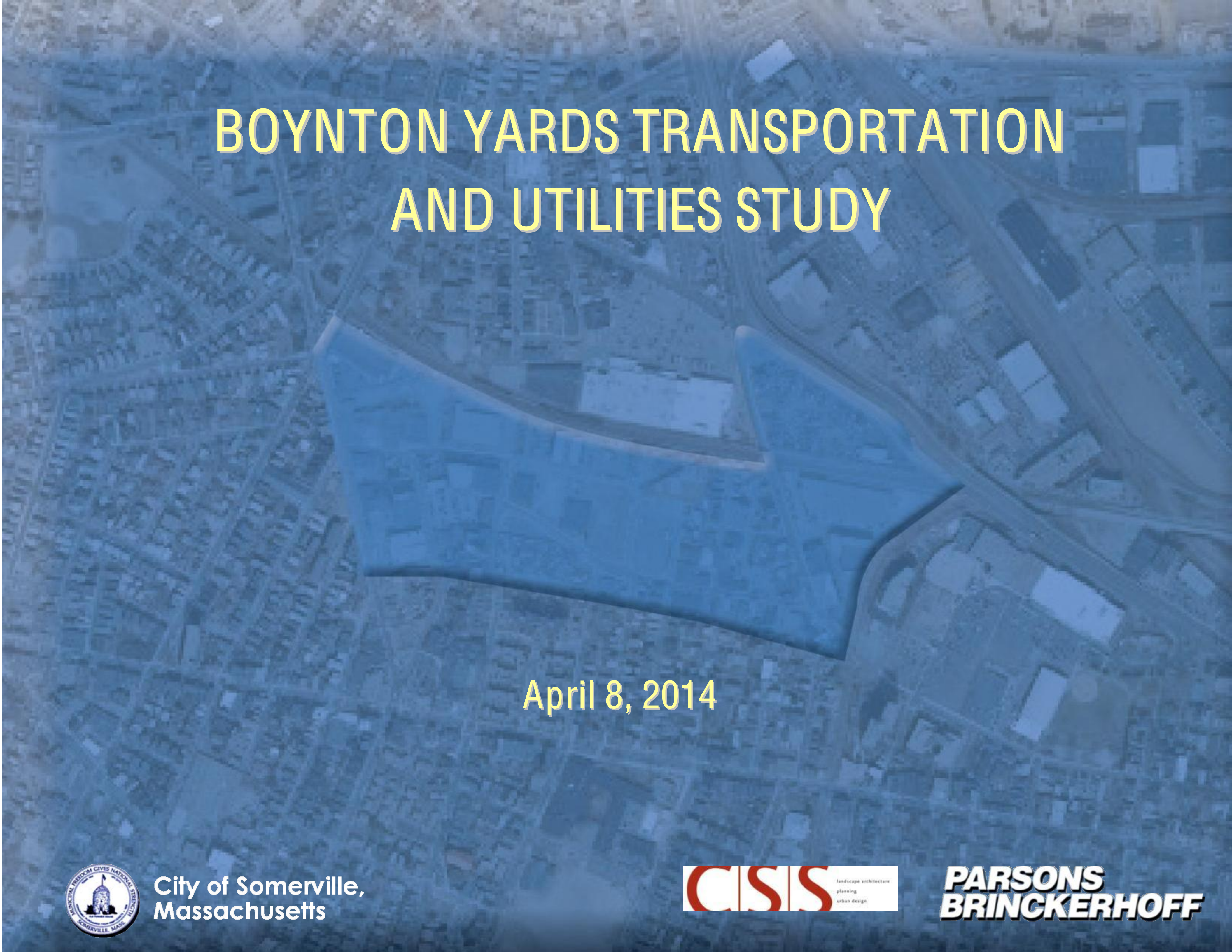


BOYNTON YARDS TRANSPORTATION AND UTILITIES STUDY

April 8, 2014

City of Somerville, Massachusetts

CSS landscape architecture planning urban design

PARSONS BRINCKERHOFF

Table of Contents

List of Figures

List of Tables

• Study Overview

The present circumstances offer a unique and extraordinary opportunity for the Boynton Yards area, seen in Figure 1. The Green Line Extension (GLX) and the opening of Union Square station – planned for 2017 – will increase access to a location that is already close to downtown Boston (2 miles) and to Kendall Square/MIT (1 mile). Along with proximity to existing commercial centers the City of Somerville is setting the table for an immediate neighbor across the tracks, the "D2 Block" in Union Square, for significant transit-oriented development (TOD) development.

Figure 1. Birdseye View of Boynton Yards

The favorable positioning of Boynton Yards must be combined with planning, zoning and infrastructure policies that enable its highest and best use. The guidelines set out in the City's 30-year plan (SomerVision) call for 2,500 new jobs and 500 new residential units. The rezoning of Boynton Yards occurred along with Union Square in 2009 and created districts with increased height and floor area ratio (FAR) to accommodate higher scale development and the potential for its reinvention as a 21st century mixed-use employment center. However, in its current condition the area suffers from a number of challenges: road access is confusing and inadequate, ownership is highly diversified and parcels are small and irregular. There are no clear visual corridors into Boynton Yards, giving this 30 acre district a sense of being "hidden" between Cambridge Street and Union Square.

This study is a framework for the next steps in the progression of Boynton Yards. It provides recommendations to address issues of transportation, urban design and utility capacity within scenarios that achieve the ambitious objectives set out by SomerVision. It offers solutions for the desired land use schemes through road configurations, parking and utilities that will support appropriate development. It will help to set the correct expectations for collaboration between the City of Somerville, a Master Developer Partner and current property owners working together toward the area's transformation.

On December 5, 2013, the Somerville Redevelopment Authority issued a Request for Qualifications (RFQ) seeking a Master Development Partner for seven (7) parcels in nearby Union Square. These seven parcels offer the potential for approximately 2.3 million square feet of new development.

The Study Area, seen in Figure 2, is generally bounded by Somerville/Cambridge City Line to the south, Webster Street to the west, Somerville Avenue and McGrath Highway to the north, and the boundaries of Twin City Plaza to the east.

The goal of the plan is to identify a conceptual roadway and utility network alternative that will:

