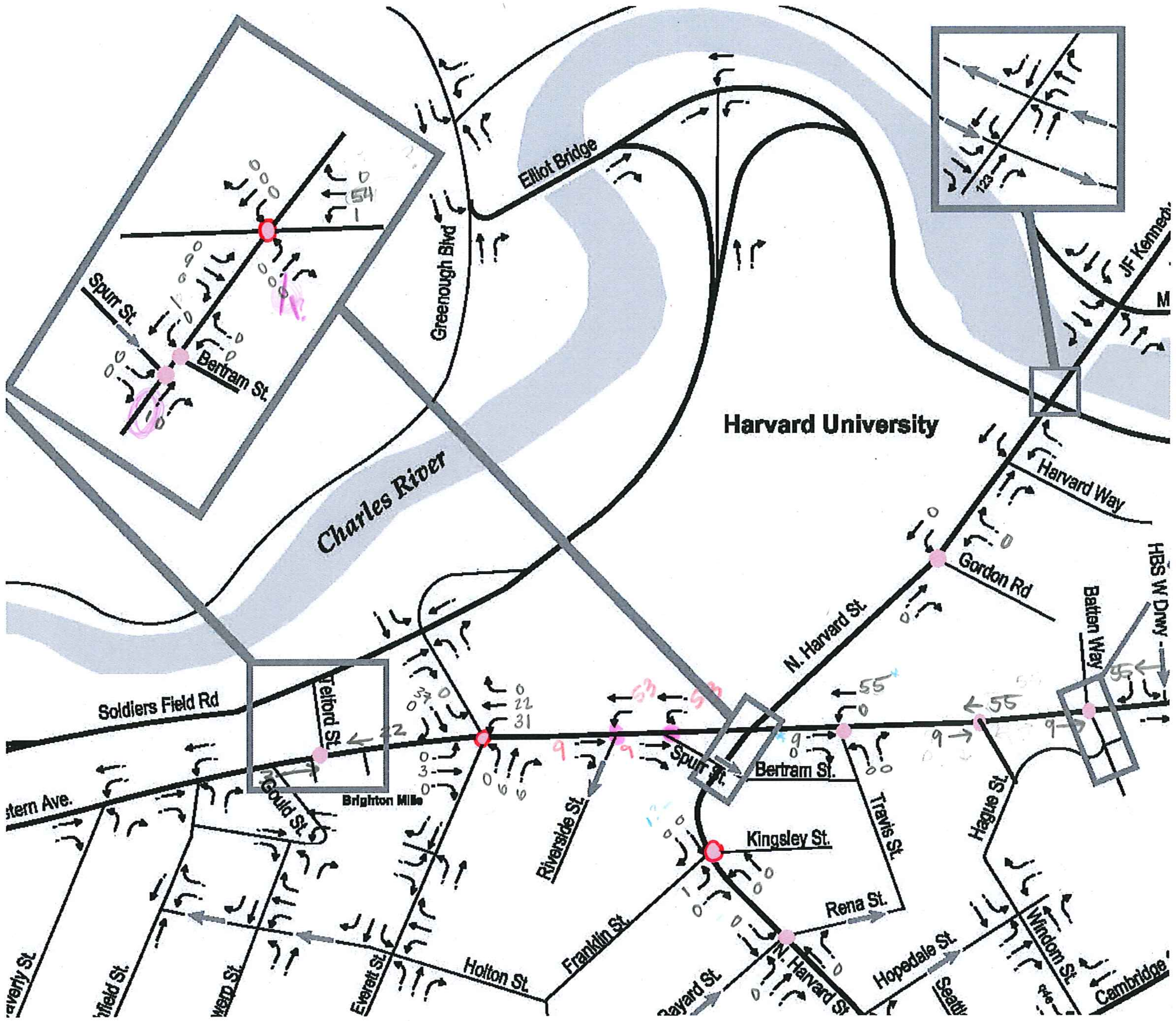
New Brighton Landing
Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

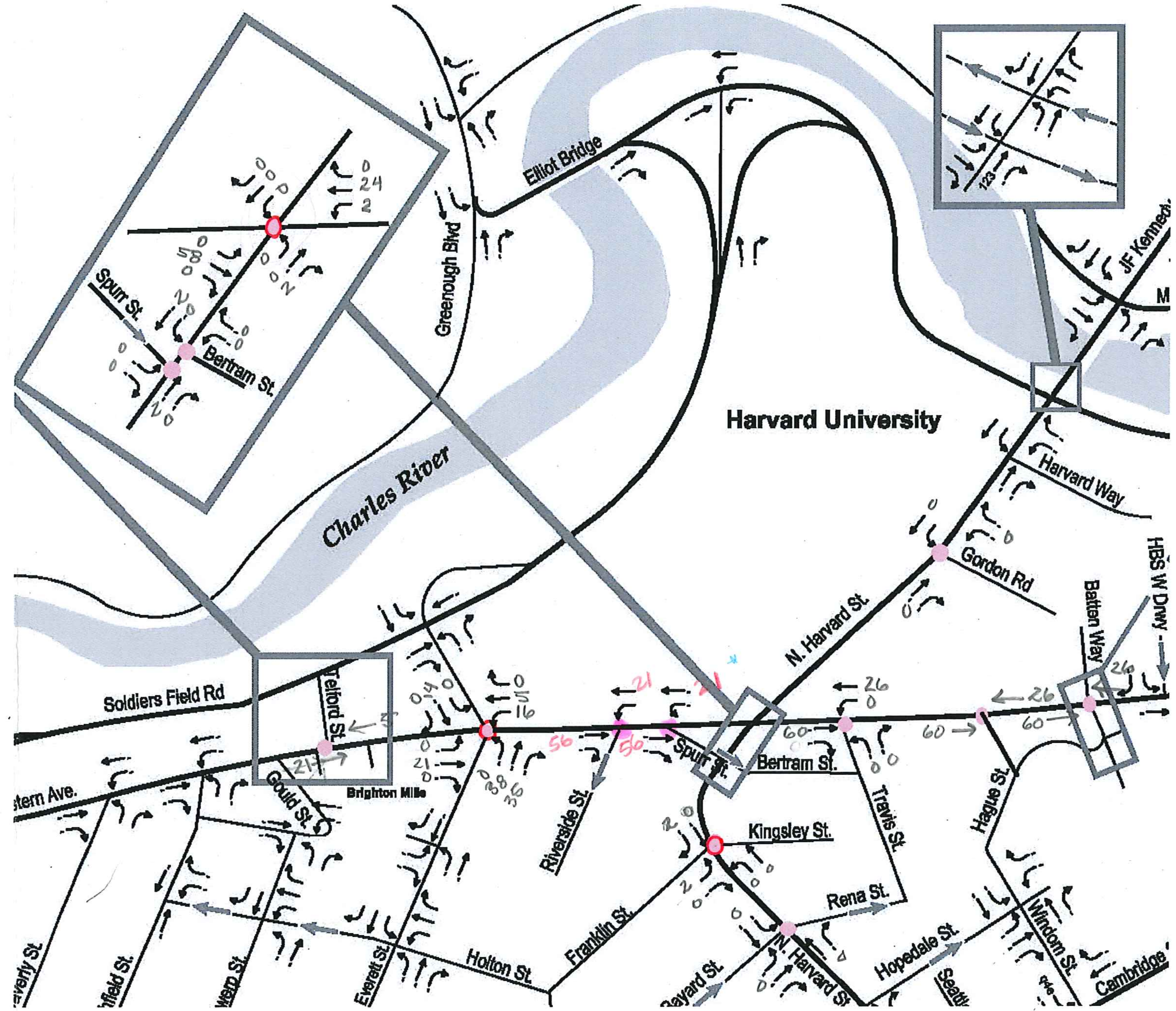
NEW BRIGHTON LANDING, LLC

Figure 27.
Year 2017 Full-Build with Mitigation Volumes, p.m. Peak Hour (outer)

NEW BALANCE



AM PEAK



PM PEAK

✓ NLH 8.31.12

Swiss Bakers Development - Trip Generation

Allston, MA

10463.00

Assumptions

Development Type	Back of House Bakery				Café			
ITE Land Use Code	140 (ksf)				932 (ksf)			
Size	12				2			
		Mode Share [a]				Mode Share [a]		
Direction	VOR [b]	Vehicle	Transit	Walk/Bike	VOR [c]	Vehicle	Transit	Walk/Bike
Weekday Daily	1.1	69%	12%	19%	1.8	52%	8%	40%
Weekday AM								
Enter	1.1	59%	18%	23%	1.8	43%	11%	46%
Exit	1.1	65%	12%	23%	1.8	47%	7%	46%
Weekday PM								
Enter	1.1	65%	12%	23%	1.8	47%	7%	46%
Exit	1.1	59%	18%	23%	1.8	43%	11%	46%

a - Access Boston Mode Share by Purpose and Time of Day for Area 17: Allston

b - New Brighton Landing Expanded PNF, based on 2000 Census Data

c - New Brighton Landing Expanded PNF, based on 2009 National Household Travel Survey

Barrys Corner Mixed Use Development - Trip Generation

Allston, MA

10463.00

Trip Generation by Mode (no credits)

Development Type	**Back of House Bakery**				**Café**			
ITE Land Use Code	**140 (ksf)**				**932 (ksf)**			
Size	**12 ksf**				**2 ksf**			
Direction	**Person Trips [a]**	**Vehicle Trips [b]**	**Transit Trips [c]**	**Walk/Bike Trips [d]**	**Person Trips**	**Vehicle Trips**	**Transit Trips**	**Walk/Bike Trips**
Weekday Daily	50	31	6	10	458	132	37	183
Weekday AM								
Enter	8	4	1	2	22	5	2	10
Exit	2	1	0	0	20	5	1	9
Total	10	5	1	2	42	10	3	19
Weekday PM								
Enter	3	2	0	1	24	6	2	11
Exit	6	3	1	1	16	4	2	7
Total	9	5	1	2	40	10	4	18

a - Person Trips = ITE Trips * VOR

b - Vehicle Trips = (Person Trips * Vehicle Mode Share)/VOR

c - Transit Trips = Person Trips * Transit Mode Share

d - Walk/Bike Trips = Person Trips * Walk/Bike Mode Share

Swiss Bakers Development - Trip Generation

Allston, MA

10463.00

Pass-By Rate: 25%

Vehicle Trip Generation Summary

Development Type	Bakery [a]	Cafe [b]			
ITE Land Use Code	140	932			
Size	12 ksf	2 ksf			
Type of Trip	Vehicle Trips	Vehicle Trips	Pass-By Trips	Vehicle - Pass-by	Total New Vehicle Trips
Weekday Daily [c]	31	132	35	97	128
Weekday AM [d]					
Enter	4	5	0	5	9
Exit	1	5	0	5	6
Total	5	10	0	10	15
Weekday PM [d]					
Enter	2	6	0	6	8
Exit	3	4	0	4	7
Total	5	10	0	10	15

a - Institute of Transportation Engineers, Trip Generation, 8th Edition - Land Use Code 140 [manufacturing] 12 ksf; average rates

b - Institute of Transportation Engineers, Trip Generation, 8th Edition - Land Use Code 932 [high-turnover, sit-down restaurant] 2 ksf; average rates

c - expressed in vehicles per day

d - expressed in vehicles per hour

Check: Pass-by no more than 10% of Western Avenue volume

Western Ave + North Harvard St	Volumes	10%
Weekday Daily	20,200	2,020
AM	1,485	149
PM	1,560	156

ITE TRIP GENERATION WORKSHEET
(7th Edition, Updated January 2004)

LANDUSE: Manufacturing
LANDUSE CODE: 140 Independent Variable --- 1,000 Sq. Feet Gross Floor Area

JOB NAME: **Swiss Bakers Development - Trip Generation** **FLOOR AREA (KSF):** 12.0
JOB NUMBER: **10463.00**

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	62	0.87	3.82	0.50	52.05	349	0	2,200	50%	50%
AM PEAK (ADJACENT ST)	51	0.67	0.73	0.10	8.75	293	0	1,775	78%	22%
PM PEAK (ADJACENT ST)	56	0.75	0.73	0.07	7.85	318	0	2,100	36%	64%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	46	23	23	26	13	13
AM PEAK (ADJACENT ST)	9	7	2	-20	-15	-4
PM PEAK (ADJACENT ST)	9	3	6	-7	-2	-4

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	2	--	1.49	0.88	6.42	483	100	850	50%	50%
PEAK OF GENERATOR	2	--	0.28	0.20	0.94	483	100	850	NA	NA

Distribution Not Available

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	18	9	9	--	--	--
PEAK OF GENERATOR	3	NA	NA	--	--	--

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	2	--	0.62	0.07	5.09	483	100	850	50%	50%
PEAK OF GENERATOR	2	--	0.09	0.01	0.75	483	100	850	NA	NA

Distribution Not Available

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	7	4	4	--	--	--
PEAK OF GENERATOR	1	NA	NA	--	--	--

ITE TRIP GENERATION WORKSHEET

(8th Edition, Updated 2012)

LANDUSE: High-Turnover (Sit-Down) Restaurant

LANDUSE CODE: 932 Independent Variable --- 1,000 Sq. Feet Gross Floor Area

JOB NAME: **Swiss Bakers Development - Trip Generation** **FLOOR AREA (KSF):** 2.0

JOB NUMBER: **10463.00**

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	14	--	127.15	73.51	246.00	7	5	12	50%	50%
AM PEAK (ADJACENT ST)	18	--	11.52	2.83	25.60	6	3	11	52%	48%
PM PEAK (ADJACENT ST)	46	--	11.15	2.80	62.00	6	2	14	59%	41%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	254	127	127	NA	NA	NA
AM PEAK (ADJACENT ST)	23	12	11	NA	NA	NA
PM PEAK (ADJACENT ST)	22	13	9	NA	NA	NA

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	2	--	158.37	144.60	172.71	5	4	5	50%	50%
PEAK OF GENERATOR	8	--	14.07	4.44	50.40	4	3	5	53%	47%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	317	158	158	NA	NA	NA
PEAK OF GENERATOR	28	15	13	NA	NA	NA

SUNDAY

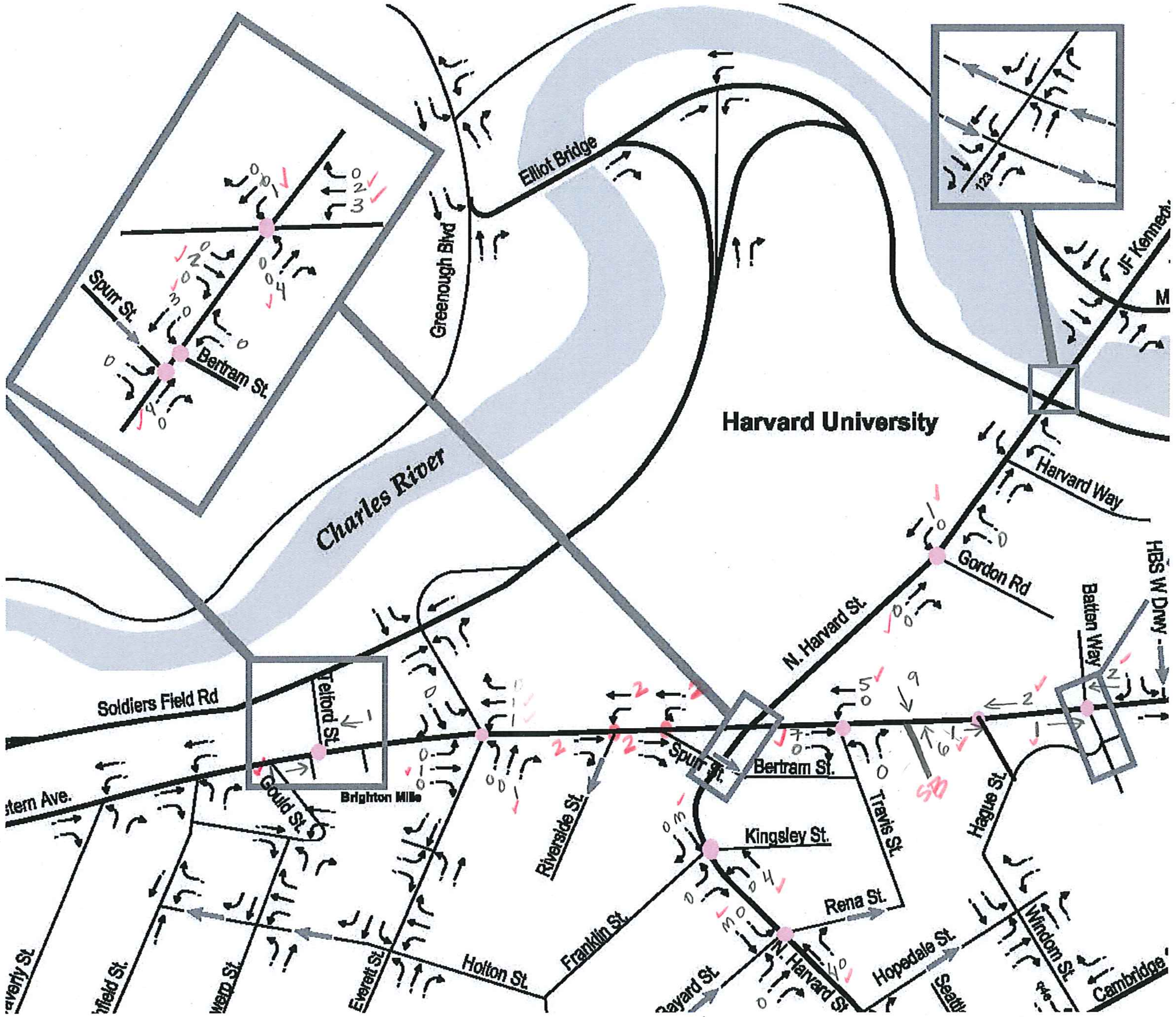
RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	2	--	131.84	119.38	143.80	5	4	5	50%	50%
PEAK OF GENERATOR	3	--	18.46	9.79	43.20	4	2	5	55%	45%

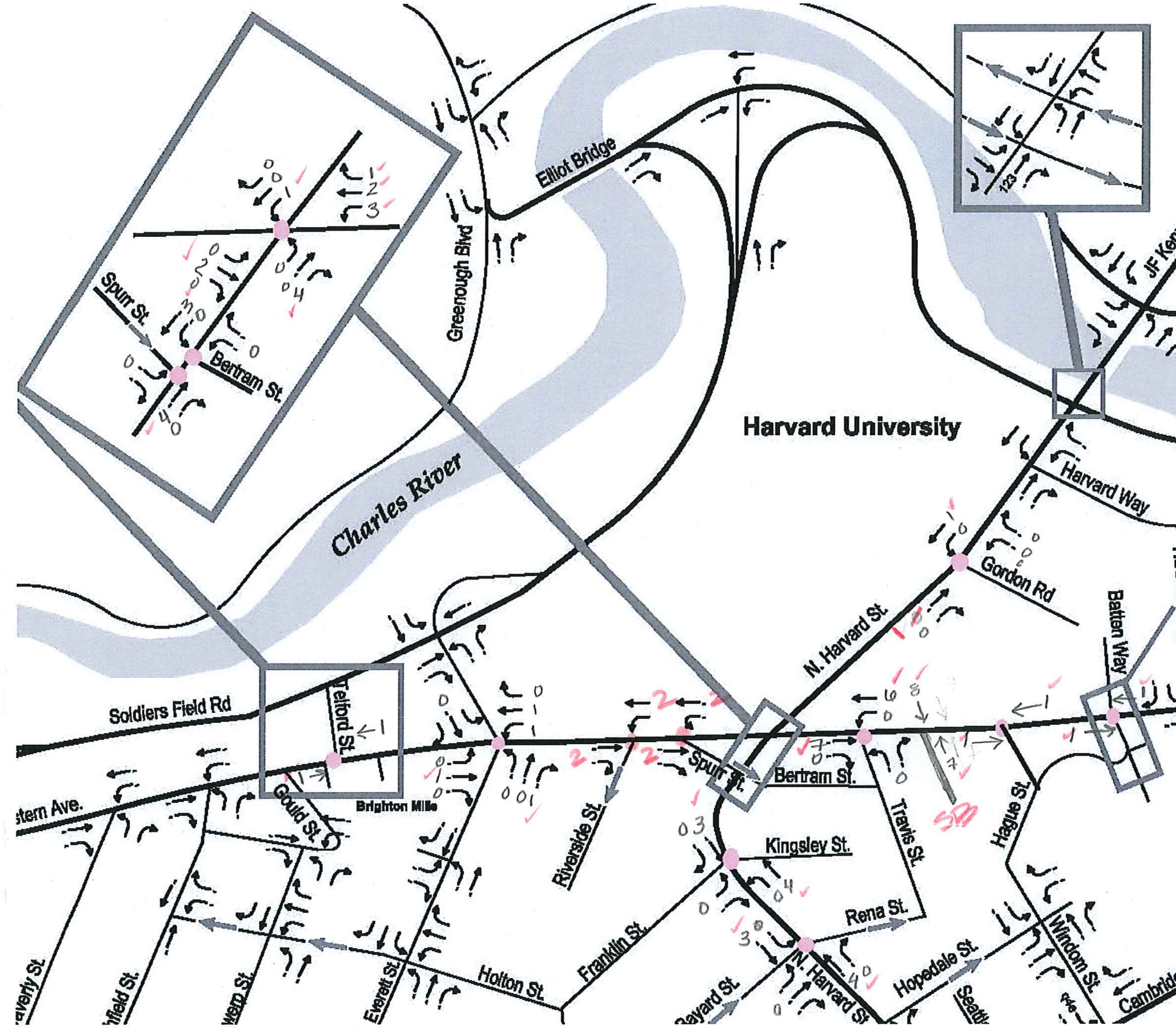
TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	264	132	132	NA	NA	NA
PEAK OF GENERATOR	37	20	17	NA	NA	NA

SWISS BAKERS



AM PEAK

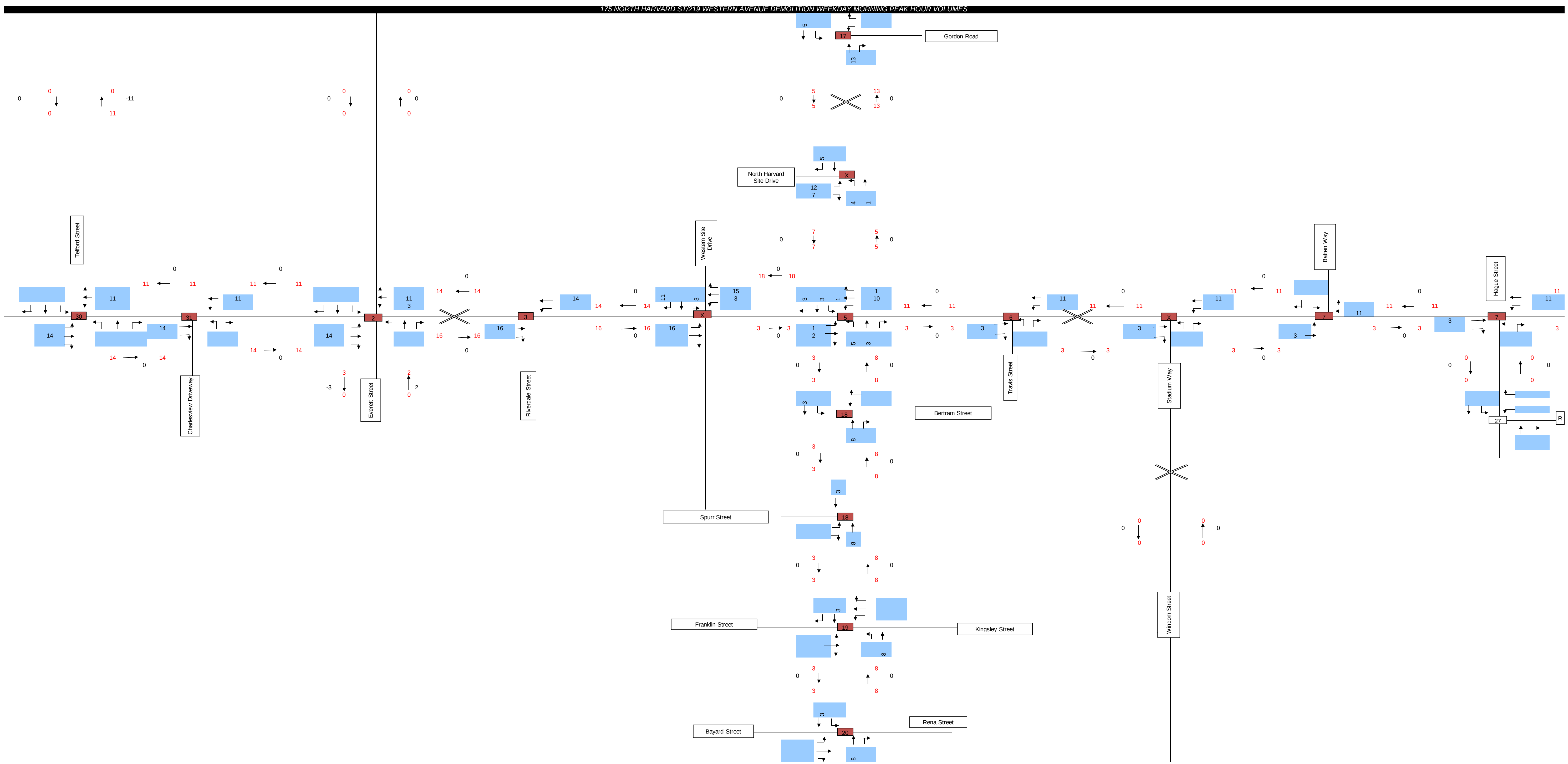


PM PEAK

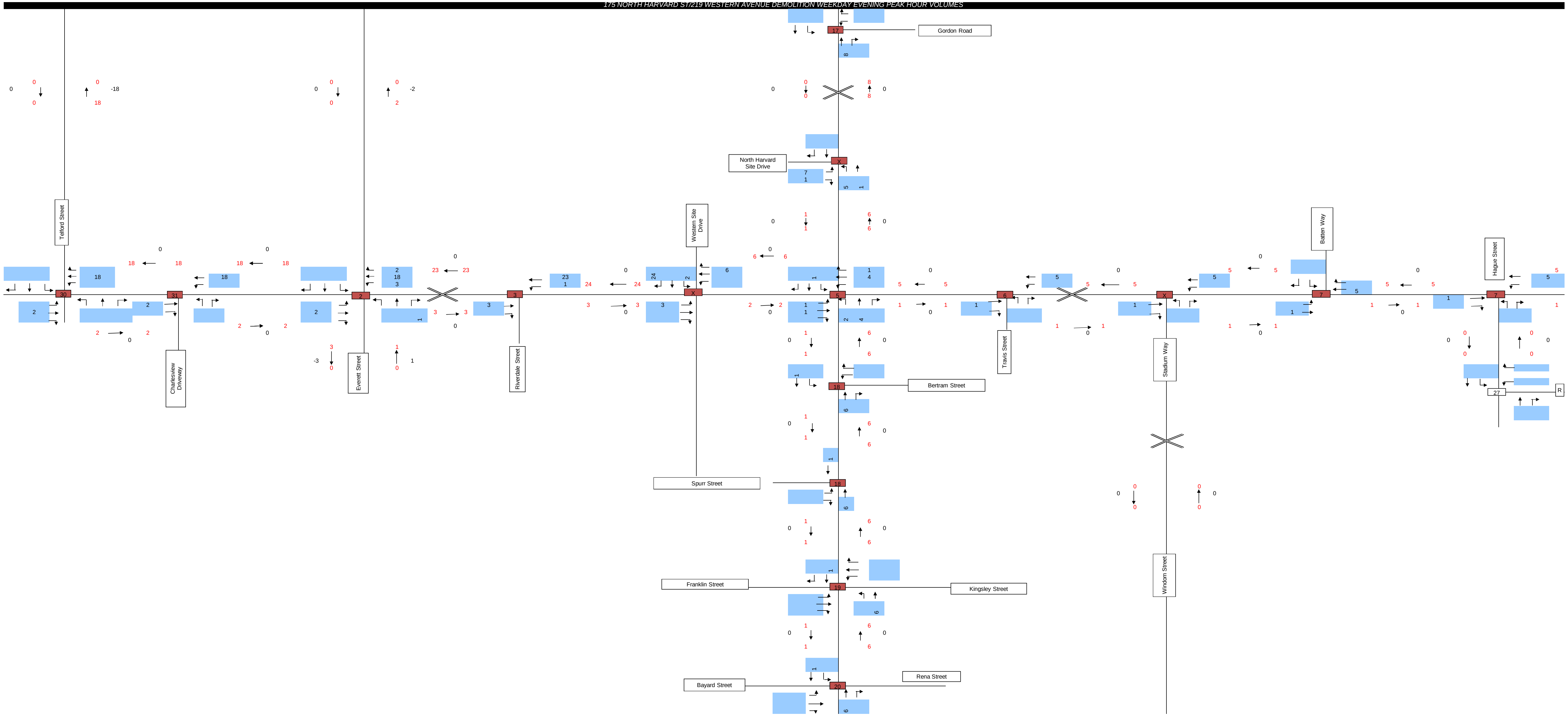
✓ NLH 9.4.12

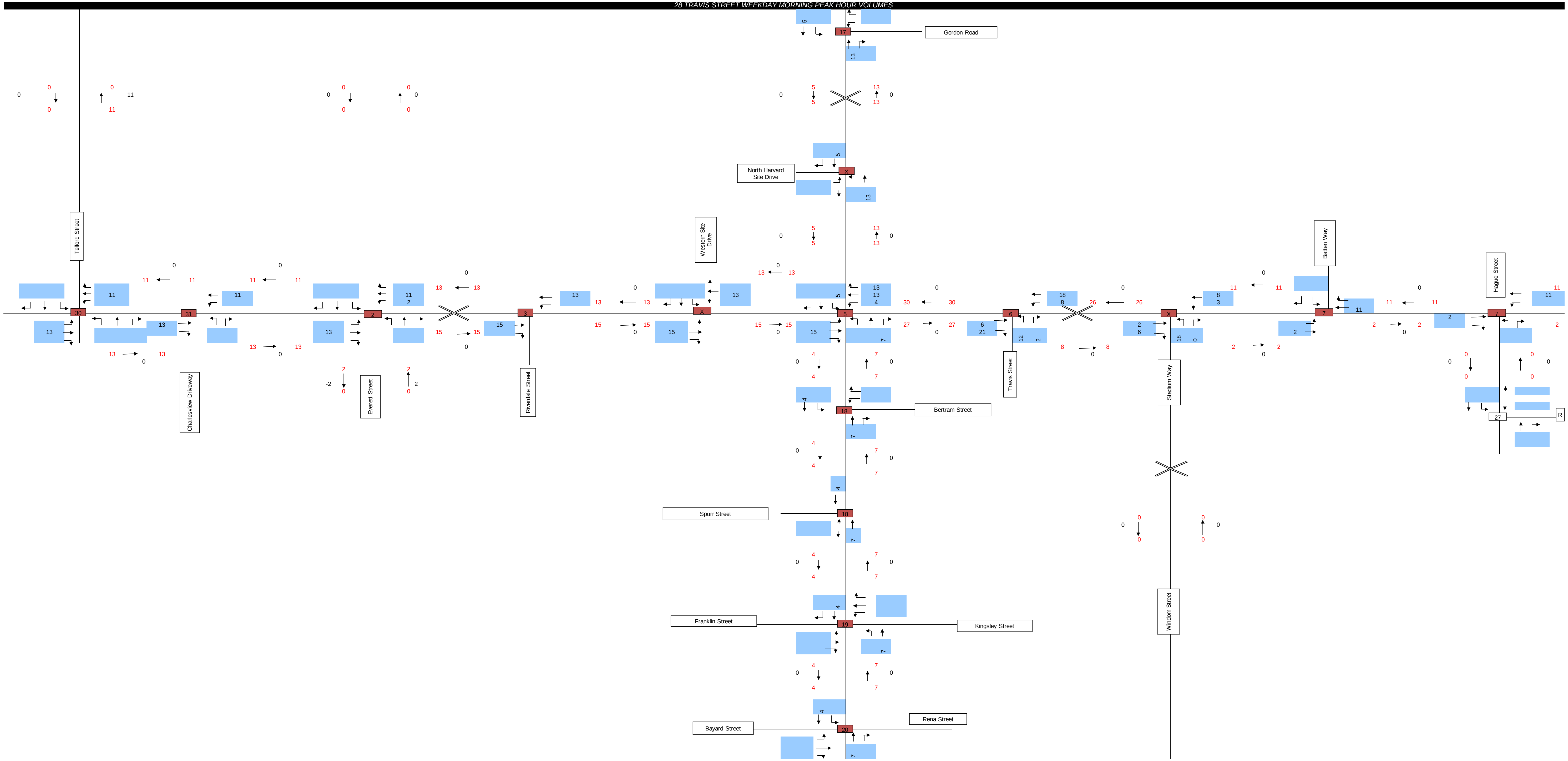
Build Condition Traffic
Displaced Trips
Trip Generation
Trip Distribution
Site-Generated Traffic Volume Networks

Displaced Trips

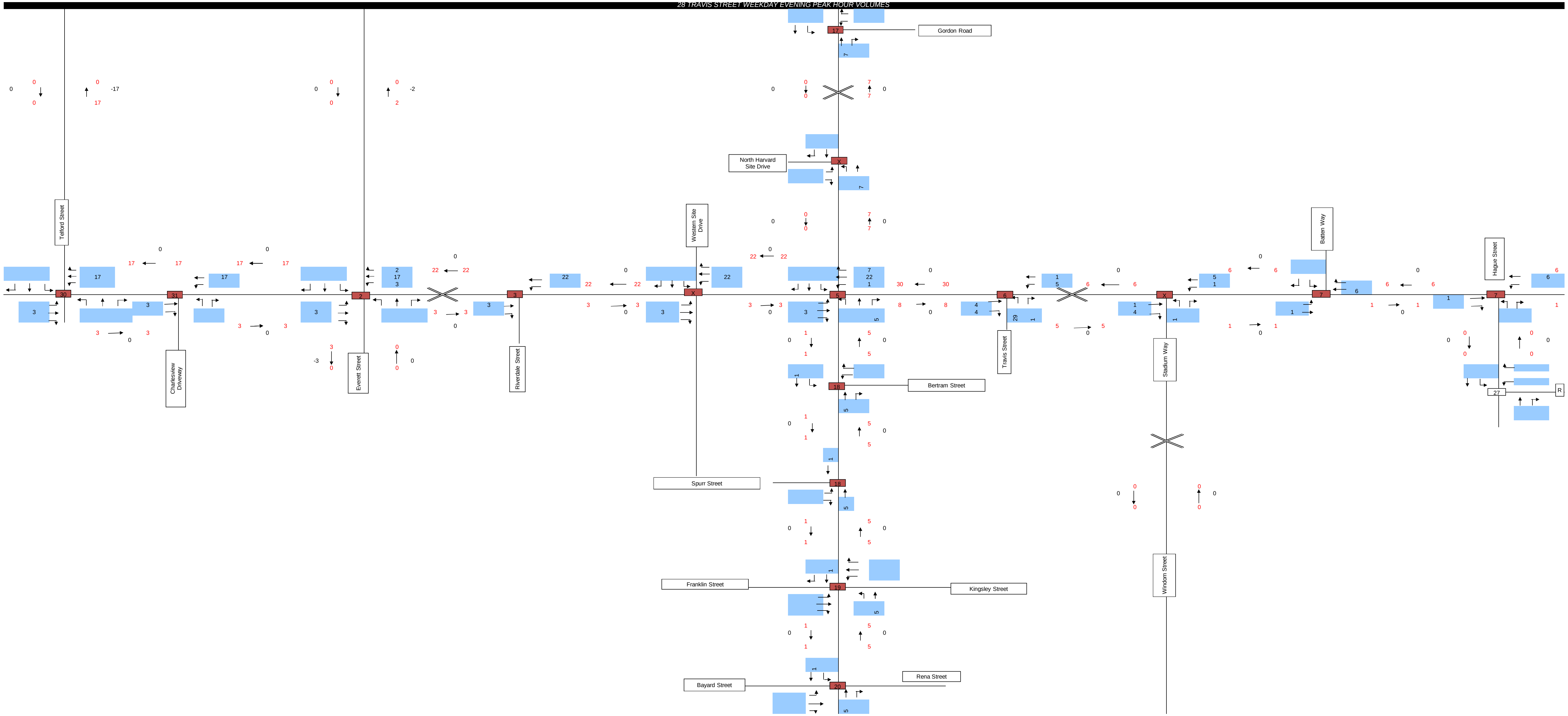


175 NORTH HARVARD ST/219 WESTERN AVENUE DEMOLITION WEEKDAY EVENING PEAK HOUR VOLUMES




Gordon Road
North Harvard Site Drive
Telford Street
Western Site Drive
Batten Way
Hague Street
Charlesview Driveway
Everett Street
Riverdale Street
Travis Street
Stadium Way
Bertram Street
Spurr Street
Franklin Street
Kingsley Street
Bayard Street
Rena Street
Windom Street

28 TRAVIS STREET WEEKDAY EVENING PEAK HOUR VOLUMES



Barrys Corner Mixed Use Development - Trip Generation

Allston, MA

10463.00

Assumptions

Development Type	Residential				Retail			
ITE Land Use Code	220 (units)				820 (ksf)			
Size	325				45			
		Mode Share [a]				Mode Share [a]		
Direction	VOR [b]	Vehicle	Transit	Walk/Bike	VOR [c]	Vehicle	Transit	Walk/Bike
Weekday Daily	1.1	47%	22%	31%	1.8	52%	8%	40%
Weekday AM								
Enter	1.1	37%	30%	33%	1.8	43%	11%	46%
Exit	1.1	43%	21%	36%	1.8	47%	7%	46%
Weekday PM								
Enter	1.1	43%	21%	36%	1.8	47%	7%	46%
Exit	1.1	37%	30%	33%	1.8	43%	11%	46%

a - Access Boston Mode Share by Purpose and Time of Day for Area 17: Allston

b - Charlesview DPIR, based on 2000 Census Data

c - New Brighton Landing Expanded PNF, based on 2009 National Household Travel Survey

Barrys Corner Mixed Use Development - Trip Generation
Allston, MA
10463.00

Trip Generation by Mode (no credits)

Development Type	Residential				Retail			
ITE Land Use Code	220 (units)				820 (ksf)			
Size	325 units				45 ksf			
Direction	**Person Trips [a]**	**Vehicle Trips [b]**	**Transit Trips [c]**	**Walk/Bike Trips [d]**	**Person Trips**	**Vehicle Trips**	**Transit Trips**	**Walk/Bike Trips**
Weekday Daily	2,300	980	510	710	7,270	2,100	580	2,910
Weekday AM								
Enter	35	10	10	10	105	25	10	50
Exit	145	55	30	50	65	15	5	30
Total	180	65	40	60	170	40	15	80
Weekday PM								
Enter	140	55	30	50	330	85	25	150
Exit	75	25	25	25	340	80	35	155
Total	215	80	55	75	670	165	60	305

a - Person Trips = ITE Trips * VOR

b - Vehicle Trips = (Person Trips * Vehicle Mode Share)/VOR

c - Transit Trips = Person Trips * Transit Mode Share

d - Walk/Bike Trips = Person Trips * Walk/Bike Mode Share

Barrys Corner Mixed Use Development - Trip Generation

Allston, MA

10463.00

Pass-By Rate: 25%

Vehicle Trip Generation Summary

Development Type ITE Land Use Code Size Type of Trip	Residential [a] 220 325 units Vehicle Trips	Retail [b] 820 45 ksf Vehicle Trips	 Pass-By Trips	 Vehicle - Pass-by	Total New Vehicle Trips
Weekday Daily [c]	980	2,100	525	1,575	2,555
Weekday AM [d]					
Enter	10	25	5	20	30
Exit	55	15	5	10	65
Total	65	40	10	30	95
Weekday PM [d]					
Enter	55	85	20	65	120
Exit	25	80	20	60	85
Total	80	165	40	125	205

a - Institute of Transportation Engineers, Trip Generation, 8th Edition - Land Use Code 220 [apartments] 325 units; regression equations

b - Institute of Transportation Engineers, Trip Generation, 8th Edition - Land Use Code 820 [shopping center] 45 ksf; regression equations

c - expressed in vehicles per day

d - expressed in vehicles per hour

Check: Pass-by no more than 10% of Western Avenue + North Harvard Street volumes

Western Ave + North Harvard St	Volumes	10%
Weekday Daily	33,600	3,360
AM	2,375	238
PM	2,580	258

ITE TRIP GENERATION WORKSHEET
(8th Edition, Updated 2008)

LANDUSE: Apartment
LANDUSE CODE: 220 — Independent Variable --- Number of Units

JOB NAME: **Barrys Corner Mixed Use Development - Trip G** **Peak Hour Traffic on Adjacent Street:** 325 units
JOB NUMBER: **10463.00**

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	88	0.87	6.65	1.27	12.50	210	0	1,000	50%	50%
AM PEAK (ADJACENT ST)	78	0.83	0.51	0.10	1.02	235	0	1,100	20%	80%
PM PEAK (ADJACENT ST)	90	0.77	0.62	0.10	1.64	233	0	1,100	65%	35%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	2,161	1,081	1,081	2093	1047	1047
AM PEAK (ADJACENT ST)	166	33	133	163	33	130
PM PEAK (ADJACENT ST)	202	131	71	196	128	69

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	15	0.85	6.39	2.84	8.40	175	65	360	50%	50%
PEAK OF GENERATOR	14	0.56	0.52	0.26	1.05	178	65	360	*Peak Distribution Not Availble*	

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	2,077	1,038	1,038	2295	1,148	1,148
PEAK OF GENERATOR	169	NA	NA	152	NA	NA

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	14	0.82	5.86	3.21	7.53	182	90	360	50%	50%
PEAK OF GENERATOR	13	--	0.51	0.26	1.43	186	90	360	*Peak Distribution Not Availble*	

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,905	1,038	1,038	1985	993	993
PEAK OF GENERATOR	166	NA	NA	NA	NA	NA

ITE TRIP GENERATION WORKSHEET
(8th Edition, Updated 2008)

LANDUSE: Shopping Center (non-Christmas)
LANDUSE CODE: 820 Independent Variable --- 1,000 Sq. Feet Gross Floor Area

JOB NAME: **Barrys Corner Mixed Use Development - TDP G** **FLOOR AREA (KSF):** 45
JOB NUMBER: **10463.00**

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	302	0.78	42.94	12.50	270.89	328	0	1,600	50%	50%
AM PEAK (ADJACENT ST)	101	0.52	1.00	0.10	9.05	296	0	1,600	61%	39%
PM PEAK (ADJACENT ST)	412	0.81	3.73	0.68	29.27	379	0	2,500	49%	51%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,932	966	966	4041	2021	2021
AM PEAK (ADJACENT ST)	45	27	18	96	59	37
PM PEAK (ADJACENT ST)	168	82	86	373	183	190

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	123	0.82	49.97	16.70	227.50	450	0	1,600	50%	50%
PEAK OF GENERATOR	127	0.83	4.89	1.46	18.32	450	0	1,600	52%	48%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	2,249	1,124	1,124	5,587	2,793	2,793
PEAK OF GENERATOR	220	114	106	510	265	245

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends Average	Total Trip Ends Low	Total Trip Ends High	Independent Variable Range Average	Independent Variable Range Low	Independent Variable Range High	Directional Distribution Enter	Directional Distribution Exit
DAILY	77	0.52	25.24	4.15	148.15	439	0	1,600	50%	50%
PEAK OF GENERATOR	39	N/A	3.12	0.39	12.40	369	0	1,300	49%	51%

TRIPS:

	BY AVERAGE Total	BY AVERAGE Enter	BY AVERAGE Exit	BY REGRESSION Total	BY REGRESSION Enter	BY REGRESSION Exit
DAILY	1,136	568	568	4918	2459	2459
PEAK OF GENERATOR	140	69	72	N/A	N/A	N/A

Distribution and Mode Share by Transportation Zone
For AM & PM Peak

AM Peak Period Trips (6-9AM)

Trips Starting in Zone 17

To/From	Mode Shares			Geographical Distribution of Trips			
ZONE	Auto	Transit	Walk	Total	Auto	Transit	Walk
1	67.6	32.4	0.0	1.1	1.7	1.9	0.0
2	29.2	70.8	0.0	4.7	3.1	17.5	0.0
3	40.7	59.3	0.0	1.2	1.1	3.8	0.0
4	35.1	54.5	10.4	8.0	6.3	23.0	2.2
5	89.9	10.1	0.0	1.5	3.0	0.8	0.0
6	74.3	25.7	0.0	0.5	0.9	0.8	0.0
7	100.0	0.0	0.0	0.2	0.4	0.0	0.0
8	93.0	7.0	0.0	0.6	1.3	0.2	0.0
9	54.2	45.8	0.0	0.5	0.6	1.1	0.0
10	52.4	18.6	29.0	6.4	7.6	6.3	5.0
11	81.9	18.1	0.0	0.3	0.5	0.3	0.0
12	100.0	0.0	0.0	0.1	0.3	0.0	0.0
13	43.3	56.7	0.0	1.2	1.1	3.5	0.0
14	100.0	0.0	0.0	0.2	0.5	0.0	0.0
15	69.1	30.9	0.0	1.3	2.1	2.2	0.0
16	100.0	0.0	0.0	0.1	0.2	0.0	0.0
17	11.7	3.8	84.5	35.1	9.3	7.1	80.0
18	100.0	0.0	0.0	0.1	0.3	0.0	0.0
19	69.9	30.1	0.0	0.7	1.1	1.1	0.0
20	100.0	0.0	0.0	0.5	1.2	0.0	0.0
RBO	95.4	4.6	0.0	2.1	4.5	0.5	0.0
RGR	54.0	22.8	23.2	15.5	19.0	18.8	9.7
RCD	77.0	5.1	17.9	6.3	10.9	1.7	3.0
RMR	60.6	39.4	0.0	0.9	1.3	1.9	0.0
BNE	93.1	6.9	0.0	0.4	0.8	0.1	0.0
BNO	56.6	43.4	0.0	1.5	1.9	3.4	0.0
BNW	87.7	12.3	0.0	4.1	8.2	2.7	0.0
CN	100.0	0.0	0.0	1.0	2.2	0.0	0.0
CW	96.2	3.8	0.0	2.1	4.5	0.4	0.0
CSW	95.2	4.8	0.0	1.3	2.8	0.3	0.0
CSE	80.1	19.9	0.0	0.6	1.1	0.7	0.0
TOTAL	44.1	18.8	37.1	100.0	100.0	100.0	100.0

Trips Ending in Zone 17

To/From	Mode Shares			Geographical Distribution of Trips			
ZONE	Auto	Transit	Walk	Total	Auto	Transit	Walk
1	30.4	69.6	0.0	0.7	0.4	2.8	0.0
2	79.9	20.1	0.0	0.3	0.4	0.3	0.0
3	100.0	0.0	0.0	0.1	0.2	0.0	0.0
4	36.4	45.2	18.4	3.4	2.3	9.5	2.2
5	38.0	62.0	0.0	2.0	1.4	7.6	0.0
6	56.9	43.1	0.0	1.1	1.1	2.8	0.0
7	51.3	48.7	0.0	0.4	0.4	1.2	0.0
8	84.4	15.6	0.0	0.3	0.5	0.3	0.0
9	61.8	38.2	0.0	0.7	0.8	1.7	0.0
10	52.2	30.1	17.7	8.0	7.6	14.8	5.0
11	100.0	0.0	0.0	0.2	0.3	0.0	0.0
12	59.1	40.9	0.0	0.7	0.8	1.8	0.0
13	81.9	18.1	0.0	0.3	0.4	0.3	0.0
14	44.4	55.6	0.0	1.4	1.1	4.6	0.0
15	79.5	20.5	0.0	0.9	1.3	1.2	0.0
16	78.8	21.2	0.0	0.4	0.6	0.6	0.0
17	11.7	3.8	84.5	26.9	5.7	6.3	80.0
18	59.1	40.9	0.0	0.2	0.2	0.5	0.0
19	93.8	6.2	0.0	1.0	1.7	0.4	0.0
20	100.0	0.0	0.0	0.2	0.3	0.0	0.0
RBO	86.1	13.9	0.0	3.5	5.5	3.0	0.0
RGR	55.2	18.7	26.1	10.6	10.6	12.1	9.7
RCD	71.3	18.0	10.7	8.0	10.4	8.9	3.0
RMR	77.5	22.5	0.0	1.4	2.0	1.9	0.0
BNE	90.3	9.7	0.0	1.1	1.8	0.7	0.0
BNO	94.7	5.3	0.0	1.9	3.3	0.6	0.0
BNW	77.4	22.6	0.0	6.4	9.0	8.9	0.0
CN	93.9	6.1	0.0	4.8	8.1	1.8	0.0
CW	96.8	3.2	0.0	6.1	10.7	1.2	0.0
CSW	93.0	7.0	0.0	4.1	6.8	1.7	0.0
CSE	86.1	13.9	0.0	2.8	4.3	2.4	0.0
TOTAL	55.3	16.3	28.4	100.0	100.0	100.0	100.0

PM Peak Period Trips (3-6PM)

Trips Starting in Zone 17

To/From	Mode Shares			Geographical Distribution of Trips			
ZONE	Auto	Transit	Walk	Total	Auto	Transit	Walk
1	43.2	56.8	0.0	0.6	0.5	2.5	0.0
2	40.3	59.7	0.0	0.6	0.4	2.4	0.0
3	52.2	47.8	0.0	0.2	0.2	0.8	0.0
4	31.8	56.8	11.4	5.9	3.4	23.4	2.2
5	61.5	38.5	0.0	1.8	2.0	4.7	0.0
6	68.1	31.9	0.0	1.1	1.3	2.4	0.0
7	70.7	29.3	0.0	0.3	0.4	0.7	0.0
8	77.6	22.4	0.0	0.6	0.9	1.0	0.0
9	75.0	25.0	0.0	0.7	1.0	1.3	0.0
10	61.1	18.5	20.5	7.4	8.1	9.5	5.0
11	90.7	9.3	0.0	0.2	0.4	0.1	0.0
12	70.7	29.3	0.0	0.5	0.6	0.9	0.0
13	73.5	26.5	0.0	0.4	0.5	0.7	0.0
14	68.9	31.1	0.0	0.9	1.2	2.0	0.0
15	81.2	18.8	0.0	1.3	2.0	1.7	0.0
16	82.4	17.6	0.0	0.3	0.5	0.4	0.0
17	13.4	1.2	85.4	28.3	6.9	2.3	80.0
18	86.6	13.4	0.0	0.2	0.4	0.2	0.0
19	95.0	5.0	0.0	0.8	1.5	0.3	0.0
20	100.0	0.0	0.0	0.2	0.4	0.0	0.0
RBO	93.7	6.3	0.0	4.2	7.1	1.9	0.0
RGR	58.9	19.2	22.0	13.4	14.2	17.9	9.7
RCD	75.2	13.5	11.3	8.1	11.0	7.6	3.0
RMR	78.0	22.0	0.0	1.2	1.7	1.9	0.0
BNE	86.4	13.6	0.0	0.9	1.4	0.9	0.0
BNO	94.9	5.1	0.0	1.5	2.6	0.5	0.0
BNW	79.5	20.5	0.0	5.0	7.2	7.1	0.0
CN	93.5	6.5	0.0	3.5	5.8	1.6	0.0
CW	97.8	2.2	0.0	4.7	8.2	0.7	0.0
CSW	95.0	5.0	0.0	3.2	5.4	1.1	0.0
CSE	88.4	11.6	0.0	1.8	2.9	1.5	0.0
TOTAL	55.4	14.4	30.2	100.0	100.0	100.0	100.0

Trips Ending in Zone 17

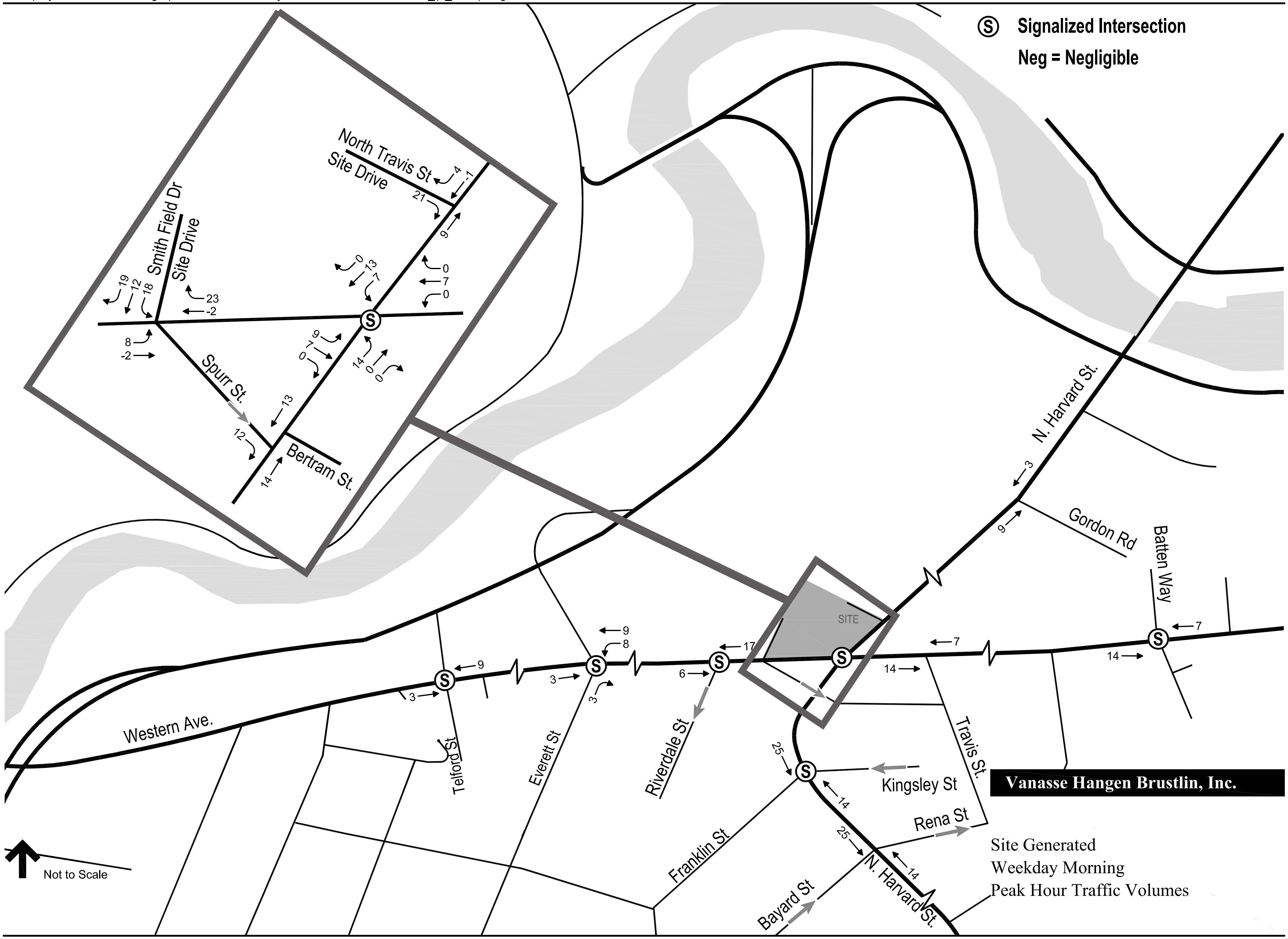
To/From	Mode Shares			Geographical Distribution of Trips			
ZONE	Auto	Transit	Walk	Total	Auto	Transit	Walk
1	61.9	38.1	0.0	0.8	1.1	1.9	0.0
2	26.5	73.5	0.0	3.1	1.7	13.8	0.0
3	38.8	61.2	0.0	0.8	0.6	3.0	0.0
4	34.5	55.9	9.6	8.0	5.6	27.1	2.2
5	48.7	51.3	0.0	2.9	2.8	8.9	0.0
6	83.0	17.0	0.0	0.8	1.3	0.8	0.0
7	100.0	0.0	0.0	0.2	0.3	0.0	0.0
8	83.8	16.2	0.0	0.7	1.3	0.7	0.0
9	82.9	17.1	0.0	0.5	0.9	0.5	0.0
10	61.4	13.4	25.2	6.8	8.5	5.5	5.0
11	74.7	25.3	0.0	0.3	0.5	0.5	0.0
12	100.0	0.0	0.0	0.2	0.4	0.0	0.0
13	57.5	42.5	0.0	0.7	0.8	1.8	0.0
14	94.0	6.0	0.0	0.5	0.9	0.2	0.0
15	88.1	11.9	0.0	1.3	2.3	0.9	0.0
16	100.0	0.0	0.0	0.2	0.3	0.0	0.0
17	13.4	1.2	85.4	32.2	8.8	2.3	80.0
18	100.0	0.0	0.0	0.2	0.4	0.0	0.0
19	100.0	0.0	0.0	0.6	1.2	0.0	0.0
20	100.0	0.0	0.0	0.2	0.4	0.0	0.0
RBO	96.4	3.6	0.0	3.3	6.4	0.7	0.0
RGR	59.0	19.5	21.5	15.5	18.7	18.3	9.7
RCD	74.1	11.5	14.5	7.2	10.8	5.0	3.0
RMR	83.2	16.8	0.0	0.8	1.4	0.8	0.0
BNE	95.4	4.6	0.0	0.5	0.9	0.1	0.0
BNO	75.8	24.2	0.0	1.2	1.9	1.8	0.0
BNW	83.2	16.8	0.0	4.0	6.8	4.1	0.0
CN	97.5	2.5	0.0	1.6	3.1	0.2	0.0
CW	97.7	2.3	0.0	2.5	5.0	0.4	0.0
CSW	96.0	4.0	0.0	1.6	3.2	0.4	0.0
CSE	95.4	4.6	0.0	0.7	1.4	0.2	0.0
TOTAL	49.1	16.6	34.3	100.0	100.0	100.0	100.0

Auto trips for AREA 17
Allston

	Commute Zone	Peak Hour Trips that Begin in Area 17 (Residents) %	Peak Hour Trips that end in Area 17 (Workers) %	Route Assignment	
1	north end	1.7	0.4	4	
2	downtown	3.1	0.4	4	
3	chinatown	1.1	0.2	3	90
4	backbay/fens	6.3	2.3	half 3, half 4	
5	lma	3.0	1.4	3	local
6	jamaica plain	0.9	1.1	half 2, half 3	local
7	revere/suffolk downs	0.4	0.4	3	90
8	north dorchester	1.3	0.5	3	90
9	south dorchester	0.6	0.8	3	90
10	brighton	7.6	7.6	25% 1, 25% 3, half 2	local
11	charlestown	0.5	0.3	4	
12	hyde park	0.3	0.8	half 2, half 3	local
13	south boston	1.1	0.4	3	90
14	mattapan	0.5	1.1	3	local
15	south end/roxbury	2.1	1.3	3	90
16	forest hills	0.2	0.6	3	local
17	allston	9.3	5.7	third 1, third 2, third 3	local
18	savin hill	0.3	0.2	3	90
19	roslindale	1.1	1.7	half 2, half 3	local
20	east boston	1.2	0.3	half 3, half 4	90
	RBO - Everett Chelsea	4.5	5.5	half 3, half 4	90
	RGR - Cambridge/Somerville	19.0	10.6	half 4, half 5	
	RCD - Newton/Chesnut Hill	10.9	10.4	third 1, third 2, third 3	local
	RMR - Quincy	1.3	2.0	3	90
	BNE - Lynn Salem Saugus	0.8	1.8	half 3, half 4	90
	BNO - Stoneham/Burlington/Wakefield	1.9	3.3	half 3, half 4	90
	BNW - Watertown	8.2	9.0	half 1, half 5	
	CN - Andover/Methuen/Wilmington	2.2	8.1	half 3, half 4	90
	CW - Natick	4.5	10.7	3	90
	CSW - Needham/Dedham	2.8	6.8	half 1, half 3	90
	CSE - Commuter SE SouthShore	1.1	4.3	3	90
	Total	99.8	100		

	Vehicle Trip Assignment	trips beginning	trips ending	Average
1	Western Ave (from west)	14	15	15
2	Everett Street (from south)	12	11	11
3	North Harvard St (from south)	37	47	42
4	Western Ave (from east)	23	17	20
5	North Harvard St (from north)	14	10	12
				0
				0
		100	100	100

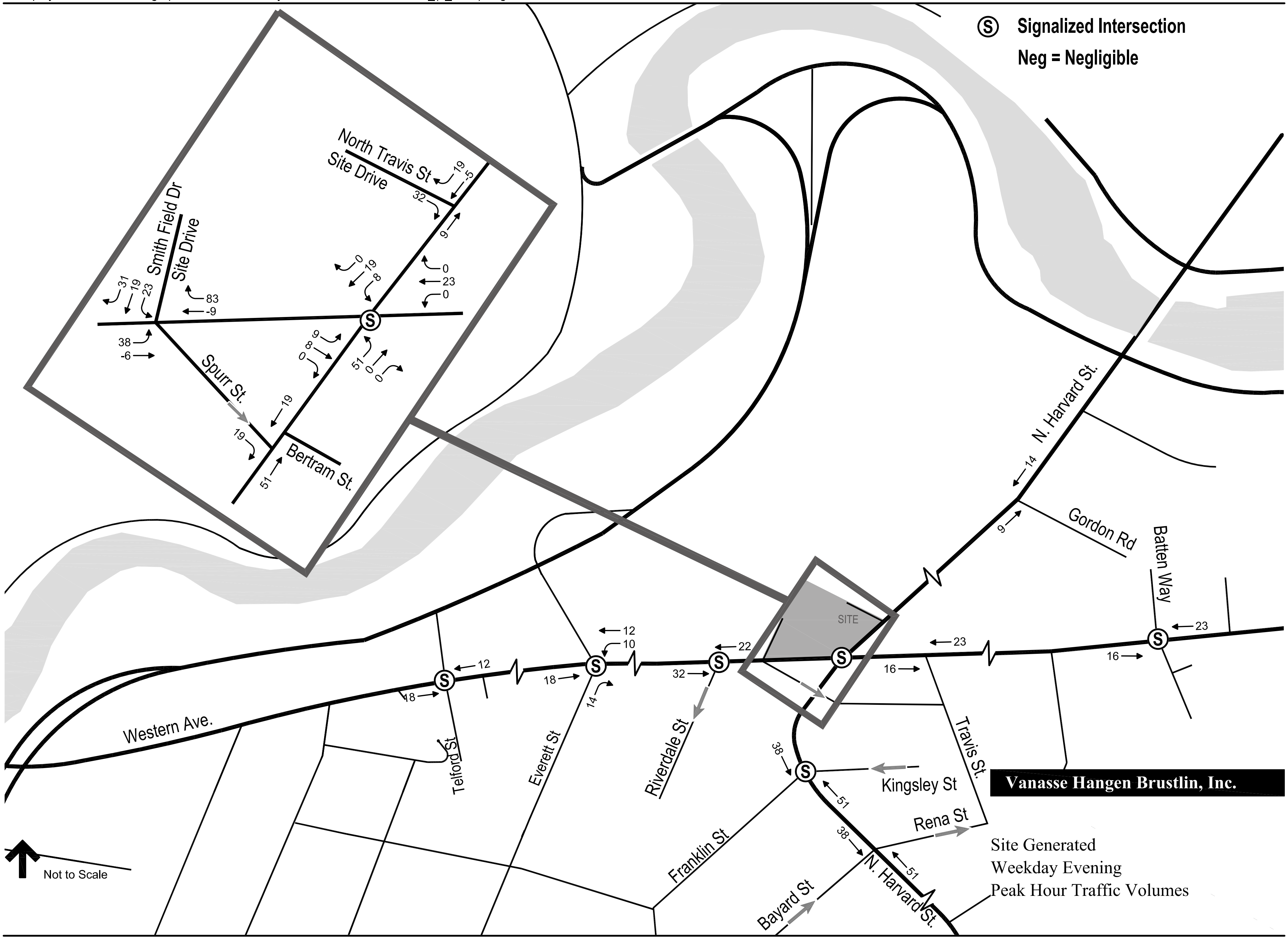
1 Western Ave (from west) = Arsenal St, SFR from west, Birmingham, Market St
2 Everett Street (from south) = Everett St
3 North Harvard St (from south) = Cambridge St, Harvard Ave, I-90
4 Western Ave (from east) = Western Ave/River St from east, SFR from east, Mem Dr from east
5 North Harvard St (from north) = JFK St, Mem Dr from west, Eliot Bridge



Vanasse Hangen Brustlin, Inc.

Site Generated
Weekday Morning
Peak Hour Traffic Volumes

\\vhb\proj\Wat-TS\10463.00\graphics\FIGURES\Barry's Corner PNF\NETWORKS_(9_2012).dwg



Site Generated
Weekday Evening
Peak Hour Traffic Volumes

Intersection Capacity Analyses
Overall Capacity Summary Tables
2012 Existing Conditions
2017 No-Build Conditions
2017 Build Conditions
2017 Build with Mitigation Conditions

Table X Signalized Intersection Capacity Analysis Summary

Intersection	Lane Group	2012 Existing Conditions								2017 No-Build Conditions								2017 Build Conditions								2017 Build with Mitigation Conditions							
		Weekday Morning Peak Hour				Weekday Evening Peak Hour				Weekday Morning Peak Hour				Weekday Evening Peak Hour				Weekday Morning Peak Hour				Weekday Evening Peak Hour				Weekday Morning Peak Hour				Weekday Evening Peak Hour			
Intersection	Lane Group	V/C[1]	Delay	LOS[3]	V/C	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q
Western Avenue at Telford Street/ Telford Street Extension	Western Ave. EB	0.67	5	A	278	0.67	6	A	329	0.75	9	A	#535	0.77	12	B	#545	0.75	9	A	#541	0.79	12	B	#636	0.75	9	A	#541	0.79	12	B	#636
	Western Ave. WB L	0.20	1	A	m0	0.25	1	A	m0	0.25	2	A	m1	0.43	4	A	m1	0.25	2	A	m1	0.44	4	A	m1	0.25	2	A	m1	0.44	4	A	m1
	Western Ave. WB T/R	0.40	2	A	m2	0.51	2	A	m62	0.46	2	A	m9	0.60	4	A	m33	0.47	2	A	m14	0.60	4	A	m34	0.47	2	A	m14	0.60	4	A	m34
	Telford St. Extension NB	0.30	36	D	30	0.47	40	D	63	0.59	37	D	70	0.68	43	D	124	0.59	37	D	70	0.68	43	D	124	0.59	37	D	70	0.68	43	D	124
	Telford St. Extension NB R	0.03	35	C	21	0.04	37	D	32	0.06	31	C	25	0.06	32	C	36	0.06	31	C	25	0.06	32	C	36	0.06	31	C	25	0.06	32	C	36
	Telford St.. SB Approach	0.06	35	C	20	0.04	37	D	17	0.11	31	C	27	0.06	32	C	22	0.11	31	C	27	0.06	32	C	22	0.11	31	C	27	0.06	32	C	22
	Overall	0.64	5	A		0.64	7	A		0.73	9	A		0.76	11	B		0.73	9	A		0.77	11	B		0.73	9	A		0.77	11	B	
Western Avenue at Everett Street	Western Ave. EB L/T	0.89	27	C	#725	0.76	19	B	#730	0.98	40	D	#959	0.95	34	C	#934	0.99	40	D	#965	1.00	45	D	#965	0.99	40	D	#965	1.00	45	D	#965
	Western Ave. EB R	0.22	10	A	m87	0.25	10	A	m113	0.23	10	B	m86	0.27	10	B	m103	0.23	10	B	m86	0.27	10	B	m100	0.23	10	B	m86	0.27	10	B	m100
	Western Ave. WB L	0.57	24	C	#164	0.49	19	B	#200	0.96	85	F	#208	0.69	31	C	#200	1.01	96	F	#217	0.80	44	D	#217	1.01	96	F	#217	0.80	44	D	#217
	Western Ave. WB T/R	0.62	16	B	#486	0.84	26	C	#742	0.68	18	B	#542	0.95	39	D	#855	0.69	18	B	#552	0.96	42	D	#869	0.69	18	B	#552	0.96	42	D	#869
	Everett St. NB Approach	>1.20	>120	F	#390	1.09	110	F	#389	>1.20	>120	F	#429	>1.20	>120	F	#511	>1.20	>120	F	#434	>1.20	>120	F	#532	>1.20	>120	F	#434	>1.20	>120	F	#532
	Everett St. SB Approach	0.97	73	E	#226	0.78	41	D	#272	>1.20	>120	F	#321	0.99	79	E	#356	>1.20	>120	F	#323	1.00	84	F	#359	>1.20	>120	F	#323	1.00	84	F	#359
	Overall	1.04	69	E		0.92	37	D		1.16	109	F		1.09	72	E		1.18	113	F		1.14	80	F		1.18	113	F		1.14	80	F	
Western Avenue at Riverdale Street	Western Ave. EB	0.44	1	A	170	0.43	1	A	169	0.50	2	A	211	0.49	2	A	208	0.50	2	A	214	0.51	2	A	226	0.50	2	A	214	0.51	2	A	224
	Western Ave. WB	0.39	1	A	141	0.52	2	A	221	0.44	1	A	170	0.59	2	A	287	0.46	2	A	180	0.61	2	A	308	0.45	1	A	177	0.60	2	A	304
	Overall	0.44	1	A		0.52	2	A		0.50	2	A		0.59	2	A		0.50	2	A		0.61	2	A		0.50	2	A		0.61	2	A	
Western Avenue at North Harvard Street (Barry's Corner)	Western Ave. EB L	0.98	103	F	#333	1.12	>120	F	#346	>1.20	>120	F	#332	>1.20	>120	F	#350	>1.20	>120	F	#381	>1.20	>120	F	#371	1.11	>120	F	#270	1.17	>120	F	#277
	Western Ave. EB T/R	0.66	39	D	429	0.54	32	C	373	0.82	49	D	#609	0.69	37	D	496	0.86	52	D	#654	0.70	37	D	512	0.80	37	D	#465	0.70	33	C	411
	Western Ave. WB L	0.38	35	D	107	0.42	32	C	132	0.54	47	D	#152	0.57	41	D	#181	0.65	58	E	#178	0.59	43	D	#188	0.73	70	E	#127	0.85	89	F	#182
	Western Ave. WB T/R	0.75	44	D	#531	0.85	47	D	#651	0.90	58	E	#695	1.01	76	E	#854	0.94	64	E	#738	1.10	105	F	#964	0.97	67	E	#585	1.12	108	F	#799
	N. Harvard St. NB L	0.63	41	D	190	0.80	60	E	#294	0.67	43	D	#216	0.92	81	F	#357	0.74	49	D	#258	>1.20	>120	F	#462	0.96	94	F	#281	1.20	>120	F	#401
	N. Harvard St. NB T/R	0.75	40	D	472	0.74	43	D	#530	0.77	41	D	491	0.74	43	D	#530	0.78	42	D	#506	0.74	43	D	#530	0.76	31	C	372	0.70	32	C	411
	N. Harvard St. SB L/T	0.55	41	D	286	0.78	57	E	#434	0.58	42	D	#310	0.83	61	E	#481	0.69	47	D	#404	0.96	83	F	#577	0.97	85	F	#379	1.20	>120	F	#540
	N. Harvard St. SB R	0.21	33	C	90	0.37	40	D	141	0.21	33	C	92	0.38	40	D	145	0.23	33	C	101	0.40	41	D	154	0.39	27	C	145	0.55	34	C	206
	Overall	0.86	45	D		0.94	52	D		1.10	64	E		>1.20	89	F		>1.20	78	E		>1.20	>120	F		1.01	62	E		1.12	95	F	
Western Avenue at Hague Street/Batten	Western Ave. EB L	0.31	21	C	85	0.12	15	B	30	0.52	17	B	#230	0.25	13	B	#108	0.53	18	B	#230	0.27	13	B	#108	0.53	17	B	#230	0.27	13	B	#108
	Western Ave. EB T/R	0.54	22	C	338	0.50	19	B	265	0.57	13	B	#576	0.67	17	B	#551	0.58	13	B	#600	0.68	18	B	#573	0.58	13	B	#600	0.68	18	B	#573
	Western Ave. WB L	0.13	17	B	43	0.12	14	B	40	0.03	7	A	19	0.05	9	A	18	0.03	7	A	19	0.05	9	A	18	0.03	7	A	19	0.05	9	A	18
	Western Ave. WB T/R	0.63	24	C	400	0.63	21	C	#404	0.63	14	B	#652	0.59	16	B	#519	0.64	15	B	#668	0.62	16	B	#555	0.64	14	B	#660	0.62	16	B	#555
	Hague St. NB Approach	0.99	86	F	#386	0.84	54	D	#238	0.20	44	D	29	0.20	37	D	28	0.20	44	D	29	0.20	37	D	28	0.20	44	D	29	0.20	37	D	28
	Batten Way SB Approach	0.43	41	D	67	0.68	41	D	113	0.45	43	D	68	0.65	39	D	110	0.45	43	D	68	0.65	39	D	110	0.45	43	D	68	0.65	39	D	110
	Overall	0.71	37	D		0.69	27	C		0.58	15	B		0.62	19	B		0.59	16	B		0.64	19	B		0.58	16	B		0.64	19	B	
North Harvard Street at Franklin Street / Kingsley Street	Franklin St. EB Approach	0.69	55	D	120	0.53	43	D	85	0.71	56	E	126	0.58	47	D	92	0.71	56	E	126	0.58	47	D	92	0.71	56	E	126	0.58	47	D	92
	Kingsley WB Approach	0.15	41	D	25	0.23	40	D	42	0.14	40	D	25	0.22	42	D	42	0.14	40	D	25	0.22	42	D	42	0.14	40	D	25	0.22	42	D	42
	N. Harvard NB Approach	0.56	12	B	384	0.51	9	A	385	0.58	13	B	410	0.56	12	B	429	0.60	13	B	429	0.61	13	B	#587	0.60	13	B	429	0.61	13	B	#587
	N. Harvard SB Approach	0.42	10	B	318	0.50	8	A	418	0.44	10	B	338	0.55	11	B	457	0.46	11	B	362	0.59	12	B	506	0.46	11	B	362	0.59	12	B	506
	Overall	0.58	17	B		0.52	12	B		0.60	17	B		0.56	15	B		0.62	17	B		0.61	15	B		0.62	17	B		0.61	15	B	

Source: VHB, Inc. using Synchro 6 (Build 614) software.
Note: Shaded cells denote LOS E/F conditions.
1 V/C – Volume-to-capacity ratio. V/C ratios range from 1.0 when demand equals capacity to 0 when demand is zero. Values over 1.0 indicate demand in excess of capacity.
2 Delay – Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
3 LOS – Level-of-Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.
4 Q – 95th percentile queue length estimate, in feet.
m Volume for 95th percentile queue is metered by upstream signal.
# 95th percentile volume exceeds capacity; queue may be longer.
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; L = Left-turn; T = Through; R = Right-turn

Table X Unsignalized Intersection Capacity Analysis Summary

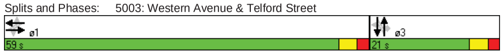
		2012 Existing Conditions								2017 No-Build Conditions								2017 Build Conditions								2017 Build with Mitigation Conditions							
		Weekday Morning Peak Hour				Weekday Evening Peak Hour				Weekday Morning Peak Hour				Weekday Evening Peak Hour				Weekday Morning Peak Hour				Weekday Evening Peak Hour				Weekday Morning Peak Hour				Weekday Evening Peak Hour			
Intersection	Critical Movement(s)	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q	V/C	Delay	LOS	Q
Western Avenue at Existing Site Driveway	Driveway SB L/R	0.08	25	D	7	0.11	21	C	9	0.13	38	E	11	0.16	30	D	14	0.74	>120	F	87	>1.20	Err	F	Err	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Western Avenue at Travis Street	Travis St. NB L/R	0.08	14	B	7	0.06	15	B	5	0.11	17	C	9	0.09	19	C	7	0.23	27	D	21	0.43	49	E	48	0.22	26	D	20	0.43	48	E	47
North Harvard Street Gordon Road	Gordon Road WB L/R	0.17	15	B	15	0.24	14	B	23	0.18	15	C	17	0.28	15	C	28	0.19	16	C	17	0.28	15	C	29	0.19	16	C	17	0.28	15	C	29
North Harvard Street Existing Site Driveway	Driveway EB L/R	0.06	19	C	5	0.03	25	C	2	0.06	19	C	5	0.03	26	D	2	0.03	11	B	3	0.07	12	B	5	0.07	17	C	5	0.10	19	C	8
North Harvard Street	Bertram St. WB L/R	0.05	16	C	4	0.09	15	C	7	0.05	16	C	4	0.09	15	C	7	0.05	17	C	4	0.09	16	C	8	0.09	11	B	7	0.15	13	B	14
Bertram Street /	Spurr St. EB L	0.19	18	C	17	0.09	17	C	7	0.20	19	C	19	0.09	17	C	7	0.21	19	C	19	0.09	18	C	7								
Spurr Street	Spurr St. EB R	0.25	12	B	25	0.39	15	B	47	0.26	12	B	26	0.42	16	C	52	0.28	12	B	29	0.48	17	C	64								
																										0.05	17	C	4	0.10	16	C	8
North Harvard Street Bayard Street / Rena Street	Bayard St. EB Approach	0.07	15	B	6	0.04	14	B	3	0.08	15	C	6	0.04	14	B	3	0.08	16	C	7	0.05	15	B	4	0.20	19	C	19	0.09	18	C	8

Source: VHB, Inc. using Synchro 6 (Build 614) software.
Note: Shaded cells denote LOS E/F conditions.
1 V/C – Volume-to-capacity ratio. V/C ratios range from 1.0 when demand equals capacity to 0 when demand is zero. Values over 1.0 indicate demand in excess of capacity.
2 Delay – Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
3 LOS – Level-of-Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.
4 Q – 95th percentile queue length estimate, in feet
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound L = Left-turn; T = Through; R = Right-turn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			257			408	
Travel Time (s)		7.8			3.5			5.8			9.3	
Volume (vph)	15	705	85	85	515	5	20	0	30	5	0	10
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	874	0	89	541	0	0	25	38	0	16	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0	0.0	59.0	59.0	0.0	21.0	21.0	21.0	21.0	21.0	0.0
Total Split (%)	73.8%	73.8%	0.0%	73.8%	73.8%	0.0%	26.3%	26.3%	26.3%	26.3%	26.3%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.64		0.21	0.38			0.20	0.21		0.10	
Control Delay		5.7		1.4	1.5			36.5	14.6		22.0	
Queue Delay		1.6		0.0	0.0			0.0	0.0		0.0	
Total Delay		7.3		1.4	1.6			36.6	14.6		22.0	
Queue Length 50th (ft)		134		5	39			12	0		2	
Queue Length 95th (ft)		278		m0	m2			30	21		20	
Internal Link Dist (ft)		265			73			177			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1366		431	1417			258	320		309	
Starvation Cap Reductn		303		0	0			0	0		0	
Spillback Cap Reductn		0		0	68			18	0		21	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.82		0.21	0.40			0.10	0.12		0.06	

Intersection Summary
Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 74 (93%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.97		0.97	
Flpb, ped/bikes		1.00		0.99	1.00			0.98	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)		1572		1475	1617			1543	1367		1470	
Flt Permitted		0.99		0.35	1.00			0.75	1.00		0.89	
Satd. Flow (perm)		1557		548	1617			1214	1367		1323	
Volume (vph)	15	705	85	85	515	5	20	0	30	5	0	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Adj. Flow (vph)	16	766	92	89	536	5	25	0	38	5	0	11
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	35	0	10	0
Lane Group Flow (vph)	0	871	0	89	541	0	0	25	3	0	6	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		65.5		65.5	65.5			4.5	4.5		4.5	
Effective Green, g (s)		66.5		66.5	66.5			5.5	5.5		5.5	
Actuated g/C Ratio		0.83		0.83	0.83			0.07	0.07		0.07	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1294		456	1344			83	94		91	
v/s Ratio Prot					0.33							
v/s Ratio Perm		c0.56		0.16				c0.02	0.00		0.00	
v/c Ratio		0.67		0.20	0.40			0.30	0.03		0.06	
Uniform Delay, d1		2.6		1.4	1.7			35.4	34.8		34.8	
Progression Factor		1.00		0.33	0.49			1.00	1.00		1.00	
Incremental Delay, d2		2.8		0.7	0.6			0.7	0.0		0.1	
Delay (s)		5.4		1.1	1.5			36.2	34.8		34.9	
Level of Service		A		A	A			D	C		C	
Approach Delay (s)		5.4			1.4			35.3			34.9	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	30	615	135	100	465	30	80	180	95	45	135	40	
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	709	148	104	515	0	0	461	0	0	290	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0	0.0	24.0	24.0	0.0	24.0	24.0	0.0	28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	35%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		1.52	0.20	0.68	0.58			1.38			0.97		
Control Delay		264.6	11.9	43.7	18.9			215.2			78.0		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		264.6	11.9	43.7	18.9			215.2			78.0		
Queue Length 50th (ft)		~379	12	26	119			~310			144		
Queue Length 95th (ft)		#725	m87	#164	#486			#390			#226		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		465	726	154	886			335			299		
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		1.52	0.20	0.68	0.58			1.38			0.97		

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.99			0.96			0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1527	1262	1514	1528			1796			1662	
Flt Permitted		0.96	1.00	0.21	1.00			0.74			0.71	
Satd. Flow (perm)		1476	1262	340	1528			1340			1197	
Volume (vph)	30	615	135	100	465	30	80	180	95	45	135	40
Peak-hour factor, PHF	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76
Adj. Flow (vph)	33	676	148	104	484	31	104	234	123	59	178	53
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	709	148	104	515	0	0	461	0	0	290	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		42.2	42.2	42.2	42.2			19.0			19.0	
Effective Green, g (s)		43.2	43.2	43.2	43.2			20.0			20.0	
Actuated g/C Ratio		0.54	0.54	0.54	0.54			0.25			0.25	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		797	681	184	825			335			299	
v/s Ratio Prot					0.34							
v/s Ratio Perm		c0.48	0.12	0.31				c0.34			0.24	
v/c Ratio		0.89	0.22	0.57	0.62			1.38			0.97	
Uniform Delay, d1		16.3	9.6	12.2	12.8			30.0			29.7	
Progression Factor		0.91	0.95	1.00	1.00			1.00			1.00	
Incremental Delay, d2		12.0	0.6	12.0	3.6			187.0			43.1	
Delay (s)		26.8	9.7	24.2	16.3			217.0			72.8	
Level of Service		C	A	C	B			F			E	
Approach Delay (s)		23.9			17.6			217.0			72.8	
Approach LOS		C			B			F			E	

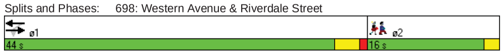
Intersection Summary			
HCM Average Control Delay	68.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	107.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			216	330		
Travel Time (s)	19.3			4.9	7.5		
Volume (vph)	710	5	5	635	0	0	
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.97	0.97	0.97	0.97	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	737	0	0	660	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.43			0.38			
Control Delay	1.6			1.4			
Queue Delay	0.0			0.0			
Total Delay	1.6			1.4			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	170			141			
Internal Link Dist (ft)	767			136	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1732			1744			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.43			0.38			

Intersection Summary
Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 120
Natural Cycle: 50
Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1793			1811		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1793			1804		
Volume (vph)	710	5	5	635	0	0
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.25	0.25
Adj. Flow (vph)	732	5	5	655	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	737	0	0	660	0	0
Confl. Peds. (#/hr)		8	8			
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1663			1673		
v/s Ratio Prot	c0.41					
v/s Ratio Perm				0.37		
v/c Ratio	0.44			0.39		
Uniform Delay, d1	0.5			0.5		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.9			0.7		
Delay (s)	1.4			1.2		
Level of Service	A			A		
Approach Delay (s)	1.4			1.2	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		100	
Storage Lanes	1		0	1		1	1		0	0		1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		195			272			186			659		
Travel Time (s)		4.4			6.2			4.2			15.0		
Volume (vph)	145	340	5	65	340	55	175	325	65	20	205	145	
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	163	388	0	70	425	0	208	464	0	0	242	156	
Turn Type	Perm			Perm			pm+pt			Perm		Perm	
Protected Phases		1			1		3	3 4			4		2
Permitted Phases	1			1			3 4			4		4	
Detector Phases	1	1		1	1		3	3 4		4	4	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		4.0			8.0	8.0	8.0	2.0
Minimum Split (s)	13.0	13.0		13.0	13.0		8.0			12.0	12.0	12.0	33.0
Total Split (s)	50.0	50.0	0.0	50.0	50.0	0.0	12.0	56.0	0.0	44.0	44.0	44.0	33.0
Total Split (%)	36.0%	36.0%	0.0%	36.0%	36.0%	0.0%	8.6%	40.3%	0.0%	31.7%	31.7%	31.7%	24%
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)	2.0	2.0		2.0	2.0		1.0			1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead			Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes	Yes
Recall Mode	Max	Max		Max	Max		Max			Max	Max	Max	None
v/c Ratio	1.16	0.65		0.43	0.75		0.66	0.74			0.54	0.35	
Control Delay	163.8	42.2		45.4	46.4		43.3	42.1			43.9	14.0	
Queue Delay	0.0	0.4		0.4	0.0		0.0	3.6			0.0	0.0	
Total Delay	163.8	42.7		45.8	46.4		43.3	45.6			43.9	14.0	
Queue Length 50th (ft)	~188	309		50	351		136	374			190	26	
Queue Length 95th (ft)	#333	429		107	#531		190	472			286	90	
Internal Link Dist (ft)		115			192			106			579		
Turn Bay Length (ft)												100	
Base Capacity (vph)	141	594		163	569		313	625			445	443	
Starvation Cap Reductn	0	0		0	0		0	90			0	0	
Spillback Cap Reductn	0	32		8	0		0	0			1	0	
Storage Cap Reductn	0	0		0	0		0	0			0	0	
Reduced v/c Ratio	1.16	0.69		0.45	0.75		0.66	0.87			0.55	0.35	

Intersection Summary

Area Type: CBD
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 100
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98			1.00	0.90
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.98	1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.98		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1510	1594		1469	1520		1491	1479			1464	1137
Flt Permitted	0.28	1.00		0.33	1.00		0.47	1.00			0.94	1.00
Satd. Flow (perm)	453	1594		504	1520		733	1479			1380	1137
Volume (vph)	145	340	5	65	340	55	175	325	65	20	205	145
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93
Adj. Flow (vph)	163	382	6	70	366	59	208	387	77	22	220	156
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	0	80
Lane Group Flow (vph)	163	387	0	70	421	0	208	459	0	0	242	76
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%
Turn Type	Perm			Perm			pm+pt			Perm		Perm
Protected Phases		1			1		3	3 4			4	
Permitted Phases	1			1			3 4			4		4
Actuated Green, G (s)	45.8	45.8		45.8	45.8		48.8	52.8			40.7	40.7
Effective Green, g (s)	46.8	46.8		46.8	46.8		48.8	52.8			40.7	40.7
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.38	0.41			0.32	0.32
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0				4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0				2.0	2.0
Lane Grp Cap (vph)	167	586		185	559		329	613			441	364
v/s Ratio Prot		0.24			0.28		0.04	c0.31				
v/s Ratio Perm	c0.36			0.14			0.20				0.18	0.07
v/c Ratio	0.98	0.66		0.38	0.75		0.63	0.75			0.55	0.21
Uniform Delay, d1	39.7	33.6		29.6	35.2		31.7	31.6			35.7	31.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	63.6	5.8		5.8	9.1		8.9	8.2			4.8	1.3
Delay (s)	103.3	39.4		35.4	44.3		40.6	39.8			40.6	32.9
Level of Service	F	D		D	D		D	D			D	C
Approach Delay (s)		58.3			43.0			40.1			37.6	
Approach LOS		E			D			D			D	

Intersection Summary

HCM Average Control Delay	45.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	127.3	Sum of lost time (s)	27.7
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		

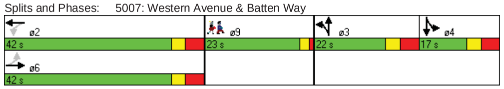
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1561			392			262			150		
Travel Time (s)		35.5			8.9			6.0			3.4		
Volume (vph)	60	360	20	35	395	60	25	70	165	20	5	20	
Confl. Peds. (#/hr)	3		1	1		3	1					1	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	67	422	0	37	479	0	0	299	0	0	54	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	22.0	22.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	40.4%	40.4%	0.0%	40.4%	40.4%	0.0%	21.2%	21.2%	0.0%	16.3%	16.3%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	0.40	0.52		0.15	0.60			0.94			0.31		
Control Delay	33.4	24.8		23.8	26.9			77.2			45.6		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	33.4	24.8		23.8	26.9			77.2			45.6		
Queue Length 50th (ft)	33	222		16	263			~231			33		
Queue Length 95th (ft)	85	338		43	400			#386			67		
Internal Link Dist (ft)		1481			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	169	817		239	793			319			208		
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	0.40	0.52		0.15	0.60			0.94			0.26		

Intersection Summary

Area Type: CBD
Cycle Length: 104
Actuated Cycle Length: 87.6
Natural Cycle: 90
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.91			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1502	1778		1673	1722			1468			1495	
Flt Permitted	0.31	1.00		0.36	1.00			1.00			0.98	
Satd. Flow (perm)	489	1778		640	1722			1468			1495	
Volume (vph)	60	360	20	35	395	60	25	70	165	20	5	20
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84
Adj. Flow (vph)	67	400	22	37	416	63	29	80	190	24	6	24
RTOR Reduction (vph)	0	2	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	67	420	0	37	474	0	0	299	0	0	54	0
Confl. Peds. (#/hr)	3		1	1		3	1					1
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	37.0	37.0		37.0	37.0			15.8			4.7	
Effective Green, g (s)	40.0	40.0		40.0	40.0			18.8			7.7	
Actuated g/C Ratio	0.44	0.44		0.44	0.44			0.21			0.08	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	213	776		279	751			301			126	
v/s Ratio Prot		0.24			c0.28			c0.20			c0.04	
v/s Ratio Perm	0.14			0.06								
v/c Ratio	0.31	0.54		0.13	0.63			0.99			0.43	
Uniform Delay, d1	16.9	19.1		15.5	20.1			36.4			39.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	3.8	2.7		1.0	4.0			49.8			0.9	
Delay (s)	20.7	21.8		16.5	24.1			86.1			40.8	
Level of Service	C	C		B	C			F			D	
Approach Delay (s)		21.6			23.6			86.1			40.8	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM Average Control Delay	37.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	91.7	Sum of lost time (s)	25.2
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

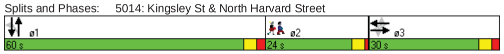
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	70	0	35	10	5	5	20	445	0	0	395	55	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	118	0	0	33	0	0	554	0	0	474	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.66			0.16			0.54			0.41		
Control Delay		50.5			31.9			17.1			13.9		
Queue Delay		0.2			0.0			0.1			0.3		
Total Delay		50.7			31.9			17.2			14.3		
Queue Length 50th (ft)		61			15			243			182		
Queue Length 95th (ft)		120			25			384			318		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		279			328			1020			1161		
Starvation Cap Reductn		0			0			0			261		
Spillback Cap Reductn		12			14			42			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.44			0.11			0.57			0.53		

Intersection Summary

Area Type: CBD
Cycle Length: 114
Actuated Cycle Length: 102.3
Natural Cycle: 70
Control Type: Semi Act-Uncoord

Splits and Phases: 5014: Kingsley St & North Harvard Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.97			1.00			0.98	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1405			1587			1565			1733	
Flt Permitted		0.80			0.85			0.97			1.00	
Satd. Flow (perm)		1159			1385			1524			1733	
Volume (vph)	70	0	35	10	5	5	20	445	0	0	395	55
Peak-hour factor, PHF	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95
Adj. Flow (vph)	79	0	39	17	8	8	24	530	0	0	416	58
RTOR Reduction (vph)	0	17	0	0	7	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	101	0	0	26	0	0	554	0	0	474	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		12.1			12.1			66.8			66.8	
Effective Green, g (s)		13.1			13.1			67.8			67.8	
Actuated g/C Ratio		0.13			0.13			0.65			0.65	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		145			174			989			1124	
v/s Ratio Prot											0.27	
v/s Ratio Perm		c0.09			0.02			c0.36				
v/c Ratio		0.69			0.15			0.56			0.42	
Uniform Delay, d1		43.8			40.7			10.1			8.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		11.0			0.1			2.3			1.2	
Delay (s)		54.7			40.9			12.4			10.0	
Level of Service		D			D			B			B	
Approach Delay (s)		54.7			40.9			12.4			10.0	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	104.5	Sum of lost time (s)	23.6
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	485	645	15	5	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	527	701	16	5	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		482	195			
pX, platoon unblocked	0.67				0.67	0.67
vC, conflicting volume	717				1269	709
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	581				1399	569
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				95	97
cM capacity (veh/h)	670				102	352

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	543	717	16
Volume Left	16	0	5
Volume Right	0	16	11
cSH	670	1700	194
Volume to Capacity	0.02	0.42	0.08
Queue Length 95th (ft)	2	0	7
Control Delay (s)	0.7	0.0	25.3
Lane LOS	A		D
Approach Delay (s)	0.7	0.0	25.3
Approach LOS			D

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	415	10	30	455	5	25
Peak Hour Factor	0.89	0.89	0.97	0.97	0.83	0.83
Hourly flow rate (vph)	466	11	31	469	6	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.80		0.80	0.80
vC, conflicting volume			478		1003	472
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			351		1004	344
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			97		97	95
cM capacity (veh/h)			959		205	555

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	478	500	36
Volume Left	0	31	6
Volume Right	11	0	30
cSH	1700	959	432
Volume to Capacity	0.28	0.03	0.08
Queue Length 95th (ft)	0	2	7
Control Delay (s)	0.0	0.9	14.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.9	14.1
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	64.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	55	500	10	70	385
Peak Hour Factor	0.82	0.82	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	6	67	562	11	80	443
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1171	567			573	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1178	567			573	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	97	87			92	
cM capacity (veh/h)	176	502			985	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	73	573	523
Volume Left	6	0	80
Volume Right	67	11	0
cSH	435	1700	985
Volume to Capacity	0.17	0.34	0.08
Queue Length 95th (ft)	15	0	7
Control Delay (s)	14.9	0.0	2.2
Lane LOS	B		A
Approach Delay (s)	14.9	0.0	2.2
Approach LOS	B		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	10	5	5	520	365	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	5	565	397	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				659		
pX, platoon unblocked	0.79					
vC, conflicting volume	976	399	402			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	969	399	402			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	99	100			
cM capacity (veh/h)	220	650	1156			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	571	402
Volume Left	11	5	0
Volume Right	5	0	5
cSH	282	1156	1700
Volume to Capacity	0.06	0.00	0.24
Queue Length 95th (ft)	5	0	0
Control Delay (s)	18.5	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	18.5	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	5	560	25	5	270
Peak Hour Factor	0.60	0.60	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	8	8	659	29	5	287
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.89	0.82			0.82	
vC, conflicting volume	971	674			688	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	739	601			619	
tC, single (s)	6.6	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.3	
p0 queue free %	97	98			99	
cM capacity (veh/h)	320	388			772	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	688	293
Volume Left	8	0	5
Volume Right	8	29	0
cSH	351	1700	772
Volume to Capacity	0.05	0.40	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	15.8	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	15.8	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	65	175	0	520	275	0
Peak Hour Factor	0.97	0.97	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	67	180	0	612	293	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.88	0.88	0.88			
vC, conflicting volume	904	293	293			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	679	192	192			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	81	75	100			
cM capacity (veh/h)	354	722	1184			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	67	180	612	293
Volume Left	67	0	0	0
Volume Right	0	180	0	0
cSH	354	722	1700	1700
Volume to Capacity	0.19	0.25	0.36	0.17
Queue Length 95th (ft)	17	25	0	0
Control Delay (s)	17.5	11.6	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	13.2		0.0	0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	20	0	0	0	0	460	10	5	435	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.91	0.91	0.99
Hourly flow rate (vph)	6	0	23	0	0	0	0	535	12	5	478	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.88	0.88	0.88	0.88	0.88		0.88					
vC, conflicting volume	1030	1036	478	1053	1030	541	478			547		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1034	1040	409	1060	1034	541	409			547		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	97	100	96	100	100	100	100			99		
cM capacity (veh/h)	187	204	571	170	204	541	983			984		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	547	484
Volume Left	6	0	5
Volume Right	23	12	0
cSH	405	1700	984
Volume to Capacity	0.07	0.32	0.01
Queue Length 95th (ft)	6	0	0
Control Delay (s)	14.6	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	14.6	0.0	0.2
Approach LOS	B		

Intersection Summary				
Average Delay		0.5		
Intersection Capacity Utilization		39.9%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			322			408	
Travel Time (s)		7.8			3.5			7.3			9.3	
Volume (vph)	15	645	140	105	635	0	50	0	50	5	0	5
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	869	0	114	690	0	0	54	54	0	10	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	67.0	67.0	0.0	67.0	67.0	0.0	23.0	23.0	23.0	23.0	23.0	0.0
Total Split (%)	74.4%	74.4%	0.0%	74.4%	74.4%	0.0%	25.6%	25.6%	25.6%	25.6%	25.6%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.65		0.27	0.50			0.40	0.27		0.06	
Control Delay		6.7		1.9	2.8			45.8	13.8		27.1	
Queue Delay		3.1		0.0	0.3			0.1	0.0		0.0	
Total Delay		9.8		1.9	3.0			45.9	13.8		27.1	
Queue Length 50th (ft)		141		9	66			29	0		3	
Queue Length 95th (ft)		329		m0	m62			63	32		17	
Internal Link Dist (ft)		265			73			242			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1336		423	1383			257	334		312	
Starvation Cap Reductn		351		0	205			0	0		0	
Spillback Cap Reductn		0		0	74			21	0		25	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.88		0.27	0.59			0.23	0.16		0.03	

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.93	
Flt Protected		1.00		0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)		1612		1516	1653			1540	1378		1556	
Flt Permitted		0.99		0.35	1.00			0.75	1.00		0.86	
Satd. Flow (perm)		1591		554	1653			1217	1378		1366	
Volume (vph)	15	645	140	105	635	0	50	0	50	5	0	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	701	152	114	690	0	54	0	54	5	0	5
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	49	0	5	0
Lane Group Flow (vph)	0	864	0	114	690	0	0	54	5	0	5	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		72.5		72.5	72.5			7.5	7.5		7.5	
Effective Green, g (s)		73.5		73.5	73.5			8.5	8.5		8.5	
Actuated g/C Ratio		0.82		0.82	0.82			0.09	0.09		0.09	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1299		452	1350			115	130		129	
v/s Ratio Prot					0.42							
v/s Ratio Perm		c0.54		0.21				c0.04	0.00		0.00	
v/c Ratio		0.67		0.25	0.51			0.47	0.04		0.04	
Uniform Delay, d1		3.3		1.9	2.6			38.6	37.0		37.0	
Progression Factor		1.00		0.36	0.62			1.00	1.00		1.00	
Incremental Delay, d2		2.7		0.8	0.8			1.1	0.0		0.0	
Delay (s)		6.0		1.4	2.4			39.7	37.1		37.1	
Level of Service		A		A	A			D	D		D	
Approach Delay (s)		6.0			2.3			38.4			37.1	
Approach LOS		A			A			D			D	

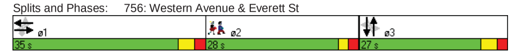
Intersection Summary			
HCM Average Control Delay	6.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	20	560	165	105	580	65	100	145	75	50	160	40	
Confl. Peds. (#/hr)	8		11	11		8	9					9	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	644	183	121	742	0	0	345	0	0	278	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	0.0	27.0	27.0	0.0	27.0	27.0	0.0	28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	31%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		1.68	0.24	0.95	0.79			1.09			0.78		
Control Delay		334.2	11.2	95.4	25.3			110.6			48.1		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		334.2	11.2	95.4	25.3			110.6			48.1		
Queue Length 50th (ft)		~455	18	49	244			~223			147		
Queue Length 95th (ft)		#730	m113	#200	#742			#389			#272		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		384	773	127	935			317			357		
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		1.68	0.24	0.95	0.79			1.09			0.78		

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St



10463.00: Barry's Corner Mixed Use (Allston, MA)
756: Western Avenue & Everett St

2012 Existing Conditions
Weekday Evening

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			1.00			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.98			0.97			0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.98			0.99	
Satd. Flow (prot)		1587	1311	1572	1576			1806			1702	
Flt Permitted		0.95	1.00	0.27	1.00			0.68			0.81	
Satd. Flow (perm)		1518	1311	444	1576			1241			1398	
Volume (vph)	20	560	165	105	580	65	100	145	75	50	160	40
Peak-hour factor, PHF	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	22	622	183	121	667	75	108	156	81	56	178	44
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	644	183	121	742	0	0	345	0	0	278	0
Confl. Peds. (#/hr)	8		11	11		8	9					9
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		49.2	49.2	49.2	49.2			22.0			22.0	
Effective Green, g (s)		50.2	50.2	50.2	50.2			23.0			23.0	
Actuated g/C Ratio		0.56	0.56	0.56	0.56			0.26			0.26	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		847	731	248	879			317			357	
v/s Ratio Prot					c0.47							
v/s Ratio Perm		0.42	0.14	0.27				c0.28			0.20	
v/c Ratio		0.76	0.25	0.49	0.84			1.09			0.78	
Uniform Delay, d1		15.3	10.2	12.1	16.6			33.5			31.1	
Progression Factor		0.89	0.87	1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.3	0.7	6.7	9.7			76.2			9.4	
Delay (s)		18.9	9.6	18.8	26.4			109.7			40.5	
Level of Service		B	A	B	C			F			D	
Approach Delay (s)		16.8			25.3			109.7			40.5	
Approach LOS		B			C			F			D	

Intersection Summary			
HCM Average Control Delay	36.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	114.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

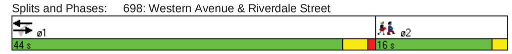
10463.00: Barry's Corner Mixed Use (Allston, MA)
698: Western Avenue & Riverdale Street

2012 Existing Conditions
Weekday Evening

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			216	330		
Travel Time (s)	19.3			4.9	7.5		
Volume (vph)	710	10	20	755	0	0	
Confl. Peds. (#/hr)		19	19				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.88	0.88	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	750	0	0	881	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.42			0.50			
Control Delay	1.6			2.0			
Queue Delay	0.0			0.0			
Total Delay	1.6			2.0			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	169			221			
Internal Link Dist (ft)	767			136	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1797			1759			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.42			0.50			

Intersection Summary	
Area Type:	CBD
Cycle Length: 60	
Actuated Cycle Length: 120	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	

Splits and Phases: 698: Western Avenue & Riverdale Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1859			1861		
Flt Permitted	1.00			0.97		
Satd. Flow (perm)	1859			1814		
Volume (vph)	710	10	20	755	0	0
Peak-hour factor, PHF	0.96	0.96	0.88	0.88	0.25	0.25
Adj. Flow (vph)	740	10	23	858	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	750	0	0	881	0	0
Confl. Peds. (#/hr)		19	19			
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1724			1683		
v/s Ratio Prot	0.40					
v/s Ratio Perm				c0.49		
v/c Ratio	0.43			0.52		
Uniform Delay, d1	0.5			0.6		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.8			1.2		
Delay (s)	1.3			1.8		
Level of Service	A			A		
Approach Delay (s)	1.3			1.8	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		100	
Storage Lanes	1		0	1		1	1		0	0		1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		195			272			186			659		
Travel Time (s)		4.4			6.2			4.2			15.0		
Volume (vph)	140	325	10	90	425	45	175	340	50	20	255	170	
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	151	360	0	105	546	0	194	434	0	0	316	195	
Turn Type	Perm			Perm			pm+pt			Perm		Perm	
Protected Phases		1			1		3	3 4			4		2
Permitted Phases	1			1			3 4			4		4	
Detector Phases	1	1		1	1		3	3 4		4	4	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		4.0			8.0	8.0	8.0	2.0
Minimum Split (s)	13.0	13.0		13.0	13.0		8.0			12.0	12.0	12.0	33.0
Total Split (s)	55.0	55.0	0.0	55.0	55.0	0.0	12.0	51.0	0.0	39.0	39.0	39.0	33.0
Total Split (%)	39.6%	39.6%	0.0%	39.6%	39.6%	0.0%	8.6%	36.7%	0.0%	28.1%	28.1%	28.1%	24%
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)	2.0	2.0		2.0	2.0		1.0			1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead			Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes	Yes
Recall Mode	Max	Max		Max	Max		Max			Max	Max	Max	None
v/c Ratio	1.50	0.54		0.45	0.84		0.87	0.73			0.81	0.49	
Control Delay	299.4	34.7		39.4	48.8		71.3	45.0			62.0	24.0	
Queue Delay	0.0	0.3		0.6	0.0		0.0	2.6			0.9	0.0	
Total Delay	299.4	35.0		40.0	48.8		71.3	47.6			62.9	24.0	
Queue Length 50th (ft)	~199	263		74	472		132	356			279	67	
Queue Length 95th (ft)	#346	373		132	#651		#294	#530			#434	141	
Internal Link Dist (ft)		115			192			106			579		
Turn Bay Length (ft)												100	
Base Capacity (vph)	101	669		232	652		223	591			390	396	
Starvation Cap Reductn	0	0		0	0		0	74			0	0	
Spillback Cap Reductn	0	57		20	0		0	0			10	0	
Storage Cap Reductn	0	0		0	0		0	0			0	0	
Reduced v/c Ratio	1.50	0.59		0.50	0.84		0.87	0.84			0.83	0.49	

Intersection Summary

Area Type: CBD
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 120
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99			1.00	0.88
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00			1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1533	1619		1512	1575		1543	1543			1510	1142
Flt Permitted	0.20	1.00		0.39	1.00		0.32	1.00			0.95	1.00
Satd. Flow (perm)	330	1619		621	1575		521	1543			1441	1142
Volume (vph)	140	325	10	90	425	45	175	340	50	20	255	170
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	151	349	11	105	494	52	194	378	56	23	293	195
RTOR Reduction (vph)	0	1	0	0	2	0	0	4	0	0	0	77
Lane Group Flow (vph)	151	359	0	105	544	0	194	430	0	0	316	118
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%
Turn Type	Perm			Perm			pm+pt			Perm		Perm
Protected Phases		1			1		3	3 4			4	
Permitted Phases	1			1			3 4			4		4
Actuated Green, G (s)	50.9	50.9		50.9	50.9		43.7	47.7			35.6	35.6
Effective Green, g (s)	51.9	51.9		51.9	51.9		43.7	47.7			35.6	35.6
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.34	0.37			0.28	0.28
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0				4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0				2.0	2.0
Lane Grp Cap (vph)	135	660		253	642		244	578			403	319
v/s Ratio Prot		0.22			0.35		0.05	c0.28				
v/s Ratio Perm	c0.46			0.17			0.22				0.22	0.10
v/c Ratio	1.12	0.54		0.42	0.85		0.80	0.74			0.78	0.37
Uniform Delay, d1	37.7	28.7		26.9	34.1		37.2	34.5			42.3	36.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	112.8	3.2		5.0	13.0		22.9	8.4			14.2	3.3
Delay (s)	150.5	31.9		31.8	47.1		60.1	43.0			56.5	40.1
Level of Service	F	C		C	D		E	D			E	D
Approach Delay (s)		67.0			44.7			48.3			50.2	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM Average Control Delay	51.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	127.3	Sum of lost time (s)	27.7
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

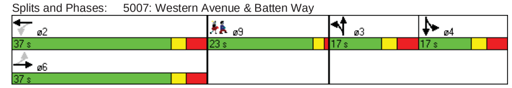
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1561			392			262			150		
Travel Time (s)		35.5			8.9			6.0			3.4		
Volume (vph)	20	325	10	35	445	30	55	25	90	50	0	50	
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	24	399	0	37	505	0	0	204	0	0	134	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	37.0	37.0	0.0	37.0	37.0	0.0	17.0	17.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	39.4%	39.4%	0.0%	39.4%	39.4%	0.0%	18.1%	18.1%	0.0%	18.1%	18.1%	0.0%	24%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	0.17	0.48		0.14	0.61			0.80			0.58		
Control Delay	23.6	21.4		20.6	24.3			60.0			45.2		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	23.6	21.4		20.6	24.3			60.0			45.2		
Queue Length 50th (ft)	6	112		9	153			86			53		
Queue Length 95th (ft)	30	265		40	#404			#238			113		
Internal Link Dist (ft)		1481			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	141	836		262	832			255			251		
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	0.17	0.48		0.14	0.61			0.80			0.53		

Intersection Summary

Area Type: CBD
Cycle Length: 94
Actuated Cycle Length: 76.6
Natural Cycle: 90
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.93			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1553	1854		1766	1842			1440			1519	
Flt Permitted	0.29	1.00		0.39	1.00			0.98			0.98	
Satd. Flow (perm)	472	1854		727	1842			1440			1519	
Volume (vph)	20	325	10	35	445	30	55	25	90	50	0	50
Peak-hour factor, PHF	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	24	387	12	37	473	32	66	30	108	67	0	67
RTOR Reduction (vph)	0	1	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	24	398	0	37	503	0	0	204	0	0	134	0
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	31.4	31.4		31.4	31.4			10.4			7.3	
Effective Green, g (s)	34.4	34.4		34.4	34.4			13.4			10.3	
Actuated g/C Ratio	0.43	0.43		0.43	0.43			0.17			0.13	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	204	801		314	796			242			197	
v/s Ratio Prot		0.21			c0.27			c0.14			c0.09	
v/s Ratio Perm	0.05			0.05								
v/c Ratio	0.12	0.50		0.12	0.63			0.84			0.68	
Uniform Delay, d1	13.5	16.3		13.5	17.7			32.1			33.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.2	2.2		0.8	3.8			21.7			7.5	
Delay (s)	14.7	18.5		14.3	21.4			53.8			40.5	
Level of Service	B	B		B	C			D			D	
Approach Delay (s)		18.3			21.0			53.8			40.5	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	79.6	Sum of lost time (s)	21.5
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

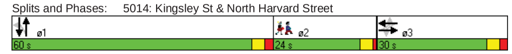
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	50	0	25	20	5	5	15	485	0	0	530	40	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	88	0	0	38	0	0	574	0	0	641	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.53			0.22			0.51			0.48		
Control Delay		41.0			34.8			12.7			11.7		
Queue Delay		0.1			0.0			0.0			0.7		
Total Delay		41.1			34.8			12.7			12.4		
Queue Length 50th (ft)		29			13			74			80		
Queue Length 95th (ft)		85			42			385			418		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		299			333			1130			1332		
Starvation Cap Reductn		0			0			0			350		
Spillback Cap Reductn		12			13			32			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.31			0.12			0.52			0.65		

Intersection Summary

Area Type: CBD
Cycle Length: 114
Actuated Cycle Length: 94.9
Natural Cycle: 70
Control Type: Semi Act-Uncoord

Splits and Phases: 5014: Kingsley St & North Harvard Street



10463.00: Barry's Corner Mixed Use (Allston, MA) | 2012 Existing Conditions
5014: Kingsley St & North Harvard Street | Weekday Evening

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			1.00			0.99	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1419			1608			1642			1846	
Flt Permitted		0.82			0.79			0.98			1.00	
Satd. Flow (perm)		1202			1319			1608			1846	
Volume (vph)	50	0	25	20	5	5	15	485	0	0	530	40
Peak-hour factor, PHF	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	59	0	29	26	6	6	17	557	0	0	596	45
RTOR Reduction (vph)	0	18	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	70	0	0	33	0	0	574	0	0	641	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		9.7			9.7			66.8			66.8	
Effective Green, g (s)		10.7			10.7			67.8			67.8	
Actuated g/C Ratio		0.11			0.11			0.69			0.69	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		132			144			1115			1280	
v/s Ratio Prot											0.35	
v/s Ratio Perm		c0.06			0.02			c0.36				
v/c Ratio		0.53			0.23			0.51			0.50	
Uniform Delay, d1		41.2			39.8			7.2			7.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.1			0.3			1.7			1.4	
Delay (s)		43.2			40.1			8.9			8.4	
Level of Service		D			D			A			A	
Approach Delay (s)		43.2			40.1			8.9			8.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	97.8	Sum of lost time (s)	19.3
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

10463.00: Barry's Corner Mixed Use (Allston, MA) | 2012 Existing Conditions
3: Western Avenue & existing site drive | Weekday Evening

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	475	765	5	0	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	516	832	5	0	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		482	195			
pX, platoon unblocked	0.61				0.61	0.61
vC, conflicting volume	837				1361	834
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	732				1595	727
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				100	89
cM capacity (veh/h)	530				71	257

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	522	837	27
Volume Left	5	0	0
Volume Right	0	5	27
cSH	530	1700	257
Volume to Capacity	0.01	0.49	0.11
Queue Length 95th (ft)	1	0	9
Control Delay (s)	0.3	0.0	20.6
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	20.6
Approach LOS			C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	395	0	20	555	5	15
Peak Hour Factor	0.92	0.92	0.90	0.90	0.82	0.82
Hourly flow rate (vph)	429	0	22	617	6	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.84		0.84	0.84
vC, conflicting volume			429		1090	429
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			320		1108	320
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		97	97
cM capacity (veh/h)			1036		189	601

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	429	639	24
Volume Left	0	22	6
Volume Right	0	0	18
cSH	1700	1036	389
Volume to Capacity	0.25	0.02	0.06
Queue Length 95th (ft)	0	2	5
Control Delay (s)	0.0	0.6	14.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	14.9
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	100	520	5	25	435
Peak Hour Factor	0.88	0.88	0.96	0.96	0.89	0.89
Hourly flow rate (vph)	6	114	542	5	28	489
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1089	544			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1093	544			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	79			97	
cM capacity (veh/h)	219	535			1012	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	119	547	517
Volume Left	6	0	28
Volume Right	114	5	0
cSH	500	1700	1012
Volume to Capacity	0.24	0.32	0.03
Queue Length 95th (ft)	23	0	2
Control Delay (s)	14.4	0.0	0.8
Lane LOS	B		A
Approach Delay (s)	14.4	0.0	0.8
Approach LOS	B		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	0	5	520	445	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	0	5	565	484	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				659		
pX, platoon unblocked	0.78					
vC, conflicting volume	1060	484	484			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1077	484	484			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	99			
cM capacity (veh/h)	188	583	1079			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	5	571	484
Volume Left	5	5	0
Volume Right	0	0	0
cSH	188	1079	1700
Volume to Capacity	0.03	0.01	0.28
Queue Length 95th (ft)	2	0	0
Control Delay (s)	24.7	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	24.7	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	15	550	15	5	350
Peak Hour Factor	0.75	0.75	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	13	20	604	16	6	407
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.87	0.85			0.85	
vC, conflicting volume	1031	613			621	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	768	542			552	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	96			99	
cM capacity (veh/h)	320	460			848	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	33	621	413
Volume Left	13	0	6
Volume Right	20	16	0
cSH	392	1700	848
Volume to Capacity	0.09	0.37	0.01
Queue Length 95th (ft)	7	0	1
Control Delay (s)	15.0	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	15.0	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	25	210	0	540	360	0
Peak Hour Factor	0.87	0.87	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	29	241	0	593	419	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.87	0.80	0.80			
vC, conflicting volume	1012	419	419			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	746	270	270			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	61	100			
cM capacity (veh/h)	333	612	1016			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	29	241	593	419
Volume Left	29	0	0	0
Volume Right	0	241	0	0
cSH	333	612	1700	1700
Volume to Capacity	0.09	0.39	0.35	0.25
Queue Length 95th (ft)	7	47	0	0
Control Delay (s)	16.8	14.7	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	14.9		0.0	0.0
Approach LOS	B			

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	10	0	0	0	0	500	10	5	570	0
Peak Hour Factor	0.55	0.55	0.55	0.25	0.25	0.25	0.94	0.94	0.94	0.89	0.89	0.89
Hourly flow rate (vph)	0	0	18	0	0	0	0	532	11	6	640	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.83	0.83	0.83	0.83	0.83		0.83					
vC, conflicting volume	1189	1194	640	1207	1189	537	640			543		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1227	1233	569	1249	1227	537	569			543		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	96	100	100	100	100			99		
cM capacity (veh/h)	130	148	438	120	149	548	828			1016		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	543	646
Volume Left	0	0	6
Volume Right	18	11	0
cSH	438	1700	1016
Volume to Capacity	0.04	0.32	0.01
Queue Length 95th (ft)	3	0	0
Control Delay (s)	13.6	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	13.6	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	10	5	5	535	370	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	5	582	402	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				659		
pX, platoon unblocked	0.78					
vC, conflicting volume	997	405	408			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	996	405	408			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	99	100			
cM capacity (veh/h)	209	646	1151			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	587	408
Volume Left	11	5	0
Volume Right	5	0	5
cSH	270	1151	1700
Volume to Capacity	0.06	0.00	0.24
Queue Length 95th (ft)	5	0	0
Control Delay (s)	19.2	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	19.2	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	570	725	15	5	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	620	788	16	5	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		482	195			
pX, platoon unblocked	0.60				0.60	0.60
vC, conflicting volume	804				1448	796
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	672				1701	658
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				91	96
cM capacity (veh/h)	548				59	277

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	636	804	16
Volume Left	16	0	5
Volume Right	0	16	11
cSH	548	1700	124
Volume to Capacity	0.03	0.47	0.13
Queue Length 95th (ft)	2	0	11
Control Delay (s)	0.8	0.0	38.3
Lane LOS	A		E
Approach Delay (s)	0.8	0.0	38.3
Approach LOS			E

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		100	
Storage Lanes	1		0	1		1	1		0	0		1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		195			272			186			659		
Travel Time (s)		4.4			6.2			4.2			15.0		
Volume (vph)	150	405	20	65	410	60	185	330	70	30	200	145	
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	169	477	0	70	506	0	220	476	0	0	247	156	
Turn Type	Perm			Perm			pm+pt			Perm		Perm	
Protected Phases		1			1		3	3 4			4		2
Permitted Phases	1			1			3 4			4		4	
Detector Phases	1	1		1	1		3	3 4		4	4	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		4.0			8.0	8.0	8.0	2.0
Minimum Split (s)	13.0	13.0		13.0	13.0		8.0			12.0	12.0	12.0	33.0
Total Split (s)	50.0	50.0	0.0	50.0	50.0	0.0	12.0	56.0	0.0	44.0	44.0	44.0	33.0
Total Split (%)	36.0%	36.0%	0.0%	36.0%	36.0%	0.0%	8.6%	40.3%	0.0%	31.7%	31.7%	31.7%	24%
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)	2.0	2.0		2.0	2.0		1.0			1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead			Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes	Yes
Recall Mode	Max	Max		Max	Max		Max			Max	Max	Max	None
v/c Ratio	2.01	0.81		0.69	0.89		0.71	0.76			0.64	0.35	
Control Delay	517.2	50.3		75.3	58.0		46.2	43.1			49.1	14.3	
Queue Delay	0.0	1.5		2.4	0.0		0.0	4.1			0.0	0.0	
Total Delay	517.2	51.8		77.7	58.0		46.2	47.2			49.1	14.3	
Queue Length 50th (ft)	~247	411		57	452		145	388			201	28	
Queue Length 95th (ft)	#332	#609		#152	#695		#216	491			#310	92	
Internal Link Dist (ft)		115			192			106			579		
Turn Bay Length (ft)												100	
Base Capacity (vph)	84	591		101	570		310	625			383	442	
Starvation Cap Reductn	0	0		0	0		0	87			0	0	
Spillback Cap Reductn	0	32		5	0		0	0			0	0	
Storage Cap Reductn	0	0		0	0		0	0			0	0	
Reduced v/c Ratio	2.01	0.85		0.73	0.89		0.71	0.88			0.64	0.35	

Intersection Summary

Area Type: CBD
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 110
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street

ø1 50 s | ø2 33 s | ø3 12 s | ø4 44 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98			1.00	0.90
Flpb, ped/bikes	1.00	1.00		0.99	1.00		0.98	1.00			0.99	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1512	1584		1472	1523		1491	1476			1458	1137
Flt Permitted	0.20	1.00		0.23	1.00		0.46	1.00			0.90	1.00
Satd. Flow (perm)	314	1584		354	1523		723	1476			1324	1137
Volume (vph)	150	405	20	65	410	60	185	330	70	30	200	145
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93
Adj. Flow (vph)	169	455	22	70	441	65	220	393	83	32	215	156
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	0	78
Lane Group Flow (vph)	169	476	0	70	502	0	220	471	0	0	247	78
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%
Turn Type	Perm			Perm			pm+pt			Perm		Perm
Protected Phases		1			1		3	3 4			4	
Permitted Phases	1			1			3 4			4		4
Actuated Green, G (s)	45.8	45.8		45.8	45.8		48.8	52.8			40.7	40.7
Effective Green, g (s)	46.8	46.8		46.8	46.8		48.8	52.8			40.7	40.7
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.38	0.41			0.32	0.32
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0				4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0				2.0	2.0
Lane Grp Cap (vph)	115	582		130	560		326	612			423	364
v/s Ratio Prot		0.30			0.33		0.04	c0.32				
v/s Ratio Perm	c0.54			0.20			0.22				0.19	0.07
v/c Ratio	1.47	0.82		0.54	0.90		0.67	0.77			0.58	0.21
Uniform Delay, d1	40.2	36.4		31.7	38.0		32.5	32.0			36.2	31.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	252.3	12.1		15.1	19.6		10.7	9.0			5.8	1.3
Delay (s)	292.6	48.5		46.8	57.6		43.2	41.0			42.0	33.0
Level of Service	F	D		D	E		D	D			D	C
Approach Delay (s)		112.3			56.3			41.7			38.5	
Approach LOS		F			E			D			D	

Intersection Summary			
HCM Average Control Delay	64.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	127.3	Sum of lost time (s)	27.7
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			216	330		
Travel Time (s)	19.3			4.9	7.5		
Volume (vph)	800	5	5	715	0	0	
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.97	0.97	0.97	0.97	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	830	0	0	742	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.48			0.43			
Control Delay	1.9			1.6			
Queue Delay	0.0			0.0			
Total Delay	1.9			1.6			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	211			170			
Internal Link Dist (ft)	767			136	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1732			1744			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.48			0.43			

Intersection Summary

Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 120
Natural Cycle: 55
Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street

ø1 44 s
ø2 16 s

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1793			1811		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1793			1804		
Volume (vph)	800	5	5	715	0	0
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.25	0.25
Adj. Flow (vph)	825	5	5	737	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	830	0	0	742	0	0
Confl. Peds. (#/hr)		8	8			
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1663			1673		
v/s Ratio Prot	c0.46					
v/s Ratio Perm				0.41		
v/c Ratio	0.50			0.44		
Uniform Delay, d1	0.6			0.5		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.1			0.9		
Delay (s)	1.7			1.4		
Level of Service	A			A		
Approach Delay (s)	1.7			1.4	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	35	675	140	130	505	35	80	190	105	60	175	45	
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	780	154	135	562	0	0	487	0	0	368	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0	0.0	24.0	24.0	0.0	24.0	24.0	0.0	28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	35%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		2.34	0.21	0.88	0.64			1.55			1.34		
Control Delay		625.7	12.5	69.4	20.1			287.3			205.5		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		625.7	12.5	69.4	20.1			287.3			205.5		
Queue Length 50th (ft)		~639	14	42	136			~348			~244		
Queue Length 95th (ft)		#959	m86	#208	#542			#429			#321		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		334	726	154	884			315			274		
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		2.34	0.21	0.88	0.64			1.55			1.34		

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St

ø1	ø2	ø3
28 s	28 s	24 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.99			0.96			0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1526	1262	1514	1527			1794			1667	
Flt Permitted		0.96	1.00	0.16	1.00			0.69			0.65	
Satd. Flow (perm)		1466	1262	260	1527			1259			1095	
Volume (vph)	35	675	140	130	505	35	80	190	105	60	175	45
Peak-hour factor, PHF	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76
Adj. Flow (vph)	38	742	154	135	526	36	104	247	136	79	230	59
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	780	154	135	562	0	0	487	0	0	368	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		42.2	42.2	42.2	42.2			19.0			19.0	
Effective Green, g (s)		43.2	43.2	43.2	43.2			20.0			20.0	
Actuated g/C Ratio		0.54	0.54	0.54	0.54			0.25			0.25	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		792	681	140	825			315			274	
v/s Ratio Prot					0.37							
v/s Ratio Perm		c0.53	0.12	0.52				c0.39			0.34	
v/c Ratio		0.98	0.23	0.96	0.68			1.55			1.34	
Uniform Delay, d1		18.1	9.6	17.7	13.4			30.0			30.0	
Progression Factor		0.84	0.99	1.00	1.00			1.00			1.00	
Incremental Delay, d2		24.5	0.6	67.1	4.5			260.9			176.8	
Delay (s)		39.7	10.2	84.7	17.9			290.9			206.8	
Level of Service		D	B	F	B			F			F	
Approach Delay (s)		34.8			30.9			290.9			206.8	
Approach LOS		C			C			F			F	

Intersection Summary			
HCM Average Control Delay	109.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	114.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			257			408	
Travel Time (s)		7.8			3.5			5.8			9.3	
Volume (vph)	15	735	85	95	550	5	60	10	60	15	0	10
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	907	0	99	578	0	0	89	76	0	27	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0	0.0	59.0	59.0	0.0	21.0	21.0	21.0	21.0	21.0	0.0
Total Split (%)	73.8%	73.8%	0.0%	73.8%	73.8%	0.0%	26.3%	26.3%	26.3%	26.3%	26.3%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.73		0.26	0.45			0.51	0.29		0.14	
Control Delay		11.0		2.3	2.6			41.3	10.5		21.6	
Queue Delay		4.2		0.0	0.0			0.2	0.0		0.0	
Total Delay		15.2		2.3	2.6			41.5	10.5		21.6	
Queue Length 50th (ft)		190		8	49			42	0		7	
Queue Length 95th (ft)		#535		m1	m9			70	25		27	
Internal Link Dist (ft)		265			73			177			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1245		380	1291			260	350		293	
Starvation Cap Reductn		258		0	0			0	0		0	
Spillback Cap Reductn		0		0	59			17	0		20	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.92		0.26	0.47			0.37	0.22		0.10	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 74 (93%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street

ø1 59 s | ø3 21 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)		1573		1477	1618			1562	1367		1524	
Flt Permitted		0.99		0.33	1.00			0.74	1.00		0.81	
Satd. Flow (perm)		1557		512	1618			1203	1367		1268	
Volume (vph)	15	735	85	95	550	5	60	10	60	15	0	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Adj. Flow (vph)	16	799	92	99	573	5	76	13	76	16	0	11
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	67	0	10	0
Lane Group Flow (vph)	0	903	0	99	578	0	0	89	10	0	17	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		61.0		61.0	61.0			9.0	9.0		9.0	
Effective Green, g (s)		62.0		62.0	62.0			10.0	10.0		10.0	
Actuated g/C Ratio		0.78		0.78	0.78			0.12	0.12		0.12	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1207		397	1254			150	171		159	
v/s Ratio Prot					0.36							
v/s Ratio Perm		c0.58		0.19				c0.07	0.01		0.01	
v/c Ratio		0.75		0.25	0.46			0.59	0.06		0.11	
Uniform Delay, d1		4.8		2.5	3.1			33.1	30.8		31.0	
Progression Factor		1.00		0.33	0.47			1.00	1.00		1.00	
Incremental Delay, d2		4.3		0.8	0.7			4.1	0.0		0.1	
Delay (s)		9.1		1.7	2.2			37.2	30.9		31.2	
Level of Service		A		A	A			D	C		C	
Approach Delay (s)		9.1			2.1			34.3			31.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	495	10	30	530	5	25
Peak Hour Factor	0.89	0.89	0.97	0.97	0.83	0.83
Hourly flow rate (vph)	556	11	31	546	6	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			567		1170	562
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			413		1231	405
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			96		96	94
cM capacity (veh/h)			833		136	469

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	567	577	36
Volume Left	0	31	6
Volume Right	11	0	30
cSH	1700	833	334
Volume to Capacity	0.33	0.04	0.11
Queue Length 95th (ft)	0	3	9
Control Delay (s)	0.0	1.0	17.1
Lane LOS		A	C
Approach Delay (s)	0.0	1.0	17.1
Approach LOS			C

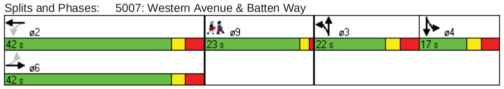
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			392			262			150		
Travel Time (s)		14.5			8.9			6.0			3.4		
Volume (vph)	130	560	10	10	575	70	5	0	10	20	0	30	
Confl. Peds. (#/hr)	3		1	1		3	1					1	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	144	633	0	11	679	0	0	17	0	0	60	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	22.0	22.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	40.4%	40.4%	0.0%	40.4%	40.4%	0.0%	21.2%	21.2%	0.0%	16.3%	16.3%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	1.25	0.51		0.09	0.56			0.12			0.34		
Control Delay	192.1	17.7		19.7	19.2			38.3			37.5		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	192.1	17.7		19.7	19.2			38.3			37.5		
Queue Length 50th (ft)	~63	80		1	90			5			17		
Queue Length 95th (ft)	#230	#576		19	#652			29			68		
Internal Link Dist (ft)		559			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	115	1243		129	1204			256			211		
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	1.25	0.51		0.09	0.56			0.07			0.28		

Intersection Summary

Area Type: CBD
Cycle Length: 104
Actuated Cycle Length: 89.3
Natural Cycle: 100
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.98			0.91			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1503	1789		1673	1729			1447			1459	
Flt Permitted	0.28	1.00		0.31	1.00			0.98			0.98	
Satd. Flow (perm)	448	1789		550	1729			1447			1459	
Volume (vph)	130	560	10	10	575	70	5	0	10	20	0	30
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84
Adj. Flow (vph)	144	622	11	11	605	74	6	0	11	24	0	36
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	144	633	0	11	676	0	0	17	0	0	60	0
Confl. Peds. (#/hr)	3		1	1		3	1					1
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	57.4	57.4		57.4	57.4			2.6			5.9	
Effective Green, g (s)	60.4	60.4		60.4	60.4			5.6			8.9	
Actuated g/C Ratio	0.62	0.62		0.62	0.62			0.06			0.09	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	278	1111		341	1073			83			133	
v/s Ratio Prot		0.35			c0.39			c0.01			c0.04	
v/s Ratio Perm	0.32			0.02								
v/c Ratio	0.52	0.57		0.03	0.63			0.20			0.45	
Uniform Delay, d1	10.3	10.8		7.1	11.5			43.7			41.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	6.7	2.1		0.2	2.8			0.4			0.9	
Delay (s)	17.1	12.9		7.3	14.3			44.2			42.8	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		13.7			14.2			44.2			42.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.4
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	60	510	10	75	400
Peak Hour Factor	0.82	0.82	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	6	73	573	11	86	460
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1211	579			584	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1220	579			584	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	96	85			91	
cM capacity (veh/h)	165	495			976	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	79	584	546
Volume Left	6	0	86
Volume Right	73	11	0
cSH	429	1700	976
Volume to Capacity	0.18	0.34	0.09
Queue Length 95th (ft)	17	0	7
Control Delay (s)	15.3	0.0	2.4
Lane LOS	C		A
Approach Delay (s)	15.3	0.0	2.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	5	580	25	5	280
Peak Hour Factor	0.60	0.60	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	8	8	682	29	5	298
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.87	0.81			0.81	
vC, conflicting volume	1006	697			712	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	774	624			642	
tC, single (s)	6.6	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.3	
p0 queue free %	97	98			99	
cM capacity (veh/h)	301	370			744	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	712	303
Volume Left	8	0	5
Volume Right	8	29	0
cSH	332	1700	744
Volume to Capacity	0.05	0.42	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	16.4	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	16.4	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	65	180	0	540	285	0
Peak Hour Factor	0.97	0.97	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	67	186	0	635	303	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.87	0.88	0.88			
vC, conflicting volume	938	303	303			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	716	205	205			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	80	74	100			
cM capacity (veh/h)	331	711	1172			

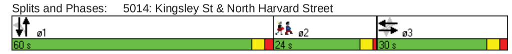
Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	67	186	635	303
Volume Left	67	0	0	0
Volume Right	0	186	0	0
cSH	331	711	1700	1700
Volume to Capacity	0.20	0.26	0.37	0.18
Queue Length 95th (ft)	19	26	0	0
Control Delay (s)	18.6	11.8	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	13.6		0.0	0.0
Approach LOS	B			

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	42.2%		ICU Level of Service	A
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	75	0	35	10	5	5	20	460	0	0	410	55	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	123	0	0	33	0	0	572	0	0	490	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.67			0.16			0.56			0.42		
Control Delay		51.4			31.6			18.0			14.5		
Queue Delay		0.2			0.0			0.1			0.4		
Total Delay		51.6			31.6			18.1			14.9		
Queue Length 50th (ft)		66			15			260			194		
Queue Length 95th (ft)		126			25			410			338		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		279			330			1015			1157		
Starvation Cap Reductn		0			0			0			258		
Spillback Cap Reductn		12			14			46			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.46			0.10			0.59			0.55		

Intersection Summary	
Area Type:	CBD
Cycle Length: 114	
Actuated Cycle Length: 101.1	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	

Splits and Phases: 5014: Kingsley St & North Harvard Street



5014: Kingsley St & North Harvard Street

Weekday Morning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.97			1.00			0.98	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1407			1587			1566			1734	
Flt Permitted		0.79			0.85			0.97			1.00	
Satd. Flow (perm)		1149			1388			1524			1734	
Volume (vph)	75	0	35	10	5	5	20	460	0	0	410	55
Peak-hour factor, PHF	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95
Adj. Flow (vph)	84	0	39	17	8	8	24	548	0	0	432	58
RTOR Reduction (vph)	0	17	0	0	7	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	106	0	0	26	0	0	572	0	0	490	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		12.4			12.4			65.7			65.7	
Effective Green, g (s)		13.4			13.4			66.7			66.7	
Actuated g/C Ratio		0.13			0.13			0.64			0.64	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		149			180			982			1117	
v/s Ratio Prot											0.28	
v/s Ratio Perm		c0.09			0.02			c0.38				
v/c Ratio		0.71			0.14			0.58			0.44	
Uniform Delay, d1		43.2			40.0			10.5			9.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		12.7			0.1			2.5			1.3	
Delay (s)		55.9			40.1			13.0			10.4	
Level of Service		E			D			B			B	
Approach Delay (s)		55.9			40.1			13.0			10.4	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	103.5	Sum of lost time (s)	23.4
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

10463.00: Barry's Corner Mixed Use (Allston, MA)
2017 No-Build Conditions

5015: Bayard Street & North Harvard Street

Weekday Morning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	20	0	0	0	0	475	10	5	450	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.91	0.91	0.99
Hourly flow rate (vph)	6	0	23	0	0	0	0	552	12	5	495	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.87	0.87	0.87	0.87	0.87		0.87					
vC, conflicting volume	1064	1069	495	1087	1064	558	495			564		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1073	1079	422	1099	1073	558	422			564		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	97	100	96	100	100	100	100			99		
cM capacity (veh/h)	174	191	556	158	191	529	963			969		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	564	500
Volume Left	6	0	5
Volume Right	23	12	0
cSH	386	1700	969
Volume to Capacity	0.08	0.33	0.01
Queue Length 95th (ft)	6	0	0
Control Delay (s)	15.1	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	15.1	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	0	5	530	455	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	0	5	576	495	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				659		
pX, platoon unblocked	0.78					
vC, conflicting volume	1082	495	495			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1105	495	495			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	99			
cM capacity (veh/h)	181	575	1069			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	5	582	495
Volume Left	5	5	0
Volume Right	0	0	0
cSH	181	1069	1700
Volume to Capacity	0.03	0.01	0.29
Queue Length 95th (ft)	2	0	0
Control Delay (s)	25.5	0.1	0.0
Lane LOS	D	A	
Approach Delay (s)	25.5	0.1	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	560	865	5	0	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	609	940	5	0	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		482	195			
pX, platoon unblocked	0.50				0.51	0.50
vC, conflicting volume	946				1562	943
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	892				2071	886
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				100	84
cM capacity (veh/h)	382				30	173

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	614	946	27
Volume Left	5	0	0
Volume Right	0	5	27
cSH	382	1700	173
Volume to Capacity	0.01	0.56	0.16
Queue Length 95th (ft)	1	0	14
Control Delay (s)	0.4	0.0	29.7
Lane LOS	A		D
Approach Delay (s)	0.4	0.0	29.7
Approach LOS			D

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		100	
Storage Lanes	1		0	1		1	1		0	0		1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		195			272			186			659		
Travel Time (s)		4.4			6.2			4.2			15.0		
Volume (vph)	140	400	20	95	505	55	195	340	50	25	260	170	
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	151	452	0	110	651	0	217	434	0	0	328	195	
Turn Type	Perm			Perm			pm+pt			Perm		Perm	
Protected Phases		1			1		3	3 4			4		2
Permitted Phases	1			1			3 4			4		4	
Detector Phases	1	1		1	1		3	3 4		4	4	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		4.0			8.0	8.0	8.0	2.0
Minimum Split (s)	13.0	13.0		13.0	13.0		8.0			12.0	12.0	12.0	33.0
Total Split (s)	55.0	55.0	0.0	55.0	55.0	0.0	12.0	51.0	0.0	39.0	39.0	39.0	33.0
Total Split (%)	39.6%	39.6%	0.0%	39.6%	39.6%	0.0%	8.6%	36.7%	0.0%	28.1%	28.1%	28.1%	24%
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)	2.0	2.0		2.0	2.0		1.0			1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead			Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes	Yes
Recall Mode	Max	Max		Max	Max		Max			Max	Max	Max	None
v/c Ratio	2.90	0.68		0.67	1.00		1.01	0.73			0.90	0.50	
Control Delay	924.4	39.6		57.2	73.8		103.0	45.0			74.3	24.9	
Queue Delay	0.0	2.7		8.1	0.0		0.0	2.6			3.2	0.0	
Total Delay	924.4	42.2		65.3	73.8		103.0	47.6			77.5	24.9	
Queue Length 50th (ft)	~202	356		86	~677		~178	356			~306	71	
Queue Length 95th (ft)	#350	496		#181	#854		#357	#530			#481	145	
Internal Link Dist (ft)		115			192			106			579		
Turn Bay Length (ft)												100	
Base Capacity (vph)	52	667		165	652		214	591			363	393	
Starvation Cap Reductn	0	0		0	0		0	74			0	0	
Spillback Cap Reductn	0	118		29	0		0	0			11	0	
Storage Cap Reductn	0	0		0	0		0	0			0	0	
Reduced v/c Ratio	2.90	0.82		0.81	1.00		1.01	0.84			0.93	0.50	

Intersection Summary

Area Type: CBD
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 100
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street

ø1 55 s | ø2 33 s | ø3 12 s | ø4 39 s

10463.00: Barry's Corner Mixed Use (Allston, MA)
188: Western Avenue & North Harvard Street
2017 No-Build Conditions
Weekday Evening

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99			1.00	0.88
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1537	1614		1514	1574		1545	1543			1508	1142
Flt Permitted	0.11	1.00		0.30	1.00		0.30	1.00			0.94	1.00
Satd. Flow (perm)	171	1614		472	1574		492	1543			1418	1142
Volume (vph)	140	400	20	95	505	55	195	340	50	25	260	170
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	151	430	22	110	587	64	217	378	56	29	299	195
RTOR Reduction (vph)	0	1	0	0	2	0	0	4	0	0	0	74
Lane Group Flow (vph)	151	451	0	110	649	0	217	430	0	0	328	121
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%
Turn Type	Perm			Perm			pm+pt			Perm		Perm
Protected Phases		1			1		3	3 4			4	
Permitted Phases	1			1			3 4			4		4
Actuated Green, G (s)	50.9	50.9		50.9	50.9		43.7	47.7			35.6	35.6
Effective Green, g (s)	51.9	51.9		51.9	51.9		43.7	47.7			35.6	35.6
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.34	0.37			0.28	0.28
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0				4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0				2.0	2.0
Lane Grp Cap (vph)	70	658		192	642		236	578			397	319
v/s Ratio Prot		0.28			0.41		c0.06	0.28				
v/s Ratio Perm	c0.88			0.23			c0.26				0.23	0.11
v/c Ratio	2.16	0.69		0.57	1.01		0.92	0.74			0.83	0.38
Uniform Delay, d1	37.7	31.0		29.1	37.7		39.8	34.5			43.0	36.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	564.9	5.7		11.8	38.1		40.9	8.4			17.6	3.4
Delay (s)	602.6	36.7		41.0	75.8		80.7	43.0			60.5	40.3
Level of Service	F	D		D	E		F	D			E	D
Approach Delay (s)		178.4			70.8			55.5			53.0	
Approach LOS		F			E			E			D	

Intersection Summary

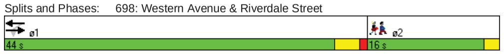
HCM Average Control Delay	88.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.60		
Actuated Cycle Length (s)	127.3	Sum of lost time (s)	31.7
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			216	330		
Travel Time (s)	19.3			4.9	7.5		
Volume (vph)	800	10	20	855	0	0	
Confl. Peds. (#/hr)		19	19				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.88	0.88	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	843	0	0	995	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.47			0.57			
Control Delay	1.8			2.5			
Queue Delay	0.0			0.0			
Total Delay	1.8			2.5			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	208			287			
Internal Link Dist (ft)	767			136	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1797			1759			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	7			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.47			0.57			

Intersection Summary
Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 120
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1860			1861		
Flt Permitted	1.00			0.97		
Satd. Flow (perm)	1860			1813		
Volume (vph)	800	10	20	855	0	0
Peak-hour factor, PHF	0.96	0.96	0.88	0.88	0.25	0.25
Adj. Flow (vph)	833	10	23	972	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	843	0	0	995	0	0
Confl. Peds. (#/hr)		19	19			
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1725			1682		
v/s Ratio Prot	0.45					
v/s Ratio Perm				c0.55		
v/c Ratio	0.49			0.59		
Uniform Delay, d1	0.6			0.7		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.0			1.5		
Delay (s)	1.6			2.2		
Level of Service	A			A		
Approach Delay (s)	1.6			2.2	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	20	615	175	125	645	80	105	185	110	55	180	60	
Confl. Peds. (#/hr)	8		11	11		8	9					9	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	705	194	144	833	0	0	430	0	0	328	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	0.0	27.0	27.0	0.0	27.0	27.0	0.0	28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	31%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		1.84	0.25	1.13	0.89			1.41			0.99		
Control Delay		402.9	11.7	146.4	32.3			230.4			82.3		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		402.9	11.7	146.4	32.3			230.4			82.3		
Queue Length 50th (ft)		~598	17	~88	308			~331			186		
Queue Length 95th (ft)		#934	m103	#200	#855			#511			#356		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		384	773	127	933			306			332		
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		1.84	0.25	1.13	0.89			1.41			0.99		

Intersection Summary

Area Type: CBD

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 150

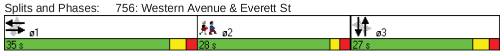
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			1.00			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.98			0.96			0.97	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1587	1311	1573	1574			1802			1689	
Flt Permitted		0.83	1.00	0.23	1.00			0.66			0.76	
Satd. Flow (perm)		1327	1311	374	1574			1197			1299	
Volume (vph)	20	615	175	125	645	80	105	185	110	55	180	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	22	683	194	144	741	92	113	199	118	61	200	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	705	194	144	833	0	0	430	0	0	328	0
Confl. Peds. (#/hr)	8		11	11		8	9					9
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		49.2	49.2	49.2	49.2			22.0			22.0	
Effective Green, g (s)		50.2	50.2	50.2	50.2			23.0			23.0	
Actuated g/C Ratio		0.56	0.56	0.56	0.56			0.26			0.26	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		740	731	209	878			306			332	
v/s Ratio Prot					0.53							
v/s Ratio Perm		c0.53	0.15	0.38				c0.36			0.25	
v/c Ratio		0.95	0.27	0.69	0.95			1.41			0.99	
Uniform Delay, d1		18.8	10.3	14.3	18.7			33.5			33.4	
Progression Factor		0.78	0.91	1.00	1.00			1.00			1.00	
Incremental Delay, d2		19.1	0.7	17.0	20.2			200.9			45.6	
Delay (s)		33.8	10.0	31.3	38.9			234.4			78.9	
Level of Service		C	B	C	D			F			E	
Approach Delay (s)		28.7			37.8			234.4			78.9	
Approach LOS		C			D			F			E	

Intersection Summary			
HCM Average Control Delay	71.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	128.2%	ICU Level of Service	H
Analysis Period (min)	15		

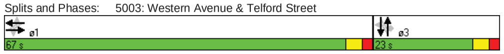
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			322			408	
Travel Time (s)		7.8			3.5			7.3			9.3	
Volume (vph)	20	680	150	150	670	10	105	15	75	10	0	5
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	924	0	163	739	0	0	130	82	0	16	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	67.0	67.0	0.0	67.0	67.0	0.0	23.0	23.0	23.0	23.0	23.0	0.0
Total Split (%)	74.4%	74.4%	0.0%	74.4%	74.4%	0.0%	25.6%	25.6%	25.6%	25.6%	25.6%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.77		0.45	0.60			0.68	0.28		0.07	
Control Delay		13.5		4.7	4.2			53.0	9.9		24.6	
Queue Delay		16.3		0.0	0.6			0.7	0.0		0.0	
Total Delay		29.8		4.7	4.8			53.6	9.9		24.6	
Queue Length 50th (ft)		250		16	83			70	0		5	
Queue Length 95th (ft)		#545		m1	m33			124	36		22	
Internal Link Dist (ft)		265			73			242			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1194		360	1242			254	356		294	
Starvation Cap Reductn		276		0	190			0	0		0	
Spillback Cap Reductn		0		0	66			21	0		24	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		1.01		0.45	0.70			0.56	0.23		0.06	

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street



10463.00: Barry's Corner Mixed Use (Allston, MA)
5003: Western Avenue & Telford Street
2017 No-Build Conditions
Weekday Evening

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.96	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)		1612		1516	1649			1553	1378		1583	
Flt Permitted		0.98		0.31	1.00			0.74	1.00		0.82	
Satd. Flow (perm)		1578		502	1649			1201	1378		1337	
Volume (vph)	20	680	150	150	670	10	105	15	75	10	0	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	739	163	163	728	11	114	16	82	11	0	5
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	69	0	4	0
Lane Group Flow (vph)	0	917	0	163	739	0	0	130	13	0	12	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		66.7		66.7	66.7			13.3	13.3		13.3	
Effective Green, g (s)		67.7		67.7	67.7			14.3	14.3		14.3	
Actuated g/C Ratio		0.75		0.75	0.75			0.16	0.16		0.16	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1187		378	1240			191	219		212	
v/s Ratio Prot					0.45							
v/s Ratio Perm		c0.58		0.32				c0.11	0.01		0.01	
v/c Ratio		0.77		0.43	0.60			0.68	0.06		0.06	
Uniform Delay, d1		6.6		4.1	5.0			35.7	32.1		32.1	
Progression Factor		1.00		0.55	0.57			1.00	1.00		1.00	
Incremental Delay, d2		4.9		1.2	0.7			7.7	0.0		0.0	
Delay (s)		11.5		3.5	3.6			43.4	32.2		32.2	
Level of Service		B		A	A			D	C		C	
Approach Delay (s)		11.5			3.6			39.1			32.2	
Approach LOS		B			A			D			C	

Intersection Summary

HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	110.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	475	0	20	650	5	15
Peak Hour Factor	0.92	0.92	0.90	0.90	0.82	0.82
Hourly flow rate (vph)	516	0	22	722	6	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.78		0.78	0.78
vC, conflicting volume			516		1283	516
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			378		1364	378
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	96
cM capacity (veh/h)			914		122	517

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	516	744	24
Volume Left	0	22	6
Volume Right	0	0	18
cSH	1700	914	286
Volume to Capacity	0.30	0.02	0.09
Queue Length 95th (ft)	0	2	7
Control Delay (s)	0.0	0.6	18.8
Lane LOS		A	C
Approach Delay (s)	0.0	0.6	18.8
Approach LOS			C

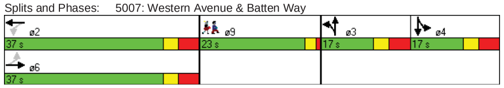
Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			392			262			150		
Travel Time (s)		14.5			8.9			6.0			3.4		
Volume (vph)	55	555	5	10	525	30	5	0	10	50	0	50	
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	65	667	0	11	591	0	0	18	0	0	134	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	37.0	37.0	0.0	37.0	37.0	0.0	17.0	17.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	39.4%	39.4%	0.0%	39.4%	39.4%	0.0%	18.1%	18.1%	0.0%	18.1%	18.1%	0.0%	24%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	0.55	0.60		0.08	0.54			0.11			0.55		
Control Delay	46.7	21.3		20.2	19.4			36.2			39.1		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	46.7	21.3		20.2	19.4			36.2			39.1		
Queue Length 50th (ft)	10	103		1	85			5			36		
Queue Length 95th (ft)	#108	#551		18	#519			28			110		
Internal Link Dist (ft)		559			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	118	1112		134	1103			217			269		
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	0.55	0.60		0.08	0.54			0.08			0.50		

Intersection Summary

Area Type: CBD
Cycle Length: 94
Actuated Cycle Length: 75.7
Natural Cycle: 90
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.91			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1556	1861		1768	1845			1397			1519	
Flt Permitted	0.30	1.00		0.24	1.00			0.98			0.98	
Satd. Flow (perm)	484	1861		447	1845			1397			1519	
Volume (vph)	55	555	5	10	525	30	5	0	10	50	0	50
Peak-hour factor, PHF	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	65	661	6	11	559	32	6	0	12	67	0	67
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	65	667	0	11	590	0	0	18	0	0	134	0
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	41.3	41.3		41.3	41.3			2.4			8.1	
Effective Green, g (s)	44.3	44.3		44.3	44.3			5.4			11.1	
Actuated g/C Ratio	0.54	0.54		0.54	0.54			0.07			0.13	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	260	1001		240	992			92			205	
v/s Ratio Prot		c0.36			0.32			c0.01			c0.09	
v/s Ratio Perm	0.13			0.02								
v/c Ratio	0.25	0.67		0.05	0.59			0.20			0.65	
Uniform Delay, d1	10.2	13.7		9.0	12.9			36.4			33.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.3	3.5		0.4	2.6			0.4			5.6	
Delay (s)	12.5	17.2		9.4	15.6			36.8			39.4	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		16.8			15.5			36.8			39.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	82.4	Sum of lost time (s)	21.6
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	115	540	5	25	440
Peak Hour Factor	0.88	0.88	0.96	0.96	0.89	0.89
Hourly flow rate (vph)	6	131	562	5	28	494
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1116	565			568	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1121	565			568	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	75			97	
cM capacity (veh/h)	210	521			995	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	136	568	522
Volume Left	6	0	28
Volume Right	131	5	0
cSH	490	1700	995
Volume to Capacity	0.28	0.33	0.03
Queue Length 95th (ft)	28	0	2
Control Delay (s)	15.1	0.0	0.8
Lane LOS	C		A
Approach Delay (s)	15.1	0.0	0.8
Approach LOS	C		

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	15	570	15	5	370
Peak Hour Factor	0.75	0.75	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	13	20	626	16	6	430
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.87	0.82			0.82	
vC, conflicting volume	1076	635			643	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	771	552			562	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	95			99	
cM capacity (veh/h)	321	438			811	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	33	643	436
Volume Left	13	0	6
Volume Right	20	16	0
cSH	382	1700	811
Volume to Capacity	0.09	0.38	0.01
Queue Length 95th (ft)	7	0	1
Control Delay (s)	15.3	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	15.3	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	25	215	0	560	380	0
Peak Hour Factor	0.87	0.87	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	29	247	0	615	442	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.88	0.79	0.79			
vC, conflicting volume	1057	442	442			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	748	289	289			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	58	100			
cM capacity (veh/h)	334	589	986			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	29	247	615	442
Volume Left	29	0	0	0
Volume Right	0	247	0	0
cSH	334	589	1700	1700
Volume to Capacity	0.09	0.42	0.36	0.26
Queue Length 95th (ft)	7	52	0	0
Control Delay (s)	16.8	15.5	0.0	0.0
Lane LOS	C	C		
Approach Delay (s)	15.6		0.0	0.0
Approach LOS	C			

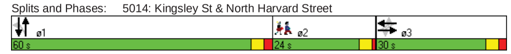
Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	55	0	25	20	5	5	15	500	0	0	550	45	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	94	0	0	38	0	0	592	0	0	669	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.58			0.21			0.58			0.53		
Control Delay		46.2			36.3			17.0			15.1		
Queue Delay		0.1			0.0			0.1			0.7		
Total Delay		46.3			36.4			17.1			15.7		
Queue Length 50th (ft)		46			19			257			276		
Queue Length 95th (ft)		92			42			429			457		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		281			317			1021			1253		
Starvation Cap Reductn		0			0			0			270		
Spillback Cap Reductn		11			13			40			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.35			0.13			0.60			0.68		

Intersection Summary

Area Type: CBD
Cycle Length: 114
Actuated Cycle Length: 99.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

Splits and Phases: 5014: Kingsley St & North Harvard Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			1.00			0.99	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1422			1608			1642			1844	
Flt Permitted		0.82			0.79			0.98			1.00	
Satd. Flow (perm)		1201			1320			1607			1844	
Volume (vph)	55	0	25	20	5	5	15	500	0	0	550	45
Peak-hour factor, PHF	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	65	0	29	26	6	6	17	575	0	0	618	51
RTOR Reduction (vph)	0	16	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	78	0	0	33	0	0	592	0	0	669	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		10.4			10.4			66.1			66.1	
Effective Green, g (s)		11.4			11.4			67.1			67.1	
Actuated g/C Ratio		0.11			0.11			0.66			0.66	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		134			147			1056			1212	
v/s Ratio Prot											0.36	
v/s Ratio Perm		c0.06			0.02			c0.37				
v/c Ratio		0.58			0.22			0.56			0.55	
Uniform Delay, d1		43.1			41.3			9.5			9.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.1			0.3			2.2			1.8	
Delay (s)		47.2			41.6			11.6			11.2	
Level of Service		D			D			B			B	
Approach Delay (s)		47.2			41.6			11.6			11.2	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	102.1	Sum of lost time (s)	23.6
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	10	0	0	0	0	515	10	5	590	0
Peak Hour Factor	0.55	0.55	0.55	0.25	0.25	0.25	0.94	0.94	0.94	0.89	0.89	0.89
Hourly flow rate (vph)	0	0	18	0	0	0	0	548	11	6	663	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.80	0.80	0.80	0.80	0.80		0.80					
vC, conflicting volume	1227	1233	663	1246	1227	553	663			559		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1284	1291	579	1307	1284	553	579			559		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	96	100	100	100	100			99		
cM capacity (veh/h)	114	131	415	105	132	536	788			1002		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	559	669
Volume Left	0	0	6
Volume Right	18	11	0
cSH	415	1700	1002
Volume to Capacity	0.04	0.33	0.01
Queue Length 95th (ft)	3	0	0
Control Delay (s)	14.1	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	14.1	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	20	0	560	375	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	22	0	609	408	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				211		
pX, platoon unblocked	0.68					
vC, conflicting volume	1019	410	413			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1028	410	413			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	175	641	1146			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	609	413
Volume Left	0	0	0
Volume Right	22	0	5
cSH	641	1700	1700
Volume to Capacity	0.03	0.36	0.24
Queue Length 95th (ft)	3	0	0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		100	
Storage Lanes	1		0	1		1	1		0	0		1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		406			272			186			211		
Travel Time (s)		9.2			6.2			4.2			4.8		
Volume (vph)	160	425	20	70	420	70	195	330	75	40	210	145	
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	180	500	0	75	527	0	232	482	0	0	269	156	
Turn Type	Perm			Perm			pm+pt			Perm		Perm	
Protected Phases		1			1		3	3 4			4		2
Permitted Phases	1			1			3 4			4		4	
Detector Phases	1	1		1	1		3	3 4		4	4	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		4.0			8.0	8.0	8.0	2.0
Minimum Split (s)	13.0	13.0		13.0	13.0		8.0			12.0	12.0	12.0	33.0
Total Split (s)	50.0	50.0	0.0	50.0	50.0	0.0	12.0	56.0	0.0	44.0	44.0	44.0	33.0
Total Split (%)	36.0%	36.0%	0.0%	36.0%	36.0%	0.0%	8.6%	40.3%	0.0%	31.7%	31.7%	31.7%	24%
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)	2.0	2.0		2.0	2.0		1.0			1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead			Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes	Yes
Recall Mode	Max	Max		Max	Max		Max			Max	Max	Max	None
v/c Ratio	2.57	0.85		0.87	0.93		0.79	0.77			0.80	0.36	
Control Delay	773.7	53.5		112.5	63.4		53.5	43.9			61.0	16.4	
Queue Delay	0.0	3.4		10.0	0.0		0.0	4.7			0.1	0.0	
Total Delay	773.7	56.8		122.5	63.4		53.5	48.6			61.1	16.4	
Queue Length 50th (ft)	~280	440		67	~510		154	396			234	35	
Queue Length 95th (ft)	#381	#654		#178	#738		#258	#506			#404	101	
Internal Link Dist (ft)		326			192			106			131		
Turn Bay Length (ft)												100	
Base Capacity (vph)	70	591		86	569		294	623			336	435	
Starvation Cap Reductn	0	0		0	0		0	86			0	0	
Spillback Cap Reductn	0	40		5	0		0	0			1	0	
Storage Cap Reductn	0	0		0	0		0	0			0	0	
Reduced v/c Ratio	2.57	0.91		0.93	0.93		0.79	0.90			0.80	0.36	

Intersection Summary

Area Type: CBD
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 110
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98			1.00	0.90
Flpb, ped/bikes	1.00	1.00		0.99	1.00		0.98	1.00			0.99	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1512	1585		1472	1519		1495	1472			1454	1137
Flt Permitted	0.17	1.00		0.20	1.00		0.43	1.00			0.83	1.00
Satd. Flow (perm)	278	1585		315	1519		677	1472			1220	1137
Volume (vph)	160	425	20	70	420	70	195	330	75	40	210	145
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93
Adj. Flow (vph)	180	478	22	75	452	75	232	393	89	43	226	156
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	0	71
Lane Group Flow (vph)	180	499	0	75	523	0	232	477	0	0	269	85
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%
Turn Type	Perm			Perm			pm+pt			Perm		Perm
Protected Phases		1			1		3	3 4			4	
Permitted Phases	1			1			3 4			4		4
Actuated Green, G (s)	45.8	45.8		45.8	45.8		48.8	52.8			40.7	40.7
Effective Green, g (s)	46.8	46.8		46.8	46.8		48.8	52.8			40.7	40.7
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.38	0.41			0.32	0.32
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0				4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0				2.0	2.0
Lane Grp Cap (vph)	102	583		116	558		312	611			390	364
v/s Ratio Prot		0.31			0.34		0.05	c0.32				
v/s Ratio Perm	c0.65			0.24			0.24				0.22	0.07
v/c Ratio	1.76	0.86		0.65	0.94		0.74	0.78			0.69	0.23
Uniform Delay, d1	40.2	37.1		33.4	38.8		34.0	32.2			37.8	31.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	380.9	14.9		24.6	25.4		14.8	9.5			9.6	1.5
Delay (s)	421.2	52.0		58.0	64.3		48.9	41.8			47.4	33.3
Level of Service	F	D		E	E		D	D			D	C
Approach Delay (s)		149.7			63.5			44.1			42.2	
Approach LOS		F			E			D			D	

Intersection Summary			
HCM Average Control Delay	78.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	127.3	Sum of lost time (s)	27.7
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			271	330		
Travel Time (s)	19.3			6.2	7.5		
Volume (vph)	805	5	5	735	0	0	
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.97	0.97	0.97	0.97	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	835	0	0	763	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.48			0.44			
Control Delay	1.9			1.7			
Queue Delay	0.0			0.0			
Total Delay	1.9			1.7			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	214			180			
Internal Link Dist (ft)	767			191	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1732			1744			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.48			0.44			

Intersection Summary

Area Type: CBD

Cycle Length: 60

Actuated Cycle Length: 120

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1793			1811		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1793			1804		
Volume (vph)	805	5	5	735	0	0
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.25	0.25
Adj. Flow (vph)	830	5	5	758	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	835	0	0	763	0	0
Confl. Peds. (#/hr)		8	8			
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1663			1673		
v/s Ratio Prot	c0.47					
v/s Ratio Perm				0.42		
v/c Ratio	0.50			0.46		
Uniform Delay, d1	0.6			0.6		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.1			0.9		
Delay (s)	1.7			1.5		
Level of Service	A			A		
Approach Delay (s)	1.7			1.5	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	35	675	140	135	515	35	80	190	110	60	175	45	
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	780	154	141	572	0	0	494	0	0	368	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0	0.0	24.0	24.0	0.0	24.0	24.0	0.0	28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	35%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		2.51	0.21	0.92	0.65			1.56			1.36		
Control Delay		703.8	12.5	77.2	20.4			294.6			211.8		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		703.8	12.5	77.2	20.4			294.6			211.8		
Queue Length 50th (ft)		~653	14	46	140			~355			~245		
Queue Length 95th (ft)		#965	m86	#217	#552			#434			#323		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		311	726	154	886			316			271		
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		2.51	0.21	0.92	0.65			1.56			1.36		

Intersection Summary

Area Type: CBD

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.99			0.96			0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1526	1262	1514	1527			1791			1667	
Flt Permitted		0.96	1.00	0.16	1.00			0.70			0.64	
Satd. Flow (perm)		1465	1262	260	1527			1262			1085	
Volume (vph)	35	675	140	135	515	35	80	190	110	60	175	45
Peak-hour factor, PHF	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76
Adj. Flow (vph)	38	742	154	141	536	36	104	247	143	79	230	59
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	780	154	141	572	0	0	494	0	0	368	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		42.2	42.2	42.2	42.2			19.0			19.0	
Effective Green, g (s)		43.2	43.2	43.2	43.2			20.0			20.0	
Actuated g/C Ratio		0.54	0.54	0.54	0.54			0.25			0.25	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		791	681	140	825			316			271	
v/s Ratio Prot					0.37							
v/s Ratio Perm		0.53	0.12	c0.54				c0.39			0.34	
v/c Ratio		0.99	0.23	1.01	0.69			1.56			1.36	
Uniform Delay, d1		18.1	9.6	18.4	13.5			30.0			30.0	
Progression Factor		0.84	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		24.8	0.6	78.0	4.8			268.4			183.2	
Delay (s)		40.0	10.2	96.4	18.3			298.4			213.2	
Level of Service		D	B	F	B			F			F	
Approach Delay (s)		35.1			33.7			298.4			213.2	
Approach LOS		D			C			F			F	

Intersection Summary			
HCM Average Control Delay	112.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			257			408	
Travel Time (s)		7.8			3.5			5.8			9.3	
Volume (vph)	15	735	85	95	560	5	60	10	60	15	0	10
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	907	0	99	588	0	0	89	76	0	27	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0	0.0	59.0	59.0	0.0	21.0	21.0	21.0	21.0	21.0	0.0
Total Split (%)	73.8%	73.8%	0.0%	73.8%	73.8%	0.0%	26.3%	26.3%	26.3%	26.3%	26.3%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.73		0.26	0.46			0.51	0.29		0.14	
Control Delay		11.0		2.3	2.7			41.3	10.5		21.6	
Queue Delay		4.2		0.0	0.0			0.2	0.0		0.0	
Total Delay		15.3		2.3	2.7			41.5	10.5		21.6	
Queue Length 50th (ft)		190		8	50			42	0		7	
Queue Length 95th (ft)		#541		m1	m14			70	25		27	
Internal Link Dist (ft)		265			73			177			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1244		380	1291			260	350		293	
Starvation Cap Reductn		257		0	0			0	0		0	
Spillback Cap Reductn		0		0	57			18	0		20	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.92		0.26	0.48			0.37	0.22		0.10	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 74 (93%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)		1573		1477	1618			1562	1367		1524	
Flt Permitted		0.99		0.33	1.00			0.74	1.00		0.81	
Satd. Flow (perm)		1557		512	1618			1203	1367		1268	
Volume (vph)	15	735	85	95	560	5	60	10	60	15	0	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Adj. Flow (vph)	16	799	92	99	583	5	76	13	76	16	0	11
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	67	0	10	0
Lane Group Flow (vph)	0	903	0	99	588	0	0	89	10	0	17	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		61.0		61.0	61.0			9.0	9.0		9.0	
Effective Green, g (s)		62.0		62.0	62.0			10.0	10.0		10.0	
Actuated g/C Ratio		0.78		0.78	0.78			0.12	0.12		0.12	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1207		397	1254			150	171		159	
v/s Ratio Prot					0.36							
v/s Ratio Perm		c0.58		0.19				c0.07	0.01		0.01	
v/c Ratio		0.75		0.25	0.47			0.59	0.06		0.11	
Uniform Delay, d1		4.8		2.5	3.2			33.1	30.8		31.0	
Progression Factor		1.00		0.33	0.49			1.00	1.00		1.00	
Incremental Delay, d2		4.3		0.8	0.7			4.1	0.0		0.1	
Delay (s)		9.1		1.7	2.2			37.2	30.9		31.2	
Level of Service		A		A	A			D	C		C	
Approach Delay (s)		9.1			2.2			34.3			31.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	585	215	15	720	25	0	0	0	20	10	20
Peak Hour Factor	0.92	0.96	0.96	0.95	0.95	0.92	0.25	0.92	0.25	0.92	0.92	0.92
Hourly flow rate (vph)	5	609	224	16	758	27	0	0	0	22	11	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		271			406							
pX, platoon unblocked	0.60			0.92			0.64	0.64	0.92	0.64	0.64	0.60
vC, conflicting volume	785			833			1562	1549	721	1535	1647	771
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	642			819			1689	1668	697	1647	1822	620
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	56	77	93
cM capacity (veh/h)	566			725			36	60	409	50	48	293

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	839	801	54
Volume Left	5	16	22
Volume Right	224	27	22
cSH	566	725	74
Volume to Capacity	0.01	0.02	0.74
Queue Length 95th (ft)	1	2	87
Control Delay (s)	0.3	0.6	135.7
Lane LOS	A	A	F
Approach Delay (s)	0.3	0.6	135.7
Approach LOS			F

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	510	30	40	545	15	25
Peak Hour Factor	0.89	0.89	0.97	0.97	0.83	0.83
Hourly flow rate (vph)	573	34	41	562	18	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.72		0.72	0.72
vC, conflicting volume			607		1234	590
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			452		1327	428
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			95		84	93
cM capacity (veh/h)			784		114	443

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	607	603	48
Volume Left	0	41	18
Volume Right	34	0	30
cSH	1700	784	213
Volume to Capacity	0.36	0.05	0.23
Queue Length 95th (ft)	0	4	21
Control Delay (s)	0.0	1.4	26.8
Lane LOS		A	D
Approach Delay (s)	0.0	1.4	26.8
Approach LOS			D

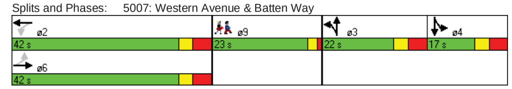
Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			392			262			150		
Travel Time (s)		14.5			8.9			6.0			3.4		
Volume (vph)	130	575	10	10	585	70	5	0	10	20	0	30	
Confl. Peds. (#/hr)	3		1	1		3	1					1	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	144	650	0	11	690	0	0	17	0	0	60	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	22.0	22.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	40.4%	40.4%	0.0%	40.4%	40.4%	0.0%	21.2%	21.2%	0.0%	16.3%	16.3%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	1.25	0.52		0.09	0.57			0.12			0.34		
Control Delay	192.1	18.0		19.7	19.4			38.3			37.5		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	192.1	18.0		19.7	19.4			38.3			37.5		
Queue Length 50th (ft)	~63	83		1	92			5			17		
Queue Length 95th (ft)	#230	#600		19	#668			29			68		
Internal Link Dist (ft)		559			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	115	1243		129	1204			256			211		
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	1.25	0.52		0.09	0.57			0.07			0.28		

Intersection Summary

Area Type: CBD
Cycle Length: 104
Actuated Cycle Length: 89.3
Natural Cycle: 100
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.98			0.91			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1503	1789		1673	1729			1447			1459	
Flt Permitted	0.28	1.00		0.30	1.00			0.98			0.98	
Satd. Flow (perm)	437	1789		531	1729			1447			1459	
Volume (vph)	130	575	10	10	585	70	5	0	10	20	0	30
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84
Adj. Flow (vph)	144	639	11	11	616	74	6	0	11	24	0	36
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	144	650	0	11	687	0	0	17	0	0	60	0
Confl. Peds. (#/hr)	3		1	1		3	1					1
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	57.4	57.4		57.4	57.4			2.6			5.9	
Effective Green, g (s)	60.4	60.4		60.4	60.4			5.6			8.9	
Actuated g/C Ratio	0.62	0.62		0.62	0.62			0.06			0.09	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	271	1111		330	1073			83			133	
v/s Ratio Prot		0.36			c0.40			c0.01			c0.04	
v/s Ratio Perm	0.33			0.02								
v/c Ratio	0.53	0.58		0.03	0.64			0.20			0.45	
Uniform Delay, d1	10.4	11.0		7.1	11.6			43.7			41.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	7.3	2.3		0.2	2.9			0.4			0.9	
Delay (s)	17.7	13.2		7.3	14.6			44.2			42.8	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		14.1			14.4			44.2			42.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.4
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	60	520	10	75	405
Peak Hour Factor	0.82	0.82	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	6	73	584	11	86	466
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1228	590			596	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1238	590			596	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	96	85			91	
cM capacity (veh/h)	161	488			966	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	79	596	552
Volume Left	6	0	86
Volume Right	73	11	0
cSH	422	1700	966
Volume to Capacity	0.19	0.35	0.09
Queue Length 95th (ft)	17	0	7
Control Delay (s)	15.5	0.0	2.4
Lane LOS	C		A
Approach Delay (s)	15.5	0.0	2.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	5	595	25	5	295
Peak Hour Factor	0.60	0.60	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	8	8	700	29	5	314
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.87	0.80			0.80	
vC, conflicting volume	1039	715			729	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	785	641			660	
tC, single (s)	6.6	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.3	
p0 queue free %	97	98			99	
cM capacity (veh/h)	295	357			724	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	729	319
Volume Left	8	0	5
Volume Right	8	29	0
cSH	323	1700	724
Volume to Capacity	0.05	0.43	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	16.8	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	16.8	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	65	190	0	555	300	0
Peak Hour Factor	0.97	0.97	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	67	196	0	653	319	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.86	0.86	0.86			
vC, conflicting volume	972	319	319			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	728	210	210			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	79	72	100			
cM capacity (veh/h)	324	694	1148			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	67	196	653	319
Volume Left	67	0	0	0
Volume Right	0	196	0	0
cSH	324	694	1700	1700
Volume to Capacity	0.21	0.28	0.38	0.19
Queue Length 95th (ft)	19	29	0	0
Control Delay (s)	19.0	12.2	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	13.9		0.0	0.0
Approach LOS	B			

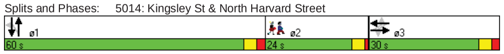
Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	75	0	35	10	5	5	20	475	0	0	435	55	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	123	0	0	33	0	0	589	0	0	516	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.67			0.16			0.58			0.45		
Control Delay		51.4			31.6			18.5			14.9		
Queue Delay		0.2			0.0			0.1			0.4		
Total Delay		51.6			31.6			18.6			15.3		
Queue Length 50th (ft)		66			15			273			208		
Queue Length 95th (ft)		126			25			429			362		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		279			330			1014			1157		
Starvation Cap Reductn		0			0			0			252		
Spillback Cap Reductn		13			14			49			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.46			0.10			0.61			0.57		

Intersection Summary

Area Type: CBD
Cycle Length: 114
Actuated Cycle Length: 101.1
Natural Cycle: 75
Control Type: Semi Act-Uncoord

Splits and Phases: 5014: Kingsley St & North Harvard Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.97			1.00			0.98	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1407			1587			1566			1735	
Flt Permitted		0.79			0.85			0.97			1.00	
Satd. Flow (perm)		1149			1388			1523			1735	
Volume (vph)	75	0	35	10	5	5	20	475	0	0	435	55
Peak-hour factor, PHF	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95
Adj. Flow (vph)	84	0	39	17	8	8	24	565	0	0	458	58
RTOR Reduction (vph)	0	17	0	0	7	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	106	0	0	26	0	0	589	0	0	516	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		12.4			12.4			65.7			65.7	
Effective Green, g (s)		13.4			13.4			66.7			66.7	
Actuated g/C Ratio		0.13			0.13			0.64			0.64	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		149			180			981			1118	
v/s Ratio Prot											0.30	
v/s Ratio Perm		c0.09			0.02			c0.39				
v/c Ratio		0.71			0.14			0.60			0.46	
Uniform Delay, d1		43.2			40.0			10.7			9.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		12.7			0.1			2.7			1.4	
Delay (s)		55.9			40.1			13.4			10.7	
Level of Service		E			D			B			B	
Approach Delay (s)		55.9			40.1			13.4			10.7	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	103.5	Sum of lost time (s)	23.4
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	20	0	0	0	0	490	10	5	475	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.91	0.91	0.99
Hourly flow rate (vph)	6	0	23	0	0	0	0	570	12	5	522	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.86	0.86	0.86	0.86	0.86		0.86					
vC, conflicting volume	1109	1114	522	1132	1109	576	522			581		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1126	1133	446	1153	1126	576	446			581		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	96	100	96	100	100	100	100			99		
cM capacity (veh/h)	158	175	532	143	176	517	930			954		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	581	527
Volume Left	6	0	5
Volume Right	23	12	0
cSH	361	1700	954
Volume to Capacity	0.08	0.34	0.01
Queue Length 95th (ft)	7	0	0
Control Delay (s)	15.9	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	15.9	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	35	0	545	450	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	38	0	592	489	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				211		
pX, platoon unblocked	0.72					
vC, conflicting volume	1092	500	511			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1129	500	511			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	100			
cM capacity (veh/h)	161	571	1054			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	38	592	511
Volume Left	0	0	0
Volume Right	38	0	22
cSH	571	1700	1700
Volume to Capacity	0.07	0.35	0.30
Queue Length 95th (ft)	5	0	0
Control Delay (s)	11.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		100	
Storage Lanes	1		0	1		1	1		0	0		1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		406			272			186			211		
Travel Time (s)		9.2			6.2			4.2			4.8		
Volume (vph)	150	410	20	95	550	60	245	335	55	35	280	170	
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	161	463	0	110	710	0	272	433	0	0	362	195	
Turn Type	Perm			Perm			pm+pt			Perm		Perm	
Protected Phases		1			1		3	3 4			4		2
Permitted Phases	1			1			3 4			4		4	
Detector Phases	1	1		1	1		3	3 4		4	4	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		4.0			8.0	8.0	8.0	2.0
Minimum Split (s)	13.0	13.0		13.0	13.0		8.0			12.0	12.0	12.0	33.0
Total Split (s)	55.0	55.0	0.0	55.0	55.0	0.0	12.0	51.0	0.0	39.0	39.0	39.0	33.0
Total Split (%)	39.6%	39.6%	0.0%	39.6%	39.6%	0.0%	8.6%	36.7%	0.0%	28.1%	28.1%	28.1%	24%
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)	2.0	2.0		2.0	2.0		1.0			1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead			Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes	Yes
Recall Mode	Max	Max		Max	Max		Max			Max	Max	Max	None
v/c Ratio	3.10	0.69		0.70	1.09		1.43	0.74			1.11	0.51	
Control Delay	1008.7	40.2		61.4	98.6		249.7	45.0			124.7	27.0	
Queue Delay	0.0	4.9		14.8	0.0		0.0	2.6			24.6	0.0	
Total Delay	1008.7	45.1		76.2	98.6		249.7	47.6			149.3	27.0	
Queue Length 50th (ft)	~221	368		88	~789		~274	355			~406	79	
Queue Length 95th (ft)	#371	512		#188	#964		#462	#530			#577	154	
Internal Link Dist (ft)		326			192			106			131		
Turn Bay Length (ft)												100	
Base Capacity (vph)	52	667		157	652		190	588			327	386	
Starvation Cap Reductn	0	0		0	0		0	72			0	0	
Spillback Cap Reductn	0	141		32	0		0	0			17	0	
Storage Cap Reductn	0	0		0	0		0	0			0	0	
Reduced v/c Ratio	3.10	0.88		0.88	1.09		1.43	0.84			1.17	0.51	

Intersection Summary

Area Type: CBD
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 140
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99			1.00	0.88
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1538	1614		1515	1574		1549	1539			1506	1142
Flt Permitted	0.08	1.00		0.29	1.00		0.25	1.00			0.89	1.00
Satd. Flow (perm)	125	1614		455	1574		412	1539			1349	1142
Volume (vph)	150	410	20	95	550	60	245	335	55	35	280	170
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	161	441	22	110	640	70	272	372	61	40	322	195
RTOR Reduction (vph)	0	1	0	0	2	0	0	4	0	0	0	67
Lane Group Flow (vph)	161	462	0	110	708	0	272	429	0	0	362	128
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%
Turn Type	Perm			Perm			pm+pt			Perm		Perm
Protected Phases		1			1		3	3 4			4	
Permitted Phases	1			1			3 4			4		4
Actuated Green, G (s)	50.9	50.9		50.9	50.9		43.7	47.7			35.6	35.6
Effective Green, g (s)	51.9	51.9		51.9	51.9		43.7	47.7			35.6	35.6
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.34	0.37			0.28	0.28
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0				4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0				2.0	2.0
Lane Grp Cap (vph)	51	658		186	642		214	577			377	319
v/s Ratio Prot		0.29			0.45		c0.08	0.28				
v/s Ratio Perm	c1.29			0.24			c0.36				0.27	0.11
v/c Ratio	3.16	0.70		0.59	1.10		1.27	0.74			0.96	0.40
Uniform Delay, d1	37.7	31.3		29.4	37.7		40.9	34.5			45.2	37.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	1019.8	6.2		13.1	66.8		153.3	8.4			37.3	3.7
Delay (s)	1057.5	37.4		42.5	104.5		194.3	42.9			82.5	40.9
Level of Service	F	D		D	F		F	D			F	D
Approach Delay (s)		300.6			96.2			101.3			67.9	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	138.9	HCM Level of Service	F
HCM Volume to Capacity ratio	2.30		
Actuated Cycle Length (s)	127.3	Sum of lost time (s)	31.7
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		

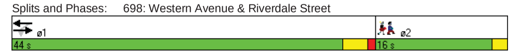
c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			271	330		
Travel Time (s)	19.3			6.2	7.5		
Volume (vph)	835	10	20	880	0	0	
Confl. Peds. (#/hr)		19	19				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.88	0.88	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	880	0	0	1023	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.49			0.58			
Control Delay	1.9			2.7			
Queue Delay	0.0			0.0			
Total Delay	2.0			2.7			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	226			308			
Internal Link Dist (ft)	767			191	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1797			1758			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	12			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.49			0.58			

Intersection Summary

Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 120
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1860			1861		
Flt Permitted	1.00			0.97		
Satd. Flow (perm)	1860			1812		
Volume (vph)	835	10	20	880	0	0
Peak-hour factor, PHF	0.96	0.96	0.88	0.88	0.25	0.25
Adj. Flow (vph)	870	10	23	1000	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	880	0	0	1023	0	0
Confl. Peds. (#/hr)		19	19			
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1725			1681		
v/s Ratio Prot	0.47					
v/s Ratio Perm				c0.56		
v/c Ratio	0.51			0.61		
Uniform Delay, d1	0.6			0.7		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.1			1.6		
Delay (s)	1.7			2.4		
Level of Service	A			A		
Approach Delay (s)	1.7			2.4	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	2.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

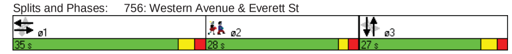
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	20	635	175	135	655	80	105	185	125	55	180	60	
Confl. Peds. (#/hr)	8		11	11		8	9					9	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	728	194	155	845	0	0	446	0	0	328	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	0.0	27.0	27.0	0.0	27.0	27.0	0.0	28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	31%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		1.90	0.25	1.22	0.90			1.45			1.00		
Control Delay		429.3	11.7	176.3	33.6			248.0			86.5		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		429.3	11.7	176.3	33.6			248.0			86.5		
Queue Length 50th (ft)		~625	18	~101	317			~349			~188		
Queue Length 95th (ft)		#965	m100	#217	#869			#532			#359		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		384	773	127	934			308			327		
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		1.90	0.25	1.22	0.90			1.45			1.00		

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			1.00			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.98			0.96			0.97	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1587	1311	1573	1574			1797			1689	
Flt Permitted		0.82	1.00	0.21	1.00			0.66			0.75	
Satd. Flow (perm)		1300	1311	348	1574			1207			1279	
Volume (vph)	20	635	175	135	655	80	105	185	125	55	180	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	22	706	194	155	753	92	113	199	134	61	200	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	728	194	155	845	0	0	446	0	0	328	0
Confl. Peds. (#/hr)	8		11	11		8	9					9
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		49.2	49.2	49.2	49.2			22.0			22.0	
Effective Green, g (s)		50.2	50.2	50.2	50.2			23.0			23.0	
Actuated g/C Ratio		0.56	0.56	0.56	0.56			0.26			0.26	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		725	731	194	878			308			327	
v/s Ratio Prot					0.54							
v/s Ratio Perm		c0.56	0.15	0.45				c0.37			0.26	
v/c Ratio		1.00	0.27	0.80	0.96			1.45			1.00	
Uniform Delay, d1		19.9	10.3	15.9	19.0			33.5			33.5	
Progression Factor		0.77	0.91	1.00	1.00			1.00			1.00	
Incremental Delay, d2		29.5	0.6	28.1	22.5			219.0			50.5	
Delay (s)		44.8	10.0	44.0	41.5			252.5			84.0	
Level of Service		D	B	D	D			F			F	
Approach Delay (s)		37.5			41.9			252.5			84.0	
Approach LOS		D			D			F			F	

Intersection Summary			
HCM Average Control Delay	80.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	130.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			322			408	
Travel Time (s)		7.8			3.5			7.3			9.3	
Volume (vph)	20	700	150	150	680	10	105	15	75	10	0	5
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	946	0	163	750	0	0	130	82	0	16	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	67.0	67.0	0.0	67.0	67.0	0.0	23.0	23.0	23.0	23.0	23.0	0.0
Total Split (%)	74.4%	74.4%	0.0%	74.4%	74.4%	0.0%	25.6%	25.6%	25.6%	25.6%	25.6%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.79		0.46	0.60			0.68	0.28		0.07	
Control Delay		14.4		4.9	4.3			53.0	9.9		24.6	
Queue Delay		18.9		0.0	0.6			0.7	0.0		0.0	
Total Delay		33.3		4.9	4.9			53.6	9.9		24.6	
Queue Length 50th (ft)		265		17	85			70	0		5	
Queue Length 95th (ft)		#636		m1	m34			124	36		22	
Internal Link Dist (ft)		265			73			242			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1195		352	1242			254	356		294	
Starvation Cap Reductn		265		0	188			0	0		0	
Spillback Cap Reductn		0		0	66			21	0		25	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		1.02		0.46	0.71			0.56	0.23		0.06	

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.96	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)		1613		1516	1649			1553	1378		1583	
Flt Permitted		0.98		0.31	1.00			0.74	1.00		0.82	
Satd. Flow (perm)		1579		491	1649			1201	1378		1337	
Volume (vph)	20	700	150	150	680	10	105	15	75	10	0	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	761	163	163	739	11	114	16	82	11	0	5
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	69	0	4	0
Lane Group Flow (vph)	0	939	0	163	750	0	0	130	13	0	12	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		66.7		66.7	66.7			13.3	13.3		13.3	
Effective Green, g (s)		67.7		67.7	67.7			14.3	14.3		14.3	
Actuated g/C Ratio		0.75		0.75	0.75			0.16	0.16		0.16	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1188		369	1240			191	219		212	
v/s Ratio Prot					0.45							
v/s Ratio Perm		c0.59		0.33				c0.11	0.01		0.01	
v/c Ratio		0.79		0.44	0.60			0.68	0.06		0.06	
Uniform Delay, d1		6.8		4.1	5.1			35.7	32.1		32.1	
Progression Factor		1.00		0.58	0.59			1.00	1.00		1.00	
Incremental Delay, d2		5.4		1.2	0.7			7.7	0.0		0.0	
Delay (s)		12.2		3.6	3.7			43.4	32.2		32.2	
Level of Service		B		A	A			D	C		C	
Approach Delay (s)		12.2			3.7			39.1			32.2	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	112.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	40	560	235	15	870	80	0	0	0	20	20	30
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.92	0.38	0.92	0.38	0.92	0.92	0.92
Hourly flow rate (vph)	43	609	255	18	1024	87	0	0	0	22	22	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		271			406							
pX, platoon unblocked	0.47			0.91			0.52	0.52	0.91	0.52	0.52	0.47
vC, conflicting volume	1110			864			1969	1969	736	1926	2053	1067
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1235			851			2620	2620	710	2536	2784	1142
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	84			98			0	100	100	0	0	72
cM capacity (veh/h)	265			713			0	10	398	8	8	115

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	908	1128	76
Volume Left	43	18	22
Volume Right	255	87	33
cSH	265	713	13
Volume to Capacity	0.16	0.02	5.71
Queue Length 95th (ft)	14	2	Err
Control Delay (s)	7.7	0.9	Err
Lane LOS	A	A	F
Approach Delay (s)	7.7	0.9	Err
Approach LOS			F

Intersection Summary			
Average Delay	364.0		
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	495	5	25	670	35	15
Peak Hour Factor	0.92	0.92	0.90	0.90	0.82	0.82
Hourly flow rate (vph)	538	5	28	744	43	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.77		0.77	0.77
vC, conflicting volume			543		1341	541
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			407		1443	403
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		60	96
cM capacity (veh/h)			882		107	495

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	543	772	61
Volume Left	0	28	43
Volume Right	5	0	18
cSH	1700	882	140
Volume to Capacity	0.32	0.03	0.43
Queue Length 95th (ft)	0	2	48
Control Delay (s)	0.0	0.8	49.0
Lane LOS		A	E
Approach Delay (s)	0.0	0.8	49.0
Approach LOS			E

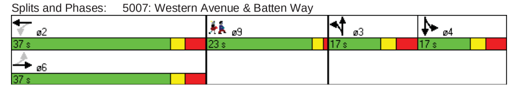
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			392			262			150		
Travel Time (s)		14.5			8.9			6.0			3.4		
Volume (vph)	55	570	5	10	550	30	5	0	10	50	0	50	
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	65	685	0	11	617	0	0	18	0	0	134	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	37.0	37.0	0.0	37.0	37.0	0.0	17.0	17.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	39.4%	39.4%	0.0%	39.4%	39.4%	0.0%	18.1%	18.1%	0.0%	18.1%	18.1%	0.0%	24%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	0.55	0.62		0.08	0.56			0.11			0.55		
Control Delay	46.7	21.7		20.2	20.1			36.2			39.1		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	46.7	21.7		20.2	20.1			36.2			39.1		
Queue Length 50th (ft)	10	107		1	91			5			36		
Queue Length 95th (ft)	#108	#573		18	#555			28			110		
Internal Link Dist (ft)		559			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	118	1112		134	1103			217			269		
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	0.55	0.62		0.08	0.56			0.08			0.50		

Intersection Summary

Area Type: CBD
Cycle Length: 94
Actuated Cycle Length: 75.7
Natural Cycle: 90
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.91			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1556	1861		1768	1846			1397			1519	
Flt Permitted	0.28	1.00		0.23	1.00			0.98			0.98	
Satd. Flow (perm)	453	1861		423	1846			1397			1519	
Volume (vph)	55	570	5	10	550	30	5	0	10	50	0	50
Peak-hour factor, PHF	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	65	679	6	11	585	32	6	0	12	67	0	67
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	65	685	0	11	616	0	0	18	0	0	134	0
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	41.3	41.3		41.3	41.3			2.4			8.1	
Effective Green, g (s)	44.3	44.3		44.3	44.3			5.4			11.1	
Actuated g/C Ratio	0.54	0.54		0.54	0.54			0.07			0.13	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	244	1001		227	992			92			205	
v/s Ratio Prot		c0.37			0.33			c0.01			c0.09	
v/s Ratio Perm	0.14			0.03								
v/c Ratio	0.27	0.68		0.05	0.62			0.20			0.65	
Uniform Delay, d1	10.3	13.9		9.0	13.2			36.4			33.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.7	3.8		0.4	2.9			0.4			5.6	
Delay (s)	12.9	17.7		9.4	16.1			36.8			39.4	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		17.3			16.0			36.8			39.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	82.4	Sum of lost time (s)	21.6
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	115	550	5	25	455
Peak Hour Factor	0.88	0.88	0.96	0.96	0.89	0.89
Hourly flow rate (vph)	6	131	573	5	28	511
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1143	576			578	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1149	576			578	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	75			97	
cM capacity (veh/h)	202	513			986	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	136	578	539
Volume Left	6	0	28
Volume Right	131	5	0
cSH	483	1700	986
Volume to Capacity	0.28	0.34	0.03
Queue Length 95th (ft)	29	0	2
Control Delay (s)	15.4	0.0	0.8
Lane LOS	C		A
Approach Delay (s)	15.4	0.0	0.8
Approach LOS	C		

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	15	620	15	5	390
Peak Hour Factor	0.75	0.75	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	13	20	681	16	6	453
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.86	0.78			0.78	
vC, conflicting volume	1155	690			698	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	801	603			614	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	95			99	
cM capacity (veh/h)	304	393			745	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	33	698	459
Volume Left	13	0	6
Volume Right	20	16	0
cSH	352	1700	745
Volume to Capacity	0.09	0.41	0.01
Queue Length 95th (ft)	8	0	1
Control Delay (s)	16.3	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.3	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	25	235	0	610	400	0
Peak Hour Factor	0.87	0.87	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	29	270	0	670	465	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.87	0.76	0.76			
vC, conflicting volume	1135	465	465			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	779	296	296			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	52	100			
cM capacity (veh/h)	317	565	948			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	29	270	670	465
Volume Left	29	0	0	0
Volume Right	0	270	0	0
cSH	317	565	1700	1700
Volume to Capacity	0.09	0.48	0.39	0.27
Queue Length 95th (ft)	7	64	0	0
Control Delay (s)	17.5	17.1	0.0	0.0
Lane LOS	C	C		
Approach Delay (s)	17.1		0.0	0.0
Approach LOS	C			

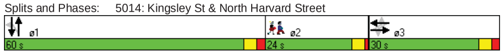
Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	55	0	25	20	5	5	15	550	0	0	590	45	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	94	0	0	38	0	0	649	0	0	714	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.58			0.21			0.68			0.57		
Control Delay		46.2			36.3			20.9			15.9		
Queue Delay		0.1			0.0			0.2			0.8		
Total Delay		46.3			36.4			21.1			16.7		
Queue Length 50th (ft)		46			19			319			307		
Queue Length 95th (ft)		92			42			#587			506		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		281			317			950			1253		
Starvation Cap Reductn		0			0			0			259		
Spillback Cap Reductn		12			13			37			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.35			0.13			0.71			0.72		

Intersection Summary

Area Type: CBD
Cycle Length: 114
Actuated Cycle Length: 99.8
Natural Cycle: 80
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5014: Kingsley St & North Harvard Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			1.00			0.99	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1422			1608			1642			1845	
Flt Permitted		0.82			0.79			0.98			1.00	
Satd. Flow (perm)		1201			1320			1607			1845	
Volume (vph)	55	0	25	20	5	5	15	550	0	0	590	45
Peak-hour factor, PHF	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	65	0	29	26	6	6	17	632	0	0	663	51
RTOR Reduction (vph)	0	16	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	78	0	0	33	0	0	649	0	0	714	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		10.4			10.4			66.1			66.1	
Effective Green, g (s)		11.4			11.4			67.1			67.1	
Actuated g/C Ratio		0.11			0.11			0.66			0.66	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		134			147			1056			1213	
v/s Ratio Prot											0.39	
v/s Ratio Perm		c0.06			0.02			c0.40				
v/c Ratio		0.58			0.22			0.61			0.59	
Uniform Delay, d1		43.1			41.3			10.1			9.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.1			0.3			2.7			2.1	
Delay (s)		47.2			41.6			12.7			11.9	
Level of Service		D			D			B			B	
Approach Delay (s)		47.2			41.6			12.7			11.9	
Approach LOS		D			D			B			B	

Intersection Summary

HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	102.1	Sum of lost time (s)	23.6
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	10	0	0	0	0	565	10	5	630	0
Peak Hour Factor	0.55	0.55	0.55	0.25	0.25	0.25	0.94	0.94	0.94	0.89	0.89	0.89
Hourly flow rate (vph)	0	0	18	0	0	0	0	601	11	6	708	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.78	0.78	0.78	0.78	0.78		0.78					
vC, conflicting volume	1325	1331	708	1344	1325	606	708			612		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1420	1427	623	1443	1420	606	623			612		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	100	100			99		
cM capacity (veh/h)	89	105	380	82	106	500	735			958		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	612	713
Volume Left	0	0	6
Volume Right	18	11	0
cSH	380	1700	958
Volume to Capacity	0.05	0.36	0.01
Queue Length 95th (ft)	4	0	0
Control Delay (s)	15.0	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	15.0	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	50	0	560	380	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	54	0	609	413	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				211		
pX, platoon unblocked	0.76					
vC, conflicting volume	1022	413	413			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1029	413	413			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	91	100			
cM capacity (veh/h)	196	639	1146			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	54	609	413
Volume Left	0	0	0
Volume Right	54	0	0
cSH	639	1700	1700
Volume to Capacity	0.09	0.36	0.24
Queue Length 95th (ft)	7	0	0
Control Delay (s)	11.2	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.2	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	10	10	10	550	370	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	11	11	598	402	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				659		
pX, platoon unblocked	0.83					
vC, conflicting volume	1024	405	408			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1030	405	408			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	98	99			
cM capacity (veh/h)	212	646	1151			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	609	408
Volume Left	11	11	0
Volume Right	11	0	5
cSH	319	1151	1700
Volume to Capacity	0.07	0.01	0.24
Queue Length 95th (ft)	5	1	0
Control Delay (s)	17.1	0.3	0.0
Lane LOS	C	A	
Approach Delay (s)	17.1	0.3	0.0
Approach LOS	C		

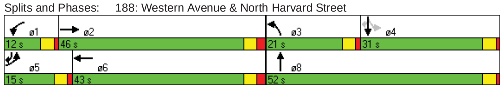
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		100
Storage Lanes	1		0	1		1	1		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		406			272			186			211	
Travel Time (s)		9.2			6.2			4.2			4.8	
Volume (vph)	150	415	20	70	415	75	190	335	75	50	220	160
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	169	488	0	75	527	0	226	488	0	0	291	172
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases										4		4
Detector Phases	5	2		1	6		3	8		4	4	5
Minimum Initial (s)	4.0	8.0		4.0	8.0		4.0	8.0		8.0	8.0	4.0
Minimum Split (s)	8.0	31.0		8.0	31.0		8.0	31.0		31.0	31.0	8.0
Total Split (s)	15.0	46.0	0.0	12.0	43.0	0.0	21.0	52.0	0.0	31.0	31.0	15.0
Total Split (%)	13.6%	41.8%	0.0%	10.9%	39.1%	0.0%	19.1%	47.3%	0.0%	28.2%	28.2%	13.6%
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	2.0		1.0	2.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Recall Mode	None	None		Min	Min		None	None		Min	Min	None
v/c Ratio	1.11	0.80		0.74	0.97		0.96	0.76			0.97	0.43
Control Delay	151.4	41.6		88.2	68.3		96.5	34.5			86.9	29.2
Queue Delay	0.0	2.3		2.2	0.0		0.0	2.4			0.0	0.0
Total Delay	151.4	43.9		90.3	68.3		96.5	36.9			86.9	29.2
Queue Length 50th (ft)	~137	303		53	358		160	277			204	86
Queue Length 95th (ft)	#270	#465		#127	#585		#281	372			#379	145
Internal Link Dist (ft)		326			192			106			131	
Turn Bay Length (ft)												100
Base Capacity (vph)	152	610		108	543		235	643			301	397
Starvation Cap Reductn	0	0		0	0		0	69			0	0
Spillback Cap Reductn	0	47		5	0		0	0			0	0
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	1.11	0.87		0.73	0.97		0.96	0.85			0.97	0.43

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 109.7
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street



10463.00: Barry's Corner Mixed Use (Allston, MA)
188: Western Avenue & North Harvard Street

2017 Build Mitigation Conditions
Weekday Morning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.97			1.00	0.91
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			0.98	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1518	1584		1481	1514		1518	1454			1442	1148
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.84	1.00
Satd. Flow (perm)	1518	1584		1481	1514		1518	1454			1222	1148
Volume (vph)	150	415	20	70	415	75	190	335	75	50	220	160
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.93	0.93	0.93
Adj. Flow (vph)	169	466	22	75	446	81	226	399	89	54	237	172
RTOR Reduction (vph)	0	1	0	0	6	0	0	7	0	0	0	0
Lane Group Flow (vph)	169	487	0	75	521	0	226	481	0	0	291	172
Confl. Peds. (#/hr)	9		13	13		9	49		76	76		49
Heavy Vehicles (%)	7%	7%	7%	6%	6%	6%	7%	7%	7%	8%	8%	8%
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases										4		4
Actuated Green, G (s)	11.0	41.2		7.6	37.8		17.0	48.0			27.0	38.0
Effective Green, g (s)	11.0	42.2		7.6	38.8		17.0	48.0			27.0	38.0
Actuated g/C Ratio	0.10	0.38		0.07	0.35		0.15	0.44			0.25	0.35
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0	2.0
Lane Grp Cap (vph)	152	609		103	535		235	636			300	439
v/s Ratio Prot	c0.11	c0.31		0.05	c0.34		c0.15	0.33				0.04
v/s Ratio Perm											c0.24	0.11
v/c Ratio	1.11	0.80		0.73	0.97		0.96	0.76			0.97	0.39
Uniform Delay, d1	49.4	30.0		50.1	35.0		46.1	26.0			41.0	27.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	106.1	6.8		19.4	32.0		47.5	4.5			43.5	0.2
Delay (s)	155.5	36.8		69.5	67.0		93.6	30.5			84.5	27.4
Level of Service	F	D		E	E		F	C			F	C
Approach Delay (s)		67.4			67.3			50.5			63.3	
Approach LOS		E			E			D			E	

Intersection Summary

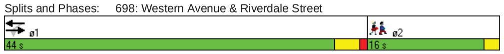
HCM Average Control Delay	61.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	109.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			271	330		
Travel Time (s)	19.3			6.2	7.5		
Volume (vph)	805	5	5	730	0	0	
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.97	0.97	0.97	0.97	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	835	0	0	758	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.48			0.43			
Control Delay	1.9			1.7			
Queue Delay	0.0			0.0			
Total Delay	1.9			1.7			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	214			177			
Internal Link Dist (ft)	767			191	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1732			1744			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.48			0.43			

Intersection Summary
Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 120
Natural Cycle: 55
Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1793			1811		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1793			1804		
Volume (vph)	805	5	5	730	0	0
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.25	0.25
Adj. Flow (vph)	830	5	5	753	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	835	0	0	758	0	0
Confl. Peds. (#/hr)		8	8			
Heavy Vehicles (%)	8%	8%	7%	7%	2%	2%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1663			1673		
v/s Ratio Prot	c0.47					
v/s Ratio Perm				0.42		
v/c Ratio	0.50			0.45		
Uniform Delay, d1	0.6			0.5		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.1			0.9		
Delay (s)	1.7			1.4		
Level of Service	A			A		
Approach Delay (s)	1.7			1.4	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	1.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	35	675	140	135	515	35	80	190	110	60	175	45	
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	780	154	141	572	0	0	494	0	0	368	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0	0.0	24.0	24.0	0.0	24.0	24.0	0.0	28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	35%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		2.51	0.21	0.92	0.65			1.56			1.36		
Control Delay		703.8	12.5	77.2	20.4			294.6			211.8		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		703.8	12.5	77.2	20.4			294.6			211.8		
Queue Length 50th (ft)		~653	14	46	140			~355			~245		
Queue Length 95th (ft)		#965	m86	#217	#552			#434			#323		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		311	726	154	886			316			271		
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		2.51	0.21	0.92	0.65			1.56			1.36		

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			0.99			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.99			0.96			0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1526	1262	1514	1527			1791			1667	
Flt Permitted		0.96	1.00	0.16	1.00			0.70			0.64	
Satd. Flow (perm)		1465	1262	260	1527			1262			1085	
Volume (vph)	35	675	140	135	515	35	80	190	110	60	175	45
Peak-hour factor, PHF	0.91	0.91	0.91	0.96	0.96	0.96	0.77	0.77	0.77	0.76	0.76	0.76
Adj. Flow (vph)	38	742	154	141	536	36	104	247	143	79	230	59
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	780	154	141	572	0	0	494	0	0	368	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	8%	8%	8%	7%	7%	7%	2%	2%	2%	2%	2%	2%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		42.2	42.2	42.2	42.2			19.0			19.0	
Effective Green, g (s)		43.2	43.2	43.2	43.2			20.0			20.0	
Actuated g/C Ratio		0.54	0.54	0.54	0.54			0.25			0.25	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		791	681	140	825			316			271	
v/s Ratio Prot					0.37							
v/s Ratio Perm		0.53	0.12	c0.54				c0.39			0.34	
v/c Ratio		0.99	0.23	1.01	0.69			1.56			1.36	
Uniform Delay, d1		18.1	9.6	18.4	13.5			30.0			30.0	
Progression Factor		0.84	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		24.8	0.6	78.0	4.8			268.4			183.2	
Delay (s)		40.0	10.2	96.4	18.3			298.4			213.2	
Level of Service		D	B	F	B			F			F	
Approach Delay (s)		35.1			33.7			298.4			213.2	
Approach LOS		D			C			F			F	

Intersection Summary			
HCM Average Control Delay	112.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			257			408	
Travel Time (s)		7.8			3.5			5.8			9.3	
Volume (vph)	15	735	85	95	560	5	60	10	60	15	0	10
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	907	0	99	588	0	0	89	76	0	27	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0	0.0	59.0	59.0	0.0	21.0	21.0	21.0	21.0	21.0	0.0
Total Split (%)	73.8%	73.8%	0.0%	73.8%	73.8%	0.0%	26.3%	26.3%	26.3%	26.3%	26.3%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.73		0.26	0.46			0.51	0.29		0.14	
Control Delay		11.0		2.3	2.7			41.3	10.5		21.6	
Queue Delay		4.2		0.0	0.0			0.2	0.0		0.0	
Total Delay		15.3		2.3	2.7			41.5	10.5		21.6	
Queue Length 50th (ft)		190		8	50			42	0		7	
Queue Length 95th (ft)		#541		m1	m14			70	25		27	
Internal Link Dist (ft)		265			73			177			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1244		380	1291			260	350		293	
Starvation Cap Reductn		257		0	0			0	0		0	
Spillback Cap Reductn		0		0	58			18	0		20	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.92		0.26	0.48			0.37	0.22		0.10	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 74 (93%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street

ø1	ø3
59 s	21 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	1.00			1.00	0.85		0.94	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)		1573		1477	1618			1562	1367		1524	
Flt Permitted		0.99		0.33	1.00			0.74	1.00		0.81	
Satd. Flow (perm)		1557		512	1618			1203	1367		1268	
Volume (vph)	15	735	85	95	560	5	60	10	60	15	0	10
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.79	0.79	0.79	0.94	0.94	0.94
Adj. Flow (vph)	16	799	92	99	583	5	76	13	76	16	0	11
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	67	0	10	0
Lane Group Flow (vph)	0	903	0	99	588	0	0	89	10	0	17	0
Confl. Peds. (#/hr)	14		11	11		14	7		3	3		7
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		61.0		61.0	61.0			9.0	9.0		9.0	
Effective Green, g (s)		62.0		62.0	62.0			10.0	10.0		10.0	
Actuated g/C Ratio		0.78		0.78	0.78			0.12	0.12		0.12	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1207		397	1254			150	171		159	
v/s Ratio Prot					0.36							
v/s Ratio Perm		c0.58		0.19				c0.07	0.01		0.01	
v/c Ratio		0.75		0.25	0.47			0.59	0.06		0.11	
Uniform Delay, d1		4.8		2.5	3.2			33.1	30.8		31.0	
Progression Factor		1.00		0.33	0.49			1.00	1.00		1.00	
Incremental Delay, d2		4.3		0.8	0.7			4.1	0.0		0.1	
Delay (s)		9.1		1.7	2.2			37.2	30.9		31.2	
Level of Service		A		A	A			D	C		C	
Approach Delay (s)		9.1			2.2			34.3			31.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	585	215	15	735	15	0	0	0	0	0	0
Peak Hour Factor	0.92	0.96	0.96	0.95	0.95	0.92	0.25	0.92	0.25	0.92	0.92	0.92
Hourly flow rate (vph)	5	609	224	16	774	16	0	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		271			406							
pX, platoon unblocked	0.70			0.92			0.74	0.74	0.92	0.74	0.74	0.70
vC, conflicting volume	790			833			1546	1554	721	1546	1658	782
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	701			819			1572	1583	697	1572	1723	690
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	100	100	100	100
cM capacity (veh/h)	630			725			66	78	409	65	64	313

Direction, Lane #	EB 1	WB 1
Volume Total	839	806
Volume Left	5	16
Volume Right	224	16
cSH	630	725
Volume to Capacity	0.01	0.02
Queue Length 95th (ft)	1	2
Control Delay (s)	0.3	0.6
Lane LOS	A	A
Approach Delay (s)	0.3	0.6
Approach LOS		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	510	30	40	545	15	25
Peak Hour Factor	0.89	0.89	0.97	0.97	0.83	0.83
Hourly flow rate (vph)	573	34	41	562	18	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			607		1234	590
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			466		1318	443
tC, single (s)			4.1		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			95		85	93
cM capacity (veh/h)			795		119	446

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	607	603	48
Volume Left	0	41	18
Volume Right	34	0	30
cSH	1700	795	219
Volume to Capacity	0.36	0.05	0.22
Queue Length 95th (ft)	0	4	20
Control Delay (s)	0.0	1.4	26.0
Lane LOS		A	D
Approach Delay (s)	0.0	1.4	26.0
Approach LOS			D

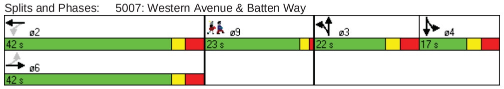
Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			392			262			150		
Travel Time (s)		14.5			8.9			6.0			3.4		
Volume (vph)	130	575	10	10	580	70	5	0	10	20	0	30	
Confl. Peds. (#/hr)	3		1	1		3	1					1	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	144	650	0	11	685	0	0	17	0	0	60	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	22.0	22.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	40.4%	40.4%	0.0%	40.4%	40.4%	0.0%	21.2%	21.2%	0.0%	16.3%	16.3%	0.0%	22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	1.25	0.52		0.09	0.57			0.12			0.34		
Control Delay	192.1	18.0		19.7	19.3			38.3			37.5		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	192.1	18.0		19.7	19.3			38.3			37.5		
Queue Length 50th (ft)	~63	83		1	91			5			17		
Queue Length 95th (ft)	#230	#600		19	#660			29			68		
Internal Link Dist (ft)		559			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	115	1243		129	1204			256			211		
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	1.25	0.52		0.09	0.57			0.07			0.28		

Intersection Summary

Area Type: CBD
Cycle Length: 104
Actuated Cycle Length: 89.3
Natural Cycle: 100
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.98			0.91			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1503	1789		1673	1729			1447			1459	
Flt Permitted	0.28	1.00		0.30	1.00			0.98			0.98	
Satd. Flow (perm)	442	1789		531	1729			1447			1459	
Volume (vph)	130	575	10	10	580	70	5	0	10	20	0	30
Peak-hour factor, PHF	0.90	0.90	0.90	0.95	0.95	0.95	0.87	0.87	0.87	0.84	0.84	0.84
Adj. Flow (vph)	144	639	11	11	611	74	6	0	11	24	0	36
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	144	650	0	11	682	0	0	17	0	0	60	0
Confl. Peds. (#/hr)	3		1	1		3	1					1
Heavy Vehicles (%)	8%	8%	8%	10%	10%	10%	6%	6%	6%	4%	4%	4%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	57.4	57.4		57.4	57.4			2.6			5.9	
Effective Green, g (s)	60.4	60.4		60.4	60.4			5.6			8.9	
Actuated g/C Ratio	0.62	0.62		0.62	0.62			0.06			0.09	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	274	1111		330	1073			83			133	
v/s Ratio Prot		0.36			c0.39			c0.01			c0.04	
v/s Ratio Perm	0.33			0.02								
v/c Ratio	0.53	0.58		0.03	0.64			0.20			0.45	
Uniform Delay, d1	10.4	11.0		7.1	11.6			43.7			41.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	7.0	2.3		0.2	2.9			0.4			0.9	
Delay (s)	17.4	13.2		7.3	14.4			44.2			42.8	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		14.0			14.3			44.2			42.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	22.4
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

5011: Gordon Rd & North Harvard Street
Weekday Morning

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	60	520	10	75	405
Peak Hour Factor	0.82	0.82	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	6	73	584	11	86	466
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1228	590			596	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1238	590			596	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	96	85			91	
cM capacity (veh/h)	161	488			966	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	79	596	552
Volume Left	6	0	86
Volume Right	73	11	0
cSH	422	1700	966
Volume to Capacity	0.19	0.35	0.09
Queue Length 95th (ft)	17	0	7
Control Delay (s)	15.5	0.0	2.4
Lane LOS	C		A
Approach Delay (s)	15.5	0.0	2.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

10463.00: Barry's Corner Mixed Use (Allston, MA)
2017 Build Mitigation Conditions
5012: Bertram St & North Harvard Street
Weekday Morning

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	5	595	25	5	305
Peak Hour Factor	0.60	0.60	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	8	8	700	29	5	324
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.87	0.80			0.80	
vC, conflicting volume	1050	715			729	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	788	641			660	
tC, single (s)	6.6	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.3	
p0 queue free %	97	98			99	
cM capacity (veh/h)	295	357			724	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	729	330
Volume Left	8	0	5
Volume Right	8	29	0
cSH	323	1700	724
Volume to Capacity	0.05	0.43	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	16.8	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	16.8	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

\\vhb\proj\Wat-TS\10463.00\tech\Samuels Barrys Corner\synchro\04_2017_BMIT_AM_ACF.sy7
HCM Unsignalized Intersection Capacity Analysis
VHB
11/1/2012
VHB, Inc.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	65	180	0	555	310	0
Peak Hour Factor	0.97	0.97	0.85	0.85	0.94	0.94
Hourly flow rate (vph)	67	186	0	653	330	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.87	0.85	0.85			
vC, conflicting volume	983	330	330			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	725	214	214			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	80	73	100			
cM capacity (veh/h)	327	683	1131			

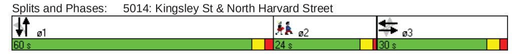
Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	67	186	653	330
Volume Left	67	0	0	0
Volume Right	0	186	0	0
cSH	327	683	1700	1700
Volume to Capacity	0.20	0.27	0.38	0.19
Queue Length 95th (ft)	19	27	0	0
Control Delay (s)	18.8	12.2	0.0	0.0
Lane LOS	C	B		
Approach Delay (s)	14.0		0.0	0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	75	0	35	10	5	5	20	475	0	0	435	55	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	123	0	0	33	0	0	589	0	0	516	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.67			0.16			0.58			0.45		
Control Delay		51.4			31.6			18.5			14.9		
Queue Delay		0.1			0.0			0.0			0.4		
Total Delay		51.5			31.6			18.5			15.3		
Queue Length 50th (ft)		66			15			273			208		
Queue Length 95th (ft)		126			25			429			362		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		279			330			1014			1157		
Starvation Cap Reductn		0			0			0			252		
Spillback Cap Reductn		5			6			11			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.45			0.10			0.59			0.57		

Intersection Summary	
Area Type:	CBD
Cycle Length: 114	
Actuated Cycle Length: 101.1	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	

Splits and Phases: 5014: Kingsley St & North Harvard Street



10463.00: Barry's Corner Mixed Use (Allston, MA)
5014: Kingsley St & North Harvard Street

2017 Build Mitigation Conditions
Weekday Morning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.97			1.00			0.98	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1407			1587			1566			1735	
Flt Permitted		0.79			0.85			0.97			1.00	
Satd. Flow (perm)		1149			1388			1523			1735	
Volume (vph)	75	0	35	10	5	5	20	475	0	0	435	55
Peak-hour factor, PHF	0.89	0.89	0.89	0.59	0.59	0.59	0.84	0.84	0.84	0.95	0.95	0.95
Adj. Flow (vph)	84	0	39	17	8	8	24	565	0	0	458	58
RTOR Reduction (vph)	0	17	0	0	7	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	106	0	0	26	0	0	589	0	0	516	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	9%	9%	10%	10%	10%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		12.4			12.4			65.7			65.7	
Effective Green, g (s)		13.4			13.4			66.7			66.7	
Actuated g/C Ratio		0.13			0.13			0.64			0.64	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		149			180			981			1118	
v/s Ratio Prot											0.30	
v/s Ratio Perm		c0.09			0.02			c0.39				
v/c Ratio		0.71			0.14			0.60			0.46	
Uniform Delay, d1		43.2			40.0			10.7			9.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		12.7			0.1			2.7			1.4	
Delay (s)		55.9			40.1			13.4			10.7	
Level of Service		E			D			B			B	
Approach Delay (s)		55.9			40.1			13.4			10.7	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	103.5	Sum of lost time (s)	23.4
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

10463.00: Barry's Corner Mixed Use (Allston, MA)
5015: Bayard Street & North Harvard Street

2017 Build Mitigation Conditions
Weekday Morning

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	20	0	0	0	0	490	10	5	475	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.91	0.91	0.99
Hourly flow rate (vph)	6	0	23	0	0	0	0	570	12	5	522	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.86	0.86	0.86	0.86	0.86		0.86					
vC, conflicting volume	1109	1114	522	1132	1109	576	522			581		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1126	1133	446	1153	1126	576	446			581		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	96	100	96	100	100	100	100			99		
cM capacity (veh/h)	158	175	532	143	176	517	930			954		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	581	527
Volume Left	6	0	5
Volume Right	23	12	0
cSH	361	1700	954
Volume to Capacity	0.08	0.34	0.01
Queue Length 95th (ft)	7	0	0
Control Delay (s)	15.9	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	15.9	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

1: North Travis Street site drive & North Harvard Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	80	0	565	465	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	87	0	614	505	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				211		
pX, platoon unblocked	0.77					
vC, conflicting volume	1125	511	516			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1162	511	516			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	85	100			
cM capacity (veh/h)	167	563	1049			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	87	614	516
Volume Left	0	0	0
Volume Right	87	0	11
cSH	563	1700	1700
Volume to Capacity	0.15	0.36	0.30
Queue Length 95th (ft)	14	0	0
Control Delay (s)	12.6	0.0	0.0
Lane LOS	B		
Approach Delay (s)	12.6	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

10463.00: Barry's Corner Mixed Use (Allston, MA)
2017 Build Mitigation Conditions
Weekday Evening

4: Northern Connection & North Harvard Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	10	15	30	535	460	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	16	33	582	500	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				659		
pX, platoon unblocked	0.81					
vC, conflicting volume	1152	505	511			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1189	505	511			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	97	97			
cM capacity (veh/h)	162	567	1054			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	27	614	511
Volume Left	11	33	0
Volume Right	16	0	11
cSH	284	1054	1700
Volume to Capacity	0.10	0.03	0.30
Queue Length 95th (ft)	8	2	0
Control Delay (s)	19.0	0.8	0.0
Lane LOS	C	A	
Approach Delay (s)	19.0	0.8	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

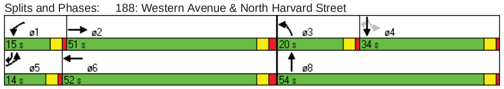
\\vhb\proj\Wat-TS\10463.00\tech\Samuels Barrys Corner\synchro\04_2017_BMIT_PM_ACF.sy7
VHB
VHB, Inc.
HCM Unsignalized Intersection Capacity Analysis
11/1/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	11	11	16	12	11	11	10	10	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		100
Storage Lanes	1		0	1		1	1		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		406			272			186			211	
Travel Time (s)		9.2			6.2			4.2			4.8	
Volume (vph)	140	395	20	100	535	70	225	355	55	50	295	200
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	151	447	0	116	703	0	250	455	0	0	396	230
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases										4		4
Detector Phases	5	2		1	6		3	8		4	4	5
Minimum Initial (s)	4.0	8.0		4.0	8.0		4.0	4.0		8.0	8.0	4.0
Minimum Split (s)	8.0	31.0		8.0	31.0		8.0	31.0		31.0	31.0	8.0
Total Split (s)	14.0	51.0	0.0	15.0	52.0	0.0	20.0	54.0	0.0	34.0	34.0	14.0
Total Split (%)	11.7%	42.5%	0.0%	12.5%	43.3%	0.0%	16.7%	45.0%	0.0%	28.3%	28.3%	11.7%
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	2.0		1.0	2.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Recall Mode	None	Min		None	Min		Min	Min		Min	Min	None
v/c Ratio	1.17	0.70		0.84	1.12		1.20	0.71			1.20	0.60
Control Delay	180.1	37.6		97.8	106.4		172.1	35.7			155.2	38.3
Queue Delay	0.0	3.0		103.8	0.0		0.0	3.2			17.8	0.0
Total Delay	180.1	40.6		201.7	106.4		172.1	38.9			173.0	38.3
Queue Length 50th (ft)	~140	286		90	~624		~235	282			~373	136
Queue Length 95th (ft)	#277	411		#182	#799		#401	411			#540	206
Internal Link Dist (ft)		326			192			106			131	
Turn Bay Length (ft)												100
Base Capacity (vph)	129	636		140	630		208	643			330	384
Starvation Cap Reductn	0	0		0	0		0	106			0	0
Spillback Cap Reductn	0	104		44	0		0	0			11	0
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	1.17	0.84		1.21	1.12		1.20	0.85			1.24	0.60

Intersection Summary

Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 188: Western Avenue & North Harvard Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	16	12	11	11	10	10	10
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.98			1.00	0.89
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			0.99	1.00
Frt	1.00	0.99		1.00	0.98		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1547	1613		1525	1564		1562	1533			1498	1152
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.87	1.00
Satd. Flow (perm)	1547	1613		1525	1564		1562	1533			1318	1152
Volume (vph)	140	395	20	100	535	70	225	355	55	50	295	200
Peak-hour factor, PHF	0.93	0.93	0.93	0.86	0.86	0.86	0.90	0.90	0.90	0.87	0.87	0.87
Adj. Flow (vph)	151	425	22	116	622	81	250	394	61	57	339	230
RTOR Reduction (vph)	0	2	0	0	4	0	0	5	0	0	0	0
Lane Group Flow (vph)	151	445	0	116	699	0	250	450	0	0	396	230
Confl. Peds. (#/hr)	22		13	13		22	55		43	43		55
Heavy Vehicles (%)	5%	5%	5%	3%	3%	3%	4%	4%	4%	5%	5%	5%
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases										4		4
Actuated Green, G (s)	10.0	46.2		10.8	47.0		16.0	50.0			30.0	40.0
Effective Green, g (s)	10.0	47.2		10.8	48.0		16.0	50.0			30.0	40.0
Actuated g/C Ratio	0.08	0.39		0.09	0.40		0.13	0.42			0.25	0.33
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0	2.0		3.0	2.0		2.0	2.0			2.0	3.0
Lane Grp Cap (vph)	129	634		137	626		208	639			330	422
v/s Ratio Prot	c0.10	0.28		0.08	c0.45		c0.16	0.29				0.05
v/s Ratio Perm											c0.30	0.15
v/c Ratio	1.17	0.70		0.85	1.12		1.20	0.70			1.20	0.55
Uniform Delay, d1	55.0	30.5		53.8	36.0		52.0	28.9			45.0	32.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	132.3	2.9		35.6	72.3		127.6	2.9			115.5	1.4
Delay (s)	187.3	33.4		89.4	108.3		179.6	31.8			160.5	34.0
Level of Service	F	C		F	F		F	C			F	C
Approach Delay (s)		72.3			105.6			84.2			114.0	
Approach LOS		E			F			F			F	

Intersection Summary

HCM Average Control Delay	94.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	16	10	10	
Grade (%)	0%			0%	0%		
Storage Length (ft)		0	0		0	0	
Storage Lanes		0	0		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50		50	50			
Trailing Detector (ft)	0		0	0			
Turning Speed (mph)		9	15		15	9	
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	847			271	330		
Travel Time (s)	19.3			6.2	7.5		
Volume (vph)	830	10	20	875	0	0	
Confl. Peds. (#/hr)		19	19				
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.88	0.88	0.25	0.25	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%			0%	0%		
Lane Group Flow (vph)	875	0	0	1017	0	0	
Turn Type			Perm				
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phases	1		1	1			
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			16.0
Total Split (s)	44.0	0.0	44.0	44.0	0.0	0.0	16.0
Total Split (%)	73.3%	0.0%	73.3%	73.3%	0.0%	0.0%	27%
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			0.0
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Recall Mode	Max		Max	Max			None
v/c Ratio	0.49			0.58			
Control Delay	1.9			2.7			
Queue Delay	0.0			0.0			
Total Delay	1.9			2.7			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	224			304			
Internal Link Dist (ft)	767			191	250		
Turn Bay Length (ft)							
Base Capacity (vph)	1797			1758			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.49			0.58			

Intersection Summary

Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 120
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 698: Western Avenue & Riverdale Street

ø1 44 s | ø2 16 s

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	16	10	10
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			1.00		
Frpb, ped/bikes	1.00			1.00		
Flpb, ped/bikes	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1860			1861		
Flt Permitted	1.00			0.97		
Satd. Flow (perm)	1860			1812		
Volume (vph)	830	10	20	875	0	0
Peak-hour factor, PHF	0.96	0.96	0.88	0.88	0.25	0.25
Adj. Flow (vph)	865	10	23	994	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	875	0	0	1017	0	0
Confl. Peds. (#/hr)		19	19			
Heavy Vehicles (%)	4%	4%	4%	4%	0%	0%
Turn Type			Perm			
Protected Phases	1			1		
Permitted Phases			1			
Actuated Green, G (s)	112.8			112.8		
Effective Green, g (s)	112.8			112.8		
Actuated g/C Ratio	0.93			0.93		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	2.0			2.0		
Lane Grp Cap (vph)	1725			1681		
v/s Ratio Prot	0.47					
v/s Ratio Perm				c0.56		
v/c Ratio	0.51			0.60		
Uniform Delay, d1	0.6			0.7		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.1			1.6		
Delay (s)	1.7			2.4		
Level of Service	A			A		
Approach Delay (s)	1.7			2.4	0.0	
Approach LOS	A			A	A	

Intersection Summary

HCM Average Control Delay	2.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	121.6	Sum of lost time (s)	8.8
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	12	11	11	16	16	16	13	13	13	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		100	120		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50	50	50	50		50	50		50	50		
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		408			847			377			569		
Travel Time (s)		9.3			19.3			8.6			12.9		
Volume (vph)	20	635	175	135	655	80	105	185	125	55	180	60	
Confl. Peds. (#/hr)	8		11	11		8	9					9	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	728	194	155	845	0	0	446	0	0	328	0	
Turn Type	Perm		Perm	Perm			Perm			Perm			
Protected Phases		1			1			3			3		2
Permitted Phases	1		1	1			3			3			
Detector Phases	1	1	1	1	1		3	3		3	3		
Minimum Initial (s)	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0		4.0
Minimum Split (s)	17.0	17.0	17.0	17.0	17.0		17.0	17.0		17.0	17.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	0.0	27.0	27.0	0.0	27.0	27.0	0.0	28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	31%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		2.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead								Lag
Lead-Lag Optimize?													
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
v/c Ratio		1.90	0.25	1.22	0.90			1.45			1.00		
Control Delay		429.3	11.7	176.3	33.6			248.0			86.5		
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0		
Total Delay		429.3	11.7	176.3	33.6			248.0			86.5		
Queue Length 50th (ft)		~625	18	~101	317			~349			~188		
Queue Length 95th (ft)		#965	m100	#217	#869			#532			#359		
Internal Link Dist (ft)		328			767			297			489		
Turn Bay Length (ft)			100	120									
Base Capacity (vph)		384	773	127	934			308			327		
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		1.90	0.25	1.22	0.90			1.45			1.00		

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 756: Western Avenue & Everett St

ø1	ø2	ø3
35 s	28 s	27 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	11	11	16	16	16	13	13	13
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			1.00			0.99	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.98			0.96			0.97	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1587	1311	1573	1574			1797			1689	
Flt Permitted		0.82	1.00	0.21	1.00			0.66			0.75	
Satd. Flow (perm)		1300	1311	348	1574			1207			1279	
Volume (vph)	20	635	175	135	655	80	105	185	125	55	180	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	22	706	194	155	753	92	113	199	134	61	200	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	728	194	155	845	0	0	446	0	0	328	0
Confl. Peds. (#/hr)	8		11	11		8	9					9
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	2%	2%	2%	0%	0%	0%
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1		1	1			3			3		
Actuated Green, G (s)		49.2	49.2	49.2	49.2			22.0			22.0	
Effective Green, g (s)		50.2	50.2	50.2	50.2			23.0			23.0	
Actuated g/C Ratio		0.56	0.56	0.56	0.56			0.26			0.26	
Clearance Time (s)		5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		725	731	194	878			308			327	
v/s Ratio Prot					0.54							
v/s Ratio Perm		c0.56	0.15	0.45				c0.37			0.26	
v/c Ratio		1.00	0.27	0.80	0.96			1.45			1.00	
Uniform Delay, d1		19.9	10.3	15.9	19.0			33.5			33.5	
Progression Factor		0.77	0.91	1.00	1.00			1.00			1.00	
Incremental Delay, d2		29.5	0.6	28.1	22.5			219.0			50.5	
Delay (s)		44.8	10.0	44.0	41.5			252.5			84.0	
Level of Service		D	B	D	D			F			F	
Approach Delay (s)		37.5			41.9			252.5			84.0	
Approach LOS		D			D			F			F	

Intersection Summary			
HCM Average Control Delay	80.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	130.9%	ICU Level of Service	H
Analysis Period (min)	15		

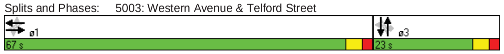
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	10	11	11	11	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	125		0	0		100	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		345			153			322			408	
Travel Time (s)		7.8			3.5			7.3			9.3	
Volume (vph)	20	700	150	150	680	10	105	15	75	10	0	5
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Lane Group Flow (vph)	0	946	0	163	750	0	0	130	82	0	16	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Detector Phases	1	1		1	1		3	3	3	3	3	
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	23.0	23.0		23.0	23.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	67.0	67.0	0.0	67.0	67.0	0.0	23.0	23.0	23.0	23.0	23.0	0.0
Total Split (%)	74.4%	74.4%	0.0%	74.4%	74.4%	0.0%	25.6%	25.6%	25.6%	25.6%	25.6%	0.0%
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)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
v/c Ratio		0.79		0.46	0.60			0.68	0.28		0.07	
Control Delay		14.4		4.9	4.3			53.0	9.9		24.6	
Queue Delay		18.9		0.0	0.6			0.7	0.0		0.0	
Total Delay		33.3		4.9	4.9			53.6	9.9		24.6	
Queue Length 50th (ft)		265		17	85			70	0		5	
Queue Length 95th (ft)		#636		m1	m34			124	36		22	
Internal Link Dist (ft)		265			73			242			328	
Turn Bay Length (ft)				125					100			
Base Capacity (vph)		1195		352	1242			254	356		294	
Starvation Cap Reductn		265		0	188			0	0		0	
Spillback Cap Reductn		0		0	66			21	0		25	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		1.02		0.46	0.71			0.56	0.23		0.06	

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5003: Western Avenue & Telford Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	10	11	11	11	11	11	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.96	
Flt Protected		1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)		1613		1516	1649			1553	1378		1583	
Flt Permitted		0.98		0.31	1.00			0.74	1.00		0.82	
Satd. Flow (perm)		1579		491	1649			1201	1378		1337	
Volume (vph)	20	700	150	150	680	10	105	15	75	10	0	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	761	163	163	739	11	114	16	82	11	0	5
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	69	0	4	0
Lane Group Flow (vph)	0	939	0	163	750	0	0	130	13	0	12	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3		3	3		
Actuated Green, G (s)		66.7		66.7	66.7			13.3	13.3		13.3	
Effective Green, g (s)		67.7		67.7	67.7			14.3	14.3		14.3	
Actuated g/C Ratio		0.75		0.75	0.75			0.16	0.16		0.16	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		1188		369	1240			191	219		212	
v/s Ratio Prot					0.45							
v/s Ratio Perm		c0.59		0.33				c0.11	0.01		0.01	
v/c Ratio		0.79		0.44	0.60			0.68	0.06		0.06	
Uniform Delay, d1		6.8		4.1	5.1			35.7	32.1		32.1	
Progression Factor		1.00		0.58	0.59			1.00	1.00		1.00	
Incremental Delay, d2		5.4		1.2	0.7			7.7	0.0		0.0	
Delay (s)		12.2		3.6	3.7			43.4	32.2		32.2	
Level of Service		B		A	A			D	C		C	
Approach Delay (s)		12.2			3.7			39.1			32.2	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	112.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	40	555	235	15	895	50	0	0	0	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.92	0.38	0.92	0.38	0.92	0.92	0.92
Hourly flow rate (vph)	43	603	255	18	1053	54	0	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		271			406							
pX, platoon unblocked	0.62			0.91			0.66	0.66	0.91	0.66	0.66	0.62
vC, conflicting volume	1107			859			1933	1961	731	1933	2061	1080
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1174			845			2209	2250	705	2209	2402	1130
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			98			100	100	100	100	100	100
cM capacity (veh/h)	368			718			19	24	401	19	19	153

Direction, Lane #	EB 1	WB 1
Volume Total	902	1125
Volume Left	43	18
Volume Right	255	54
cSH	368	718
Volume to Capacity	0.12	0.02
Queue Length 95th (ft)	10	2
Control Delay (s)	4.4	0.9
Lane LOS	A	A
Approach Delay (s)	4.4	0.9
Approach LOS		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	495	5	25	670	35	15
Peak Hour Factor	0.92	0.92	0.90	0.90	0.82	0.82
Hourly flow rate (vph)	538	5	28	744	43	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	272					
pX, platoon unblocked			0.78		0.78	0.78
vC, conflicting volume			543		1341	541
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			412		1439	408
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		61	96
cM capacity (veh/h)			886		109	496

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	543	772	61
Volume Left	0	28	43
Volume Right	5	0	18
cSH	1700	886	142
Volume to Capacity	0.32	0.03	0.43
Queue Length 95th (ft)	0	2	47
Control Delay (s)	0.0	0.8	48.0
Lane LOS		A	E
Approach Delay (s)	0.0	0.8	48.0
Approach LOS			E

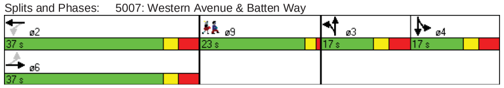
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø9
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	16	16	16	16	12	16	12	16	12	12	12	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	120		0	120		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50		50	50		
Trailing Detector (ft)	0	0		0	0		0	0		0	0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			392			262			150		
Travel Time (s)		14.5			8.9			6.0			3.4		
Volume (vph)	55	570	5	10	550	30	5	0	10	50	0	50	
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2	
Confl. Bikes (#/hr)													
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	65	685	0	11	617	0	0	18	0	0	134	0	
Turn Type	Perm			Perm			Split			Split			
Protected Phases		6			2		3	3		4	4		9
Permitted Phases	6			2									
Detector Phases	6	6		2	2		3	3		4	4		
Minimum Initial (s)	10.0	10.0		10.0	10.0		6.0	6.0		6.0	6.0		1.0
Minimum Split (s)	17.0	17.0		17.0	17.0		13.0	13.0		13.0	13.0		23.0
Total Split (s)	37.0	37.0	0.0	37.0	37.0	0.0	17.0	17.0	0.0	17.0	17.0	0.0	23.0
Total Split (%)	39.4%	39.4%	0.0%	39.4%	39.4%	0.0%	18.1%	18.1%	0.0%	18.1%	18.1%	0.0%	24%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		1.0
Lead/Lag							Lead	Lead		Lag	Lag		
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		
Recall Mode	Max	Max		Max	Max		None	None		None	None		None
v/c Ratio	0.55	0.62		0.08	0.56			0.11			0.55		
Control Delay	46.7	21.7		20.2	20.1			36.2			39.1		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	46.7	21.7		20.2	20.1			36.2			39.1		
Queue Length 50th (ft)	10	107		1	91			5			36		
Queue Length 95th (ft)	#108	#573		18	#555			28			110		
Internal Link Dist (ft)		559			312			182			70		
Turn Bay Length (ft)	120			120									
Base Capacity (vph)	118	1112		134	1103			217			269		
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	0.55	0.62		0.08	0.56			0.08			0.50		

Intersection Summary

Area Type: CBD
Cycle Length: 94
Actuated Cycle Length: 75.7
Natural Cycle: 90
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5007: Western Avenue & Batten Way



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	16	16	16	16	12	16	12	16	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.91			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1556	1861		1768	1846			1397			1519	
Flt Permitted	0.28	1.00		0.23	1.00			0.98			0.98	
Satd. Flow (perm)	453	1861		423	1846			1397			1519	
Volume (vph)	55	570	5	10	550	30	5	0	10	50	0	50
Peak-hour factor, PHF	0.84	0.84	0.84	0.94	0.94	0.94	0.83	0.83	0.83	0.75	0.75	0.75
Adj. Flow (vph)	65	679	6	11	585	32	6	0	12	67	0	67
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	65	685	0	11	616	0	0	18	0	0	134	0
Confl. Peds. (#/hr)	12		4	4		12	2		2	2		2
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	1%	1%	1%
Turn Type	Perm			Perm			Split			Split		
Protected Phases		6			2		3	3		4	4	
Permitted Phases	6			2								
Actuated Green, G (s)	41.3	41.3		41.3	41.3			2.4			8.1	
Effective Green, g (s)	44.3	44.3		44.3	44.3			5.4			11.1	
Actuated g/C Ratio	0.54	0.54		0.54	0.54			0.07			0.13	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	244	1001		227	992			92			205	
v/s Ratio Prot		c0.37			0.33			c0.01			c0.09	
v/s Ratio Perm	0.14			0.03								
v/c Ratio	0.27	0.68		0.05	0.62			0.20			0.65	
Uniform Delay, d1	10.3	13.9		9.0	13.2			36.4			33.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.7	3.8		0.4	2.9			0.4			5.6	
Delay (s)	12.9	17.7		9.4	16.1			36.8			39.4	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		17.3			16.0			36.8			39.4	
Approach LOS		B			B			D			D	

Intersection Summary

HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	82.4	Sum of lost time (s)	21.6
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	115	550	5	25	455
Peak Hour Factor	0.88	0.88	0.96	0.96	0.89	0.89
Hourly flow rate (vph)	6	131	573	5	28	511
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						829
pX, platoon unblocked	0.96					
vC, conflicting volume	1143	576			578	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1148	576			578	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	75			97	
cM capacity (veh/h)	204	513			986	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	136	578	539
Volume Left	6	0	28
Volume Right	131	5	0
cSH	483	1700	986
Volume to Capacity	0.28	0.34	0.03
Queue Length 95th (ft)	29	0	2
Control Delay (s)	15.4	0.0	0.8
Lane LOS	C		A
Approach Delay (s)	15.4	0.0	0.8
Approach LOS	C		

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	15	620	15	5	410
Peak Hour Factor	0.75	0.75	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	13	20	681	16	6	477
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			300			186
pX, platoon unblocked	0.88	0.78			0.78	
vC, conflicting volume	1178	690			698	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	831	603			614	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	95			99	
cM capacity (veh/h)	297	393			745	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	33	698	483
Volume Left	13	0	6
Volume Right	20	16	0
cSH	348	1700	745
Volume to Capacity	0.10	0.41	0.01
Queue Length 95th (ft)	8	0	1
Control Delay (s)	16.4	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.4	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	25	215	0	610	420	0
Peak Hour Factor	0.87	0.87	0.91	0.91	0.86	0.86
Hourly flow rate (vph)	29	247	0	670	488	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				250	236	
pX, platoon unblocked	0.88	0.77	0.77			
vC, conflicting volume	1159	488	488			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	808	337	337			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	55	100			
cM capacity (veh/h)	308	544	930			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	29	247	670	488
Volume Left	29	0	0	0
Volume Right	0	247	0	0
cSH	308	544	1700	1700
Volume to Capacity	0.09	0.45	0.39	0.29
Queue Length 95th (ft)	8	59	0	0
Control Delay (s)	17.9	17.0	0.0	0.0
Lane LOS	C	C		
Approach Delay (s)	17.1		0.0	0.0
Approach LOS	C			

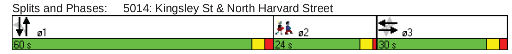
Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	10	10	10	13	13	13	12	12	12	16	16	16	
Grade (%)		0%			0%			0%			0%		
Storage Length (ft)	0		0	0		0	0		0	0		0	
Storage Lanes	0		0	0		0	0		0	0		0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Leading Detector (ft)	50	50		50	50		50	50			50		
Trailing Detector (ft)	0	0		0	0		0	0			0		
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Right Turn on Red			Yes			Yes			Yes			No	
Link Speed (mph)		25			25			30			30		
Link Distance (ft)		373			316			377			250		
Travel Time (s)		10.2			8.6			8.6			5.7		
Volume (vph)	55	0	25	20	5	5	15	550	0	0	590	45	
Confl. Peds. (#/hr)													
Confl. Bikes (#/hr)													
Peak Hour Factor	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)													
Mid-Block Traffic (%)		0%			0%			0%			0%		
Lane Group Flow (vph)	0	94	0	0	38	0	0	649	0	0	714	0	
Turn Type	Perm			Perm			Perm						
Protected Phases		3			3			1			1		2
Permitted Phases	3			3			1						
Detector Phases	3	3		3	3		1	1			1		
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0			8.0		1.0
Minimum Split (s)	13.0	13.0		13.0	13.0		13.0	13.0			13.0		24.0
Total Split (s)	30.0	30.0	0.0	30.0	30.0	0.0	60.0	60.0	0.0	0.0	60.0	0.0	24.0
Total Split (%)	26.3%	26.3%	0.0%	26.3%	26.3%	0.0%	52.6%	52.6%	0.0%	0.0%	52.6%	0.0%	21%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0			2.0		1.0
Lead/Lag							Lead	Lead			Lead		Lag
Lead-Lag Optimize?							Yes	Yes			Yes		Yes
Recall Mode	None	None		None	None		Max	Max			Max		None
v/c Ratio		0.58			0.21			0.68			0.57		
Control Delay		46.2			36.3			20.9			15.9		
Queue Delay		0.0			0.0			0.1			0.8		
Total Delay		46.2			36.3			20.9			16.7		
Queue Length 50th (ft)		46			19			319			307		
Queue Length 95th (ft)		92			42			#587			506		
Internal Link Dist (ft)		293			236			297			170		
Turn Bay Length (ft)													
Base Capacity (vph)		281			317			950			1253		
Starvation Cap Reductn		0			0			0			259		
Spillback Cap Reductn		6			6			11			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.34			0.12			0.69			0.72		

Intersection Summary

Area Type: CBD
Cycle Length: 114
Actuated Cycle Length: 99.8
Natural Cycle: 80
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5014: Kingsley St & North Harvard Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	13	13	13	12	12	12	16	16	16
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			1.00			0.99	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1422			1608			1642			1845	
Flt Permitted		0.82			0.79			0.98			1.00	
Satd. Flow (perm)		1201			1320			1607			1845	
Volume (vph)	55	0	25	20	5	5	15	550	0	0	590	45
Peak-hour factor, PHF	0.85	0.85	0.85	0.78	0.78	0.78	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	65	0	29	26	6	6	17	632	0	0	663	51
RTOR Reduction (vph)	0	16	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	78	0	0	33	0	0	649	0	0	714	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm			Perm			Perm					
Protected Phases		3			3			1			1	
Permitted Phases	3			3			1					
Actuated Green, G (s)		10.4			10.4			66.1			66.1	
Effective Green, g (s)		11.4			11.4			67.1			67.1	
Actuated g/C Ratio		0.11			0.11			0.66			0.66	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		2.0			2.0			2.0			2.0	
Lane Grp Cap (vph)		134			147			1056			1213	
v/s Ratio Prot											0.39	
v/s Ratio Perm		c0.06			0.02			c0.40				
v/c Ratio		0.58			0.22			0.61			0.59	
Uniform Delay, d1		43.1			41.3			10.1			9.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.1			0.3			2.7			2.1	
Delay (s)		47.2			41.6			12.7			11.9	
Level of Service		D			D			B			B	
Approach Delay (s)		47.2			41.6			12.7			11.9	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	102.1	Sum of lost time (s)	23.6
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	10	0	0	0	0	565	10	5	630	0
Peak Hour Factor	0.55	0.55	0.55	0.25	0.25	0.25	0.94	0.94	0.94	0.89	0.89	0.89
Hourly flow rate (vph)	0	0	18	0	0	0	0	601	11	6	708	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											377	
pX, platoon unblocked	0.78	0.78	0.78	0.78	0.78		0.78					
vC, conflicting volume	1325	1331	708	1344	1325	606	708			612		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1420	1427	623	1443	1420	606	623			612		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	100	100			99		
cM capacity (veh/h)	89	105	380	82	106	500	735			958		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	612	713
Volume Left	0	0	6
Volume Right	18	11	0
cSH	380	1700	958
Volume to Capacity	0.05	0.36	0.01
Queue Length 95th (ft)	4	0	0
Control Delay (s)	15.0	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	15.0	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

Wind

Tel: 519.823.1311
Fax: 519.823.1316

Rowan Williams Davies & Irwin Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada
N1K 1B8

Residential Commons at Barry's Corner

Allston, MA

Final Report

Pedestrian Wind Conditions Consultation

RWDI # 1300436
December 13, 2012

SUBMITTED TO
Steven G. Dube, AIA LEED AP
Elkus Manfredi Architects
300 A Street
Boston, MA 02210
617-368-3355
sdube@elkus-manfredi.com

cc: eambs@elkus-manfredi.com
cschlessinger@epsilonassociates.com
gstarsiak@epsilonassociates.com

SUBMITTED BY
Daniel Wrobel, M.A.Sc.
Technical Coordinator
daniel.wrobel@rwdi.com

Derek Kelly, M.Eng., P.Eng.
Project Manager/Principal
derek.kelly@rwdi.com

Hanqing Wu, Ph.D., P.Eng.
Project Director/Principal
hanqing.wu@rwdi.com

1. INTRODUCTION

A pedestrian wind study was conducted on the proposed Residential Commons at Barry's Corner development located in Allston, MA. The objective of the study was to assess the effect of the proposed development on local conditions in pedestrian areas around the study site and provide recommendations for minimizing adverse effects, if necessary.

The study involved wind simulations on a 1:400 scale model of the proposed building and surroundings. These simulations were then conducted in RWDI's boundary-layer wind tunnel at Guelph, Ontario, for the purpose of quantifying local wind speed conditions and comparing to appropriate criteria for gauging wind comfort in pedestrian areas. A list of the drawings used for the construction of the model can be found in Appendix A. The criteria recommended by the Boston Redevelopment Authority (BRA) were used in this study. The present report describes the methods and presents the results of the wind tunnel simulations.

2. OVERVIEW

Major buildings, especially those that protrude above their surroundings, often cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings intercept these faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around corners of buildings may also cause increases in wind speed. Conversely, if a building is surrounded by others of equivalent height, it may be protected from the prevailing upper-level winds, resulting in no significant changes to the local pedestrian-level wind environment. The most effective way to assess potential pedestrian-level wind impacts around a proposed new building is to conduct scale model tests in a wind tunnel.

The consideration of wind in planning outdoor activity areas is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, the wind comfort criteria can be relaxed even further. The actual effects of wind can range from pedestrian inconvenience, due to the blowing of dust and other loose material in a moderate breeze, to severe difficulty with walking due to the wind forces on the pedestrian.

3. METHODOLOGY

Information concerning the site and surroundings was derived from site photographs and site plans. The following configurations were simulated:

No Build Configuration: all existing and surrounding buildings; and

Full Build Configuration: the proposed Residential Commons at Barry's Corner (Smith Field Connector), the future Science Center and all existing surroundings.

As shown in Figures 1a through 1c, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1500 ft radius of the study site. The mean speed profile and turbulence of the natural wind approaching the modelled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with 60 specially designed wind speed sensors that were connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full-scale height of 5 feet above grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 wind directions, in 10 degree increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long-term meteorological data, recorded during the years 1981 to 2011 at Boston's Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 2a, 2b and 2c present wind roses summarizing the annual and seasonal wind climates in the Boston area, based on the data from Logan Airport. The left hand wind rose in Figure 2a, for example, summarizes the spring (March, April, and May) wind data. Throughout the year, the most common wind directions vary. In the fall, winter, and spring, the most frequent winds are from the west-northwest. During the summer, the prevailing winds are from the southwest. In the case of strong winds, the fall, winter, and spring, are the same. The strong winds during the summer however, are from the southwest and west-northwest.

On an annual basis (Figure 2c) the most frequent and strongest winds are from the west-northwest dominant direction.

This study involved state-of-the-art measurement and analysis techniques to predict wind conditions at the study site. Nevertheless, some uncertainty remains in predicting wind comfort, and this must be kept in mind. For example, the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change a particular response of an individual. The comfort limits used in this report represent an average for the total population. Also, unforeseen changes in the project area, such as the construction or removal of buildings, can affect the conditions experienced at the site. Finally, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (one percent of the time). Higher wind speeds will occur but on a less frequent basis.

4. PEDESTRIAN WIND COMFORT CRITERIA

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BRA to determine the acceptability of specific locations is based on the work of Melbourne[1]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the 1-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed). They are as follows:

BRA Mean Wind Criteria*

Dangerous	> 27 mph
Uncomfortable for Walking	> 19 and ≤ 27 mph
Comfortable for Walking	> 15 and ≤ 19 mph
Comfortable for Standing	> 12 and ≤ 15 mph
Comfortable for Sitting	< 12 mph

* Applicable to the hourly mean wind speed exceeded one percent of the time.

The wind climate found in a typical downtown location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BRA effective gust velocity criterion of 31 mph. However, without any mitigation measures, this wind climate is likely to be frequently uncomfortable for more passive activities such as sitting.

5. TEST RESULTS

Table 1 presents the mean and effective gust wind speeds for each season as well as annually. Figures 3a, 3b, 4a, and 4b, graphically depict the wind comfort and safety conditions at each wind measurement location based on the annual winds. Typically the summer and fall winds tend to be more comfortable than the annual winds while the winter and spring winds are less comfortable than the annual winds. The following summary of pedestrian wind comfort is based on the annual winds for each configuration tested, except where noted below in the text.

5.1 Study Building and Surrounding Sidewalks (Locations 41-60)

In general, the wind conditions around the proposed development, in either configuration, were suitable for walking or better. However, due to the local wind climate and building exposure, the wind conditions

---

1 Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions", Journal of Industrial Aerodynamics, 3 (1978) 241 - 249.

were uncomfortable at the sensor locations placed closest to sharp edges (Locations 42, 45, 47, 48, 50), with one safety exceedance (Location 45).

5.1.1 No Build Configuration

As shown in Figure 3a, annual wind conditions in the vicinity of the current development were appropriate for walking or better. During the winter, uncomfortable conditions were determined at Location 50.

The effective gust criterion was met (Figure 4a) at all the locations surrounding the existing site.

5.1.2 Full Build Configuration

For the Full Build Configuration, the annual wind comfort conditions were generally suitable for walking or better (Figure 3b). Uncomfortable wind conditions were detected at Locations 42, 45, 47, and 50 on an annual basis. Seasonal uncomfortable conditions were also detected at Location 42, 45, and 50 during the spring, fall, and winter, and Location 47 and 48 during the spring and winter. These uncomfortable conditions resulted from downwashing flow from the west façade of the proposed building, flow accelerations around sharp corners, and subsequent channeling between buildings. Such situations can be mitigated with the use of a corner canopy or landscaping (Images 1-3). For Location 47, mitigation would be beneficial as well.

The effective gust criterion was not met for Location 45 during the spring and winter and Location 50 during the winter, while annually the criterion was met for all locations (Figure 4b).

Image 1 – Example Corner Canopy

Image 2 – Example Landscaping

Image 3 – Example Landscaping

5.2 Off-site Sidewalks and Buildings (Locations 1-40)

The proposed development did not cause significant wind activity or any gust exceedances, at any off-site locations, and wind conditions were generally suitable for walking for all three test configurations. Some marginally uncomfortable conditions resulted due to the development (locations 15 and 36).

5.2.1 No Build Configuration

At the off-site locations for the no build configuration, the annual wind comfort conditions were generally suitable for walking or better (Figure 3a). Uncomfortable conditions were found at Locations 17 and 28. In addition, seasonally, uncomfortable conditions were detected at Location 17 during the spring, fall, and winter, Locations 27, 28, and 36 during the spring and winter, and Locations 1, 15, 18, 22, 24, 29, and 38 during the winter.

For the effective gust wind criterion, there were no observed exceedances annually or seasonally.

5.2.2 Full Build Configuration

The annual wind comfort conditions for full build configuration A were generally appropriate for standing or walking (Figure 3b). An exception to this was Locations 15, 17, and 28, where uncomfortable conditions were detected. Seasonally uncomfortable conditions were detected at Locations 17 during the spring, fall, and winter, Locations 15, 27, 28, and 36 during the spring and winter, Locations 22 and 29 during the winter, and Location 39 during the spring.

In terms of effective gust criterion, there were no exceedances at any locations off-site for this configuration (Figure 4b).

6. RECOMMENDATIONS

Based on the results and our understanding of which areas are considered critical, it is recommended that the following mitigation measures be examined initially, with the understanding that additional mitigation may be required.

- A canopy can be installed along the south, west, and north façades of the building to prevent downwashing flow from upper levels;

- Landscaping be installed on the sidewalk on the northwest side of Location 42 to mitigate channelling flow between buildings;

- Landscaping be installed on the sidewalk on the northwest side of Location 50 to mitigate flow interaction with the proposed building corner;

- Landscaping be installed on the sidewalk on the west and northeast sides of Location 45; and

- Mitigation be considered along the south and west sides of the roof-top terrace at Locations 47 and 48.

7. APPLICABILITY OF RESULTS

The results presented in this report pertain to the model of the Residential Commons at Barry's Corner development constructed using the architectural design drawings listed in Appendix A. Should there be any design changes that deviate from this list of drawings, the results presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

TABLES

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
1	1	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	24		Acceptable
	2	Spring	14	-22%	Standing	19	-21%	Acceptable
		Summer	11	-21%	Sitting	15	-21%	Acceptable
		Fall	13	-24%	Standing	18	-22%	Acceptable
		Winter	14	-30%	Standing	21	-22%	Acceptable
		Annual	13	-28%	Standing	19	-21%	Acceptable
2	1	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	21		Acceptable
	2	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	22		Acceptable
3	1	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

1 - No Build
2 – Full Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
4	1	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	13	-28%	Standing	20	-17%	Acceptable
		Summer	10	-29%	Sitting	15	-21%	Acceptable
		Fall	12	-29%	Sitting	19	-17%	Acceptable
		Winter	14	-26%	Standing	21	-19%	Acceptable
		Annual	13	-24%	Standing	20	-17%	Acceptable
5	1	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
6	1	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	15		Standing	21		Acceptable
	2	Spring	13	-13%	Standing	20		Acceptable
		Summer	10	-17%	Sitting	16		Acceptable
		Fall	12	-14%	Sitting	19		Acceptable
		Winter	14	-12%	Standing	21		Acceptable
		Annual	13	-13%	Standing	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

1 - No Build
2 – Full Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mphComfortable for Walking:

CONSULTING ENGINEERS
& SCIENTISTS

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
7	1	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
8	1	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
9	1	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	2	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
10	1	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
11	1	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	14		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
12	1	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17	+13%	Walking	24		Acceptable
		Annual	16	+14%	Walking	22		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

1 - No Build
2 – Full Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
13	1	Spring	13		Standing	18		Acceptable
		Summer	10		Sitting	14		Acceptable
		Fall	12		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	2	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable
14	1	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	16		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	14		Standing	21		Acceptable
	2	Spring	17	+13%	Walking	24	+14%	Acceptable
		Summer	13		Standing	18	+12%	Acceptable
		Fall	16	+14%	Walking	22		Acceptable
		Winter	18	+12%	Walking	26	+18%	Acceptable
		Annual	17	+21%	Walking	23		Acceptable
15	1	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	24		Acceptable
	2	Spring	20	+11%	Uncomfortable	26		Acceptable
		Summer	16	+14%	Walking	21	+11%	Acceptable
		Fall	19	+12%	Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	20	+11%	Uncomfortable	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
16	1	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	2	Spring	15	+15%	Standing	22	+16%	Acceptable
		Summer	12	+20%	Sitting	18	+20%	Acceptable
		Fall	14	+17%	Standing	20	+11%	Acceptable
		Winter	15	+15%	Standing	22		Acceptable
		Annual	15	+25%	Standing	21	+11%	Acceptable
17	1	Spring	22		Uncomfortable	29		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	23		Uncomfortable	31		Acceptable
		Annual	21		Uncomfortable	29		Acceptable
	2	Spring	22		Uncomfortable	30		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	23		Uncomfortable	31		Acceptable
		Annual	21		Uncomfortable	29		Acceptable
18	1	Spring	19		Walking	28		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	18		Walking	26		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
	2	Spring	18		Walking	27		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	17	-11%	Walking	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
1 - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
2 – Full Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mphComfortable for Walking:
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
19	1	Spring	18		Walking	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	16		Walking	21		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	16		Walking	21		Acceptable
	2	Spring	16	-11%	Walking	22		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	14	-12%	Standing	20		Acceptable
		Winter	14	-12%	Standing	21		Acceptable
		Annual	14	-12%	Standing	20		Acceptable
20	1	Spring	16		Walking	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	15		Standing	21		Acceptable
	2	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
21	1	Spring	17		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	2	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	22		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

1 - No Build
2 – Full Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
22	1	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
	2	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
23	1	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
24	1	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
	2	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
25	1	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	2	Spring	19		Walking	26		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
26	1	Spring	17		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	21		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	16		Walking	22		Acceptable
	2	Spring	17		Walking	23		Acceptable
		Summer	14		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	17		Walking	22		Acceptable
27	1	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable
	2	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	26		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
28	1	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	2	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
29	1	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	24		Acceptable
	2	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
30	1	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	2	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
31	1	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
	2	Spring	13	-13%	Standing	19		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	12	-14%	Sitting	18		Acceptable
		Winter	12	-20%	Sitting	18	-18%	Acceptable
		Annual	12	-14%	Sitting	18		Acceptable
32	1	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable
	2	Spring	16		Walking	23		Acceptable
		Summer	12	-14%	Sitting	18		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	21		Acceptable
33	1	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	2	Spring	15		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	22		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
34	1	Spring	17		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	2	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19	+12%	Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
35	1	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	19	+12%	Walking	26		Acceptable
		Summer	15		Standing	21	+11%	Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	25		Acceptable
36	1	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	19		Walking	26		Acceptable
	2	Spring	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
37	1	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
	2	Spring	12	-14%	Sitting	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11	-15%	Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
38	1	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable
	2	Spring	13	-28%	Standing	20	-20%	Acceptable
		Summer	10	-29%	Sitting	16	-16%	Acceptable
		Fall	13	-24%	Standing	19	-21%	Acceptable
		Winter	14	-30%	Standing	22	-19%	Acceptable
		Annual	13	-28%	Standing	20	-20%	Acceptable
39	1	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	20	+18%	Uncomfortable	28	+12%	Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18	+12%	Walking	25		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
40	1	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	2	Spring	18		Walking	26		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	17		Walking	25		Acceptable
41	1	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	24		Acceptable
	2	Spring	16	-11%	Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15	-12%	Standing	23		Acceptable
		Winter	16	-16%	Walking	24		Acceptable
		Annual	15	-17%	Standing	23		Acceptable
42	1	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	22	+22%	Uncomfortable	30	+20%	Acceptable
		Summer	17	+21%	Walking	23	+15%	Acceptable
		Fall	20	+25%	Uncomfortable	28	+22%	Acceptable
		Winter	22	+16%	Uncomfortable	30	+11%	Acceptable
		Annual	21	+24%	Uncomfortable	28	+17%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
43	1	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	23		Acceptable
	2	Spring	18		Walking	26		Acceptable
		Summer	15	+15%	Standing	21	+11%	Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18	+12%	Walking	25		Acceptable
44	1	Spring	18		Walking	24		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	25		Acceptable
		Annual	18		Walking	24		Acceptable
	2	Spring	15	-17%	Standing	23		Acceptable
		Summer	12	-20%	Sitting	18		Acceptable
		Fall	14	-18%	Standing	21		Acceptable
		Winter	16	-16%	Walking	24		Acceptable
		Annual	15	-17%	Standing	22		Acceptable
45	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	24		Uncomfortable	33		Unacceptable
		Summer	18		Walking	25		Acceptable
		Fall	22		Uncomfortable	30		Acceptable
		Winter	25		Uncomfortable	34		Unacceptable
		Annual	23		Uncomfortable	31		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

1 - No Build
2 – Full Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
46	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	15		Standing	24		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14		Standing	23		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	14		Standing	23		Acceptable
47	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	21		Uncomfortable	29		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
48	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	19		Walking	27		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
49	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	17		Walking	25		Acceptable
50	1	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	21		Uncomfortable	28		Acceptable
		Annual	19		Walking	25		Acceptable
	2	Spring	24	+26%	Uncomfortable	31	+19%	Acceptable
		Summer	19	+27%	Walking	25	+25%	Acceptable
		Fall	22	+22%	Uncomfortable	29	+21%	Acceptable
		Winter	26	+24%	Uncomfortable	34	+21%	Unacceptable
		Annual	24	+26%	Uncomfortable	31	+24%	Acceptable
51	1	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	2	Spring	18		Walking	27	+12%	Acceptable
		Summer	15	+15%	Standing	22	+16%	Acceptable
		Fall	17		Walking	26	+13%	Acceptable
		Winter	19		Walking	29	+12%	Acceptable
		Annual	18		Walking	27	+12%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

1 - No Build
2 – Full Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
52	1	Spring	16		Walking	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	22		Acceptable
	2	Spring	14	-12%	Standing	21		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13	-13%	Standing	20		Acceptable
		Winter	14	-12%	Standing	22		Acceptable
		Annual	13	-13%	Standing	20		Acceptable
53	1	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	22		Acceptable
	2	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	21	+17%	Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	24		Acceptable
54	1	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	2	Spring	11	-35%	Sitting	17	-29%	Acceptable
		Summer	10	-23%	Sitting	15	-21%	Acceptable
		Fall	11	-31%	Sitting	17	-23%	Acceptable
		Winter	12	-29%	Sitting	18	-28%	Acceptable
		Annual	11	-31%	Sitting	17	-26%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
55	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	15		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
56	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
57	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	12		Sitting	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
58	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	15		Standing	22		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	22		Acceptable
59	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	23		Acceptable
60	1	Spring	DATA NOT AVAILABLE					
		Summer	DATA NOT AVAILABLE					
		Fall	DATA NOT AVAILABLE					
		Winter	DATA NOT AVAILABLE					
		Annual	DATA NOT AVAILABLE					
	2	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

1 - No Build
2 – Full Build

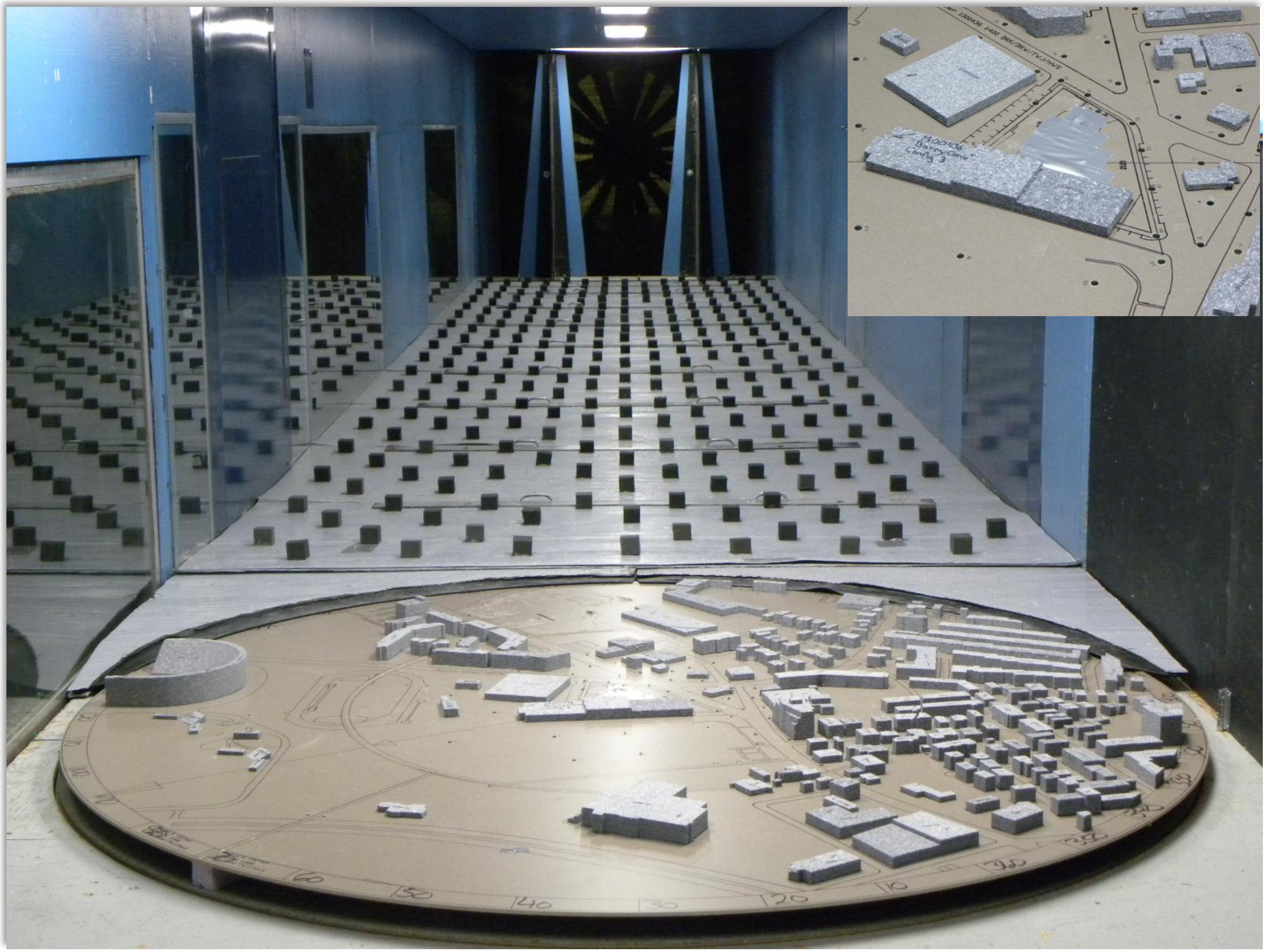
Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

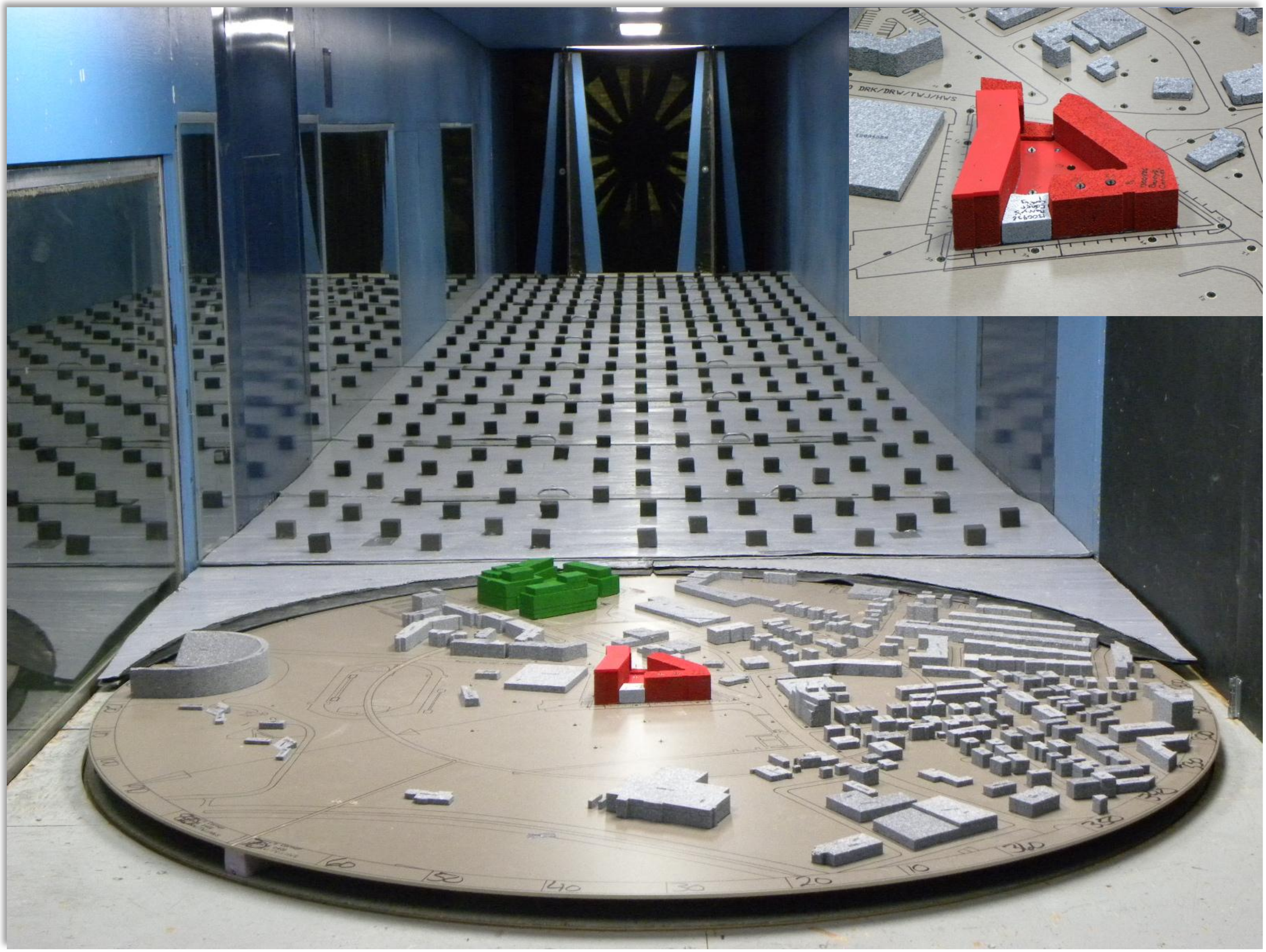
Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mphComfortable for Walking:

FIGURES



Wind Tunnel Study Model No Build Configuration Residential Commons at Barry's Corner – Allston, MA Project #1300436	Figure: 1a Date: December 6, 2012	



Wind Tunnel Study Model
Full Build Configuration A

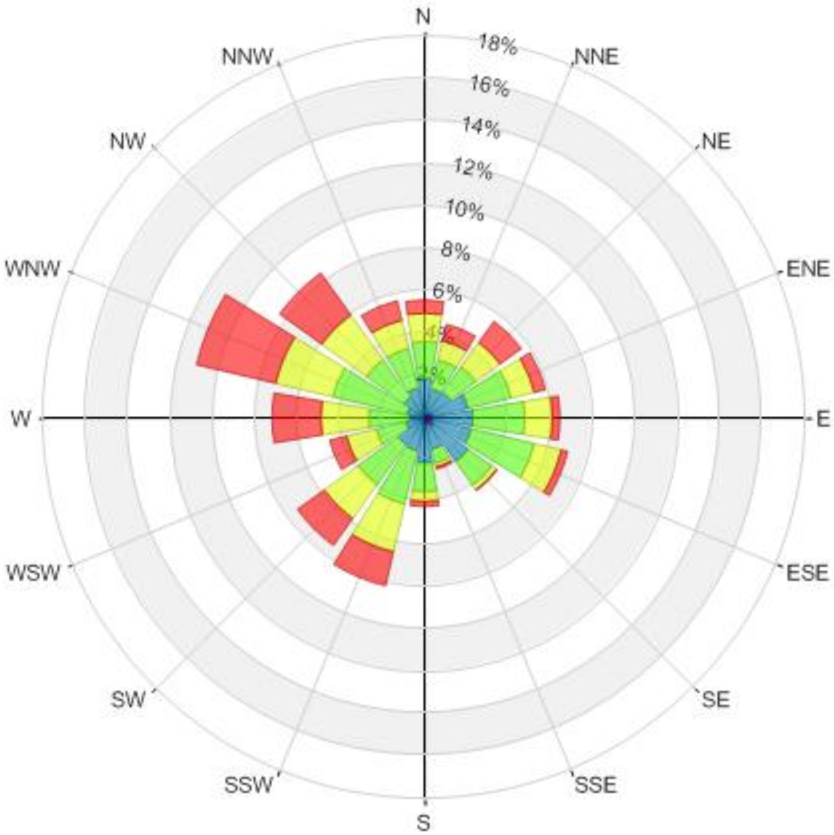
Residential Commons at Barry's Corner – Allston, MA

Project #1300456

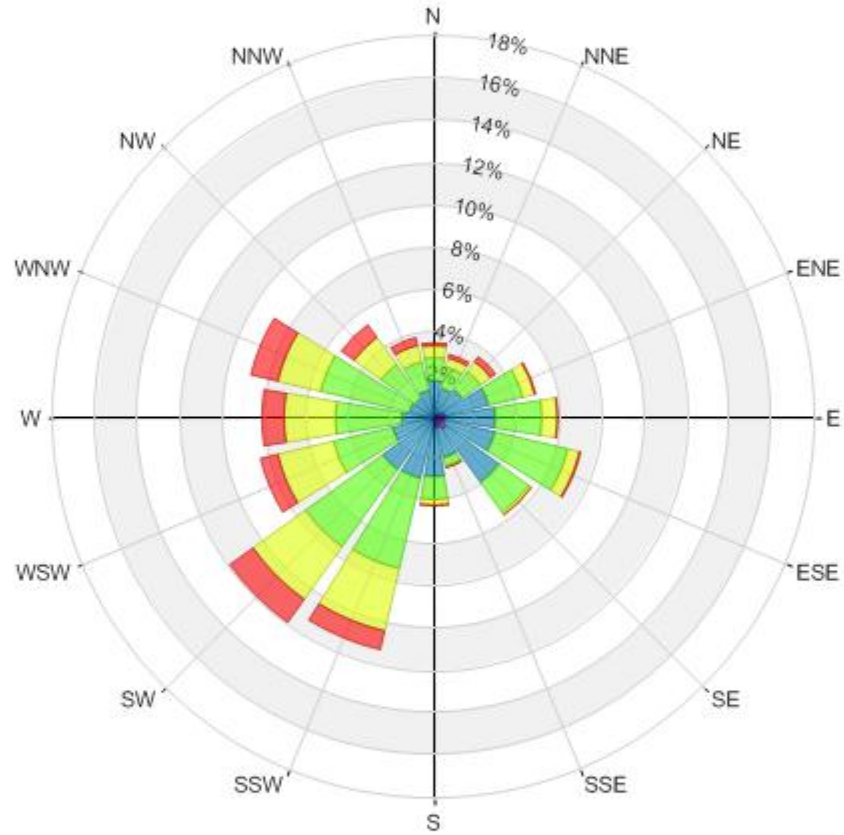
Figure: 1b

Date: December 6, 2012

RWDI



Spring
(March - May)



Summer
(June - August)

Wind Speed (mph)	Probability (%) Spring	Summer
Calm	1.7	1.8
1-5	3.5	4.6
6-10	22.5	30.3
11-15	31.5	36.4
16-20	23.0	19.5
>20	17.8	7.4

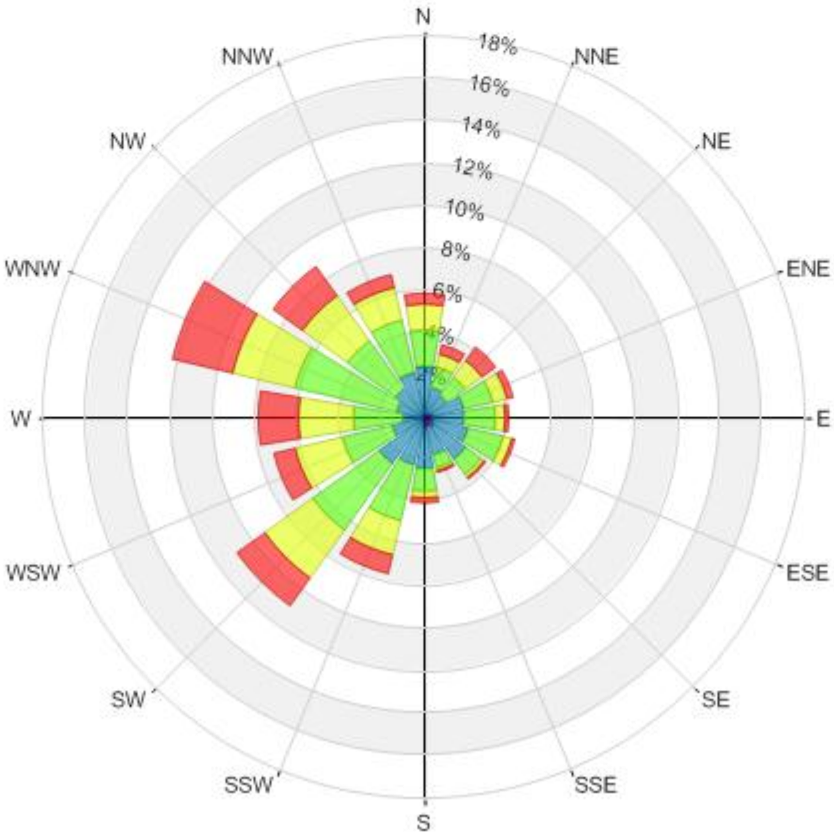
Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1981 - 2011)

Residential Commons at Barry's Corner – Allston, MA

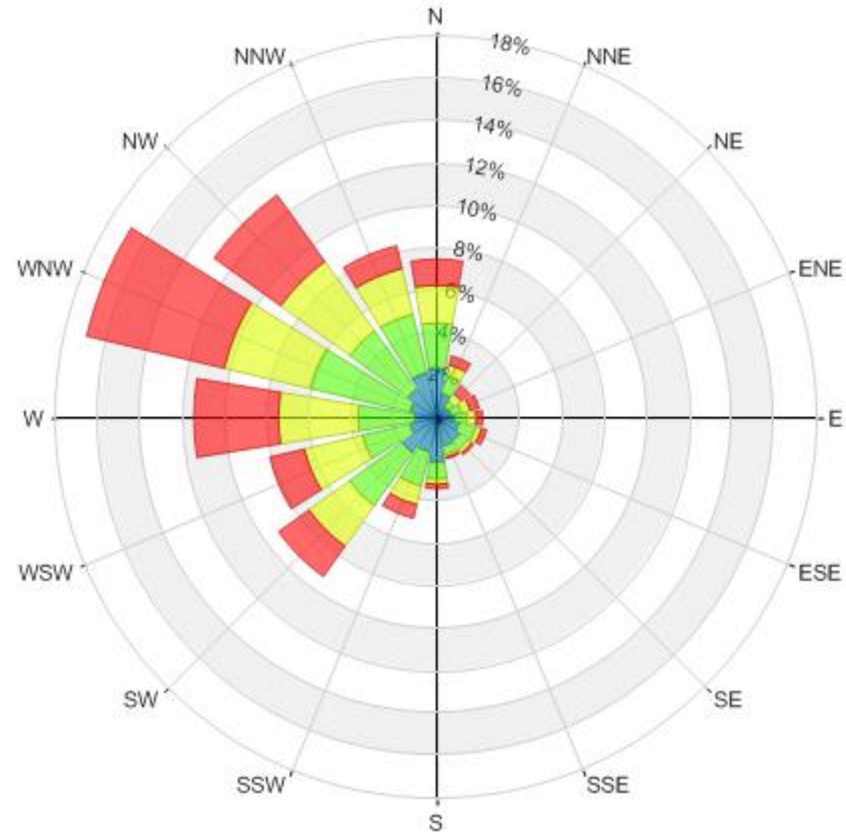
Project #1300436

Figure No. 2a

Date: December 06, 2012



Fall
(September - November)



Winter
(December - February)

Wind Speed (mph)	Probability (%) Fall	Winter
Calm	1.9	1.5
1-5	4.1	3.0
6-10	26.3	19.8
11-15	32.7	27.7
16-20	21.4	24.6
>20	13.5	23.4

Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1981 - 2011)

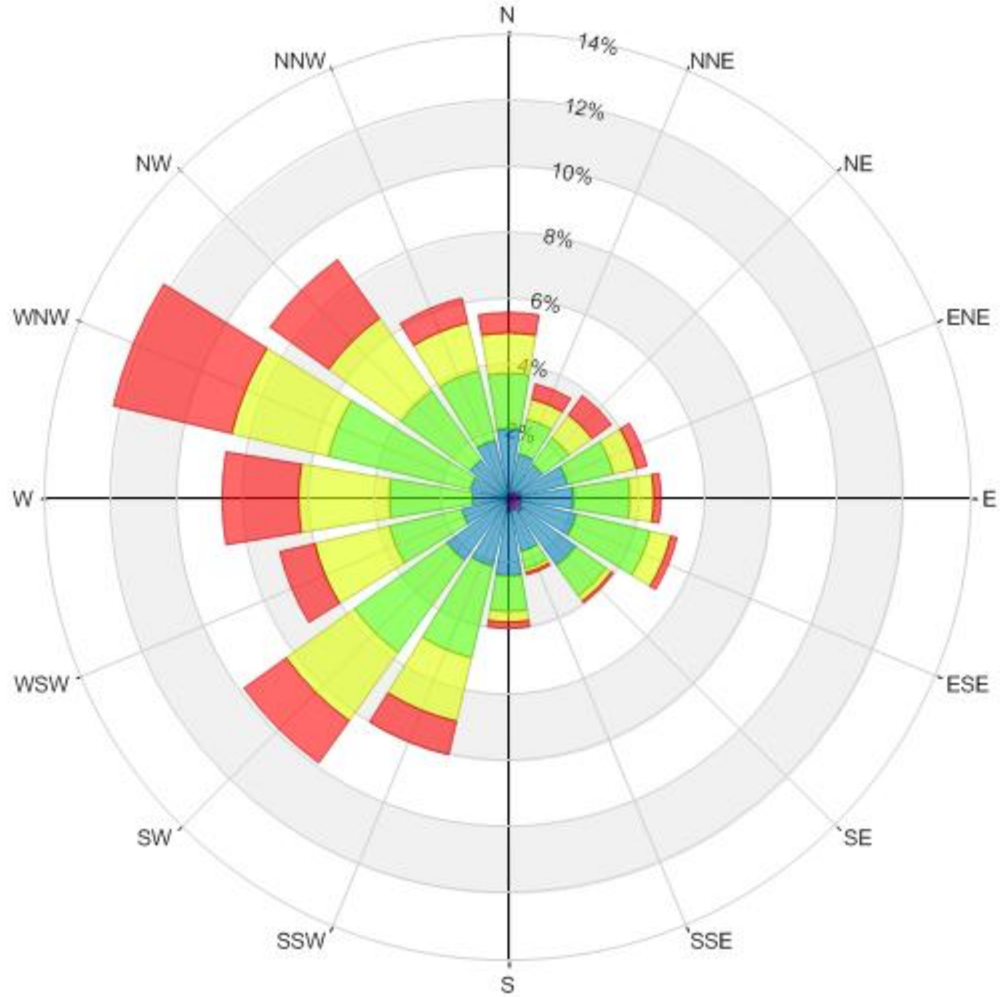
Residential Commons at Barry's Corner – Allston, MA

Project #1300436

Figure No. 2b

Date: December 06, 2012

RWDI



Annual Winds

Wind Speed (mph)	Probability (%)
Calm	1.7
1-5	3.8
6-10	24.7
11-15	32.1
16-20	22.1
>20	15.5

Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1981 - 2011)

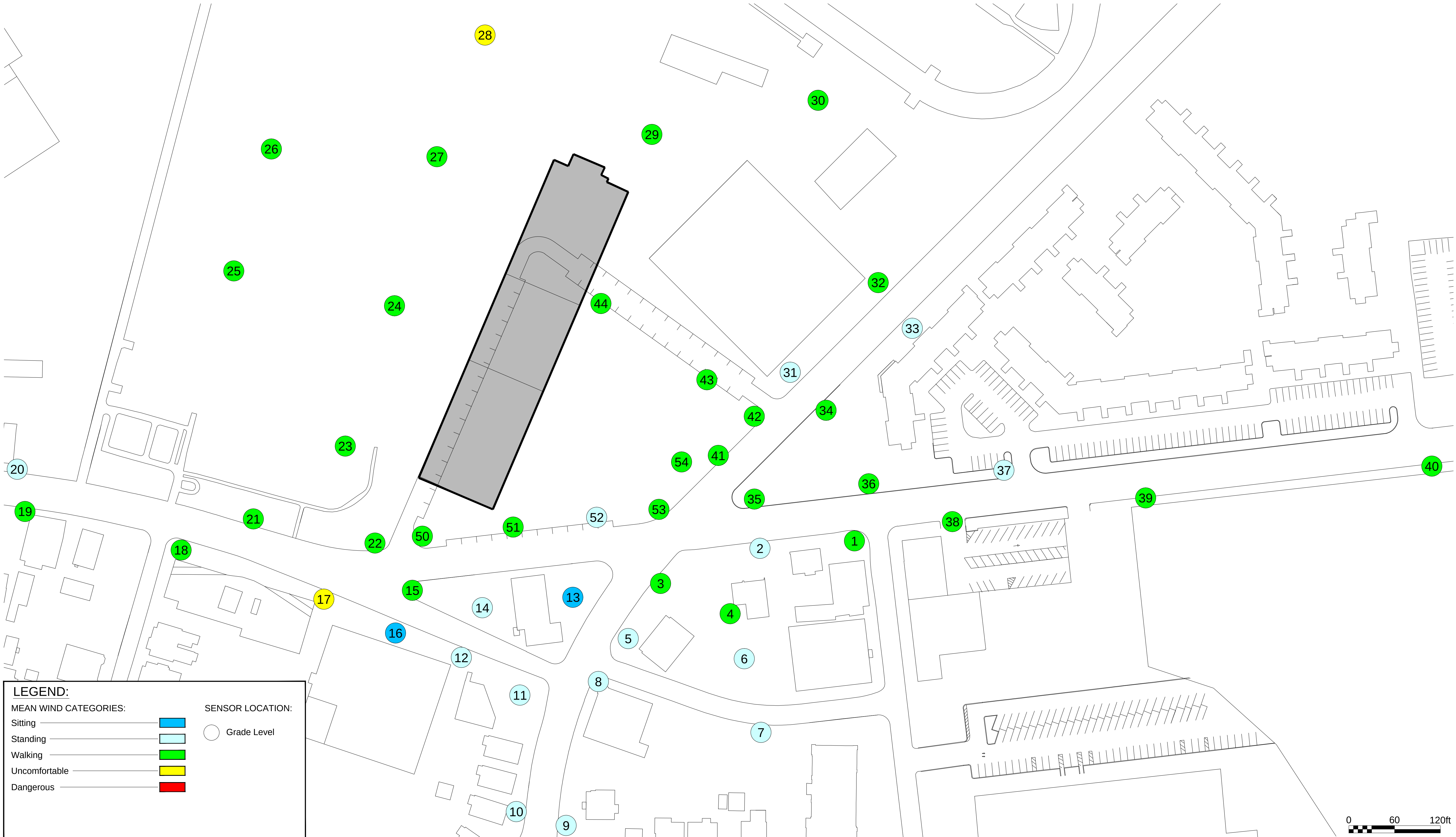
Residential Commons at Barry's Corner – Allston, MA

Project #1300436

Figure No. 2c

Date: December 06, 2012

RWDI



Pedestrian Wind Comfort Conditions - No Build Configuration
Annual (January to December, 1:00 to 24:00)

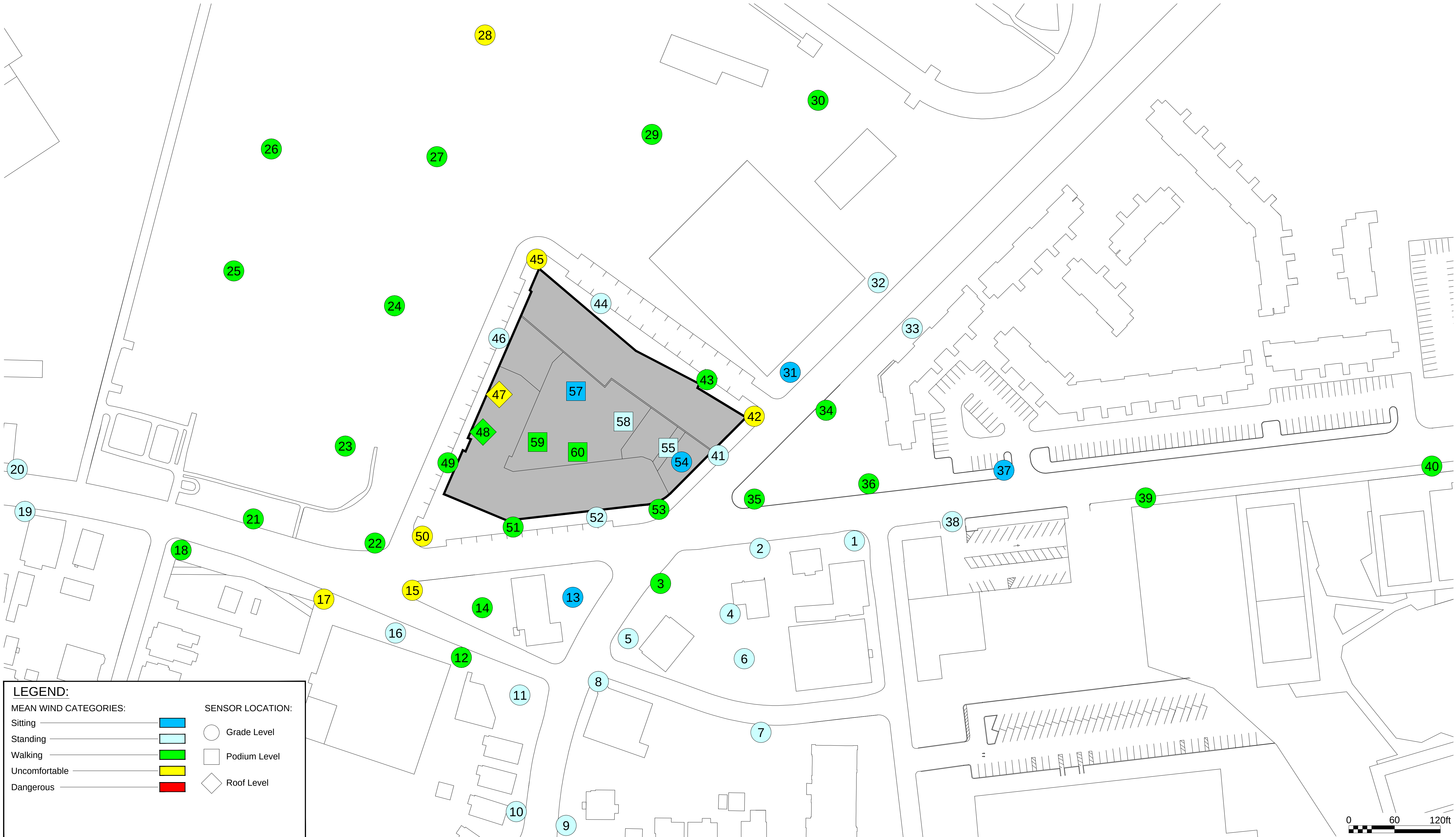
Residential Commons at Barry's Corner - Allston, MA

Project #1300436

True North

Drawn by: SMR	Figure: 3a
Approx. Scale:	1"=120'
Date Revised:	Dec. 6, 2012

RWDI



Pedestrian Wind Comfort Conditions - Full Build Configuration
Annual (January to December, 1:00 to 24:00)

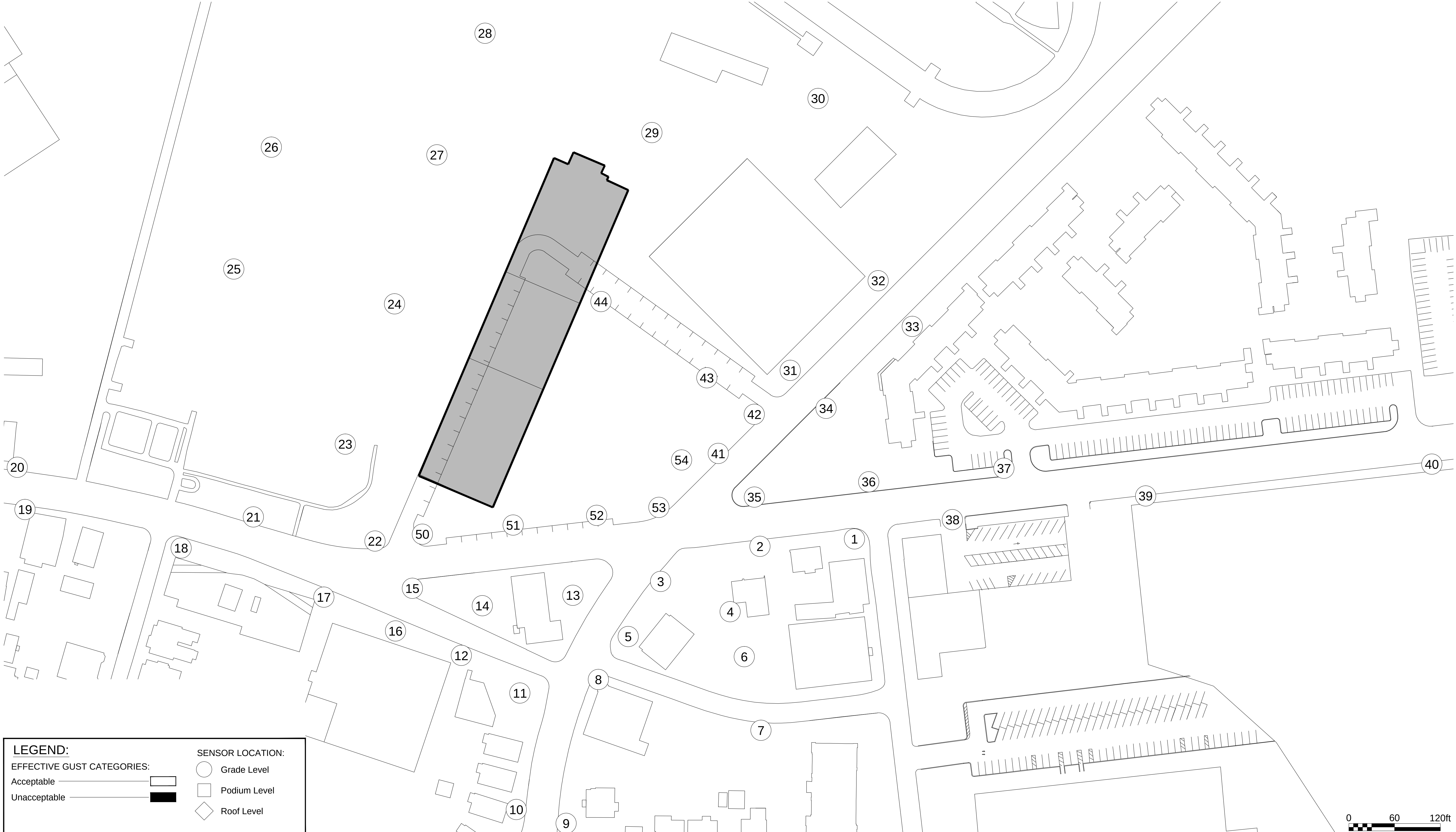
Residential Commons at Barry's Corner - Allston, MA

True North

Project #1300436

Drawn by: SMR	Figure: 3b
Approx. Scale:	1"=120'
Date Revised:	Dec. 6, 2012

RWDI



Pedestrian Wind Safety Conditions - No Build Configuration

Annual (January to December, 1:00 to 24:00)

Residential Commons at Barry's Corner - Allston, MA

True North

Project #1300436

Drawn by:	SMR	Figure:	4a
Approx. Scale:	1"=120'		
Date Revised:	Dec. 6, 2012		

RWDI

Pedestrian Wind Safety Conditions - Full Build Configuration
Annual (January to December, 1:00 to 24:00)

Residential Commons at Barry's Corner - Allston, MA

Project #1300436

Drawn by: SMR	Figure: 4b
Approx. Scale:	1"=120'
Date Revised:	Dec. 6, 2012

RWDI

APPENDIX A

APPENDIX A: DRAWING LIST FOR MODEL CONSTRUCTION

The drawings and information listed below were received from Elkus Manfredi Architects and were used to construct the scale model of the proposed Barry's Corner development. Should there be any design changes that deviate from this list of drawings, the results may change. Therefore, if changes in the design area made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (dd/mm/yyyy)
2012_11-13_BarrysCorner.skp	SketchUp	15/11/12
2012_11-14_Science.skp	SketchUp	15/11/12

Appendix D

Air Quality

APPENDIX D AIR QUALITY

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 3.6 of the report. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the microscale air quality analyses.

Motor Vehicle Emissions

The EPA MOBILE6.2 computer program generated motor vehicle emissions used in the mobile source CAL3QHC modeling. The model input parameters were provided by MassDEP. Emission rates were derived for 2012 and 2017 for speed limits of 2.5, 10, 15, and 30 mph for use in the microscale analyses.

CAL3QHC

For the intersections studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOBILE6.2. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 321 cm was used for the intersections. Idle emission rates for queue links were based on 2.5 mph emission rates derived in MOBILE6.2 and converted from grams per mile to grams per hour. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

Harvard - Barry's Corner - Boston, MA
Calculation of Microscale Modeling Emission Rates
Summary of MOBILE6.2 Output

Carbon Monoxide Only

Queues	Idle
Free Flow	30 mph
Right Turns	10 mph
Left Turns	15 mph

Summer	**2012**	**2017**	**Units**
Idle	32.245	27.355	g/hr
2.5 mph	12.898	10.942	g/mile
10 mph	5.783	4.952	g/mile
15 mph	4.897	4.185	g/mile
30 mph	4.017	3.397	g/mile

Winter	**2012**	**2017**	**Units**
Idle	50.753	43.320	g/hr
2.5 mph	20.301	17.328	g/mile
10 mph	10.920	9.468	g/mile
15 mph	9.803	8.531	g/mile
30 mph	8.727	7.636	g/mile

Due to excessive size CAL3QHC, and MOBILE6.2 input and output files are available on digital media upon request.

Appendix E

LEED Checklist

LEED v3 for New Construction and Major Renovations
Project Scorecard

Project Name: Barry's Corner Mixed Use Residential

Project Address: Allston, MA

Date: 12/05/2012

TOTALS

Yes	?	No		
62	13	35	Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points	

						Responsible	requirements
				GENERAL PROJECT DOCUMENTATION		**Responsible**	**requirements**
Y			PI form 1	Minimum Program Requirements	Required		REQUIRED - Project must meet MPRs & owner must commit to share energy & water use data with USGBC.
Y			PI form 2	Project Summary Details	Required		REQUIRED - Must provide general info on size, site, energy & water sources
Y			PI form 3	Occupant Usage Data	Required		REQUIRED - Must provide general information on occupancy and space usage
Y			PI form 4	Schedule and Overview Documents	Required		REQUIRED - Must provide general info on schedule & overview documents & narratives

Phase	Yes	?	No				Responsible	requirements
	22	3	1	**SUSTAINABLE SITES**		26	**Responsible**	**requirements**
C	Y			Prereq 1	Construction Activity Pollution Prevention	Required		REQUIRED: An EPA General Construction Permit compliant ESC plan shall be submitted and implemented on site.
D	1			Credit 1	Site Selection	1		Do not develop on sites that are prime farmland, in floodplains, adjacent to wetlands, parkland or habitat for key species. Site location meets requirements
D	5			Credit 2	Development Density and Community Connectivity	5		Locate the project densely developed urban area or within walking distance to several community services.
D		1		Credit 3	Brownfield Redevelopment	1		Develop on a contaminated site. Remediate contamination under strict adherence to applicable regulations
D	6			Credit 4.1	Alternative Transportation - Public Transportation Access	6		Locate the project within 1/2 mile of rail station or 1/4 mile of bus stops for two or more bus routes
D	1			Credit 4.2	Alternative Transportation - Bicycle Storage and Changing Rooms	1		Provide secure covered bike storage for 15% of building residents and exterior bike storage racks for 5% of visitors & employees.
D	3			Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3		Provide preferred parking spaces for 5% of the total on-site parking for LEFE vehicles.
D	2			Credit 4.4	Alternative Transportation - Parking Capacity	2		Parking capacity shall not exceed zoning requirements. Provide infrastructure and support programs to facilitate shared vehicle use
C		1		Credit 5.1	Site Development - Protect or Restore Habitat	1		On previously developed sites, restore a minimum of 50% of the site (excluding bldg footprint) or 20% of the total site area (including footprint), whichever is greater, with native or adapted vegetation.
D	1			Credit 5.2	Site Development - Maximize Open Space	1		If an applicable zoning ordinance exists, but there is no requirement for open space provide vegetated open space equal to 20% of the project's site area.
D	1			Credit 6.1	Stormwater Design - Quantity Control	1		If existing imperviousness is less than 50% No net increase in the rate and quantity of stormwater runoff from existing to developed conditions. If existing imperviousness is greater than 50%, implement a stormwater management plan that results in a 25% decrease in the rate and quantity of stormwater runoff.
D		1		Credit 6.2	Stormwater Design - Quality Control	1		Capture and treat stormwater from 90% of the avg annual rainfall using acceptable BMPs capable of removing 80% of the avg annual post development total suspended solids (TSS) load based on existing monitoring reports.
C	1			Credit 7.1	Heat Island Effect - Nonroof	1		Place a minimum of 50% of parking under cover.
D	1			Credit 7.2	Heat Island Effect - Roof	1		Use roofing materials having a compliant SRI for a minimum of 75% of the roof surface. OR Install a vegetated roof for at least 50% of the roof area. OR Install high albedo and vegetated roof surfaces that, in combination, meet the criteria.
D			1	Credit 8	Light Pollution Reduction	1		No night light trespass from building interior or site at perimeter and comply with exterior LPD limits of ASHARE 90.1-2007

Phase	Yes	?	No	WATER EFFICIENCY		10	Responsible	requirements
	6	1	3					
D	Y			Prereq 1	Water Use Reduction - 20% minimum	Required		REQUIRED: Reduce plumbing fixture potable water use by 20% below the EPAct of 1992 baseline calculation
D	2			Credit 1.1	Water Efficient Landscaping - Reduce by 50%	2		Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case.
D	2			Credit 1.2	Water Efficient Landscaping - No Potable H20 or No Irrigation	2		
D			2	Credit 2	Innovative Wastewater Technologies	2		
D	2	1	1	Credit 3	Water Use Reduction - 30% (2), 35% (3), 40% (4)	2 to 4		Install plumbing fixtures that in aggregate use 30% -40% less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements. 35% = 3 points, 40% = 4 points

Phase	Yes	?	No	ENERGY & ATMOSPHERE		35	Responsible	requirements
	10	5	20					
C	Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	Required		REQUIRED: Include a Commissioning Agent on the project. Provide a commissioning plan
D	Y			Prereq 2	Minimum Energy Performance	Required		REQUIRED: Reduce annual building energy use by 10% below ASHRAE 90.1-2007
D	Y			Prereq 3	Fundamental Refrigerant Management	Required		REQUIRED: Do not specify CFC-based refrigerants
D	5	3	11	Credit 1	Optimize Energy Performance	1 to 19		Reduce annual building energy use below ASHRAE 90.1-2007 minimums (over the 10% required by EAp2)
D			7	Credit 2	On-Site Renewable Energy	1 to 7		
C	2			Credit 3	Enhanced Commissioning	2		CxA must provide document and submittal review
D	2			Credit 4	Enhanced Refrigerant Management	2		Specify refrigerants that have low ozone depleting potential and low global warming potential
C	1		2	Credit 5	Measurement and Verification	3		Register for an Energy Star Portfolio Manager account and/or develop and implement an M & V plan
C		2		Credit 6	Green Power	2		Purchase GreenE certificates for 35% of annual building energy use for 2 years.

Phase	Yes	?	No	MATERIALS & RESOURCES		14	Responsible	requirements
	4	2	8					
D	Y			Prereq 1	Storage and Collection of Recyclables	Required		REQUIRED: Provide storage space for collected recycled materials and implement a recycling program for the building residents.
C			3	Credit 1.1	Building Reuse - Maintain Existing Walls, Floors & Roof 55% (1), 75% (	1 to 3		
C			1	Credit 1.2	Building Reuse - Maintain Interior Non-Structural Elements	1		
C	2			Credit 2	Construction Waste Management - Divert 50% (1), 75% (2)	1 to 2		Massachusetts requires a minimum of 75% of demolition and construction debris be diverted from area landfills.
C			2	Credit 3	Materials Reuse	1 to 2		
C	1			Credit 4.1	Recycled Content - 10%	1		Use materials with recycled content for 10%/20% of the materials installed in the project by cost.
		1		Credit 4.2	Recycled Content - 20%	1		
C	1			Credit 5	Regional Materials - 10%	1		Use materials harvested/extracted and manufactured within 500 miles of the project site calculated by cost for 10%/20%
		1		Credit 5	Regional Materials - 20%	1		
C			1	Credit 6	Rapidly Renewable Materials	1		
C			1	Credit 7	Certified Wood	1		Use Certified wood for 50% of the wood materials and products by cost

	Yes	?	No					
	11	1	3	INDOOR ENVIROMENTAL QUALITY		15	Responsible	requirements
D	Y			Prereq 1	Minimum Indoor Air Quality Performance	Required		REQUIRED: Comply with sections 4-7 of ASHRAE 62.1-2007, Ventilation for Acceptable Indoor Air, naturally ventilated buildings shall comply with ASHRAE 62.1-2007, paragraph 5.1.
D	Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required		REQUIRED: No Smoking in common areas. Smoking may be allowed in residential units. Blower door tests shall be required to demonstrate unit to unit separation
D			1	Credit 1	Outdoor Air Delivery Monitoring	1		
D			1	Credit 2	Increased Ventilation	1		
C	1			Credit 3.1	Construction Indoor Air Quality Management Plan - During Constructi	1		Implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building that meets the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied Building under Construction 2nd Ed 2007.
C	1			Credit 3.2	Construction Indoor Air Quality Management Plan - Before Occupancy	1		Implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase by performing a building flush-out OR conduct compliant air quality testing.
C	1			Credit 4.1	Low-Emitting Materials - Adhesives & Sealants	1		All adhesives & sealants used on the interior of the building must comply with SCAQMD Rule #1138 2004 & GS-36 1993
C	1			Credit 4.2	Low-Emitting Materials -Paints & Coatings	1		Paints and coatings used on the interior of the building must comply with GS-11, 1993, GC-03, SCAQMD Rule 1113 2004, as applicable.
C	1			Credit 4.3	Low-Emitting Materials - Floor Systems	1		Flooring materials must comply with Floor Score or CRI criteria
C	1			Credit 4.4	Low-Emitting Materials - Composite Wood	1		Composite wood and Agrifiber products must not contain added urea formaldehyde
D	1			Credit 5	Indoor Chemical and Pollutant Source Control	1		Minimize cross-contamination of reg. occupied areas by chemical pollutants.
D	1			Credit 6.1	Controllability of Systems - Lighting	1		Provide 90% of building occupants with access to Lighting controls
D	1			Credit 6.2	Controllability of Systems - Thermal Comfort	1		Provide 50% of building occupants with access to Thermal controls
D	1			Credit 7.1	Thermal Comfort - Design	1		Project must comply with ASHRAE 55
D			1	Credit 7.2	Thermal Comfort - Verification	1		
D		1		Credit 8.1	Daylight and Views - Daylight - 75%	1		Provide daylight to the level of 25 f.c. for 75% of the square foot areas of regularly occupied spaces
D	1			Credit 8.2	Daylight and Views - Views 90%	1		Provide views for 90% of the square footage of regularly occupied spaces.

	Yes	?	No					
	6	0	0	INNOVATION IN DESIGN		6	Responsible	requirements
D	1			Credit 1.1	Innovation in Design -Building as an Educational Tool	1		Comply with requirements for ID credit for Building as an Educational Tool - Signage within the building & website case study or annual building tours
	1			Credit 1.2	Innovation in Design - EP	1		Comply with exemplary performance requirements for SSc2.2
	1			Credit 1.3	Innovation in Design - EP	1		Comply with exemplary performance requirements for SSc4.1
	1			Credit 1.4	Innovation in Design - TBD	1		TBD - consider low mercury lighting; pliot credit for bike network
	1			Credit 1.5	Innovation in Design-TBD	1		TBD - consider low mercury lighting; green cleaning policy
C	1			Credit 2	LEED® Accredited Professional	1		TGE

	Yes	?	No					
	3	1	0	REGIONAL PRIORITY 01234: SSc3, SSc6.1, SSc7.1, SSc7.2, EAc2, MR		6	Responsible	requirements
D		1		Credit 1.1	Regional Priority SSc3	1		Dependent on meeting base credit requirements
D	1			Credit 1.2	Regional Priority SSc6.1	1		Dependent on meeting base credit requirements
D	1			Credit 1.3	Regional Priority SSc7.1	1		Dependent on meeting base credit requirements
D	1			Credit 1.4	Regional Priority SSc7.2	1		Dependent on meeting base credit requirements

Yes	?	No		
62	13	35	PROJECT TOTALS (Certification Estimates)	112

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points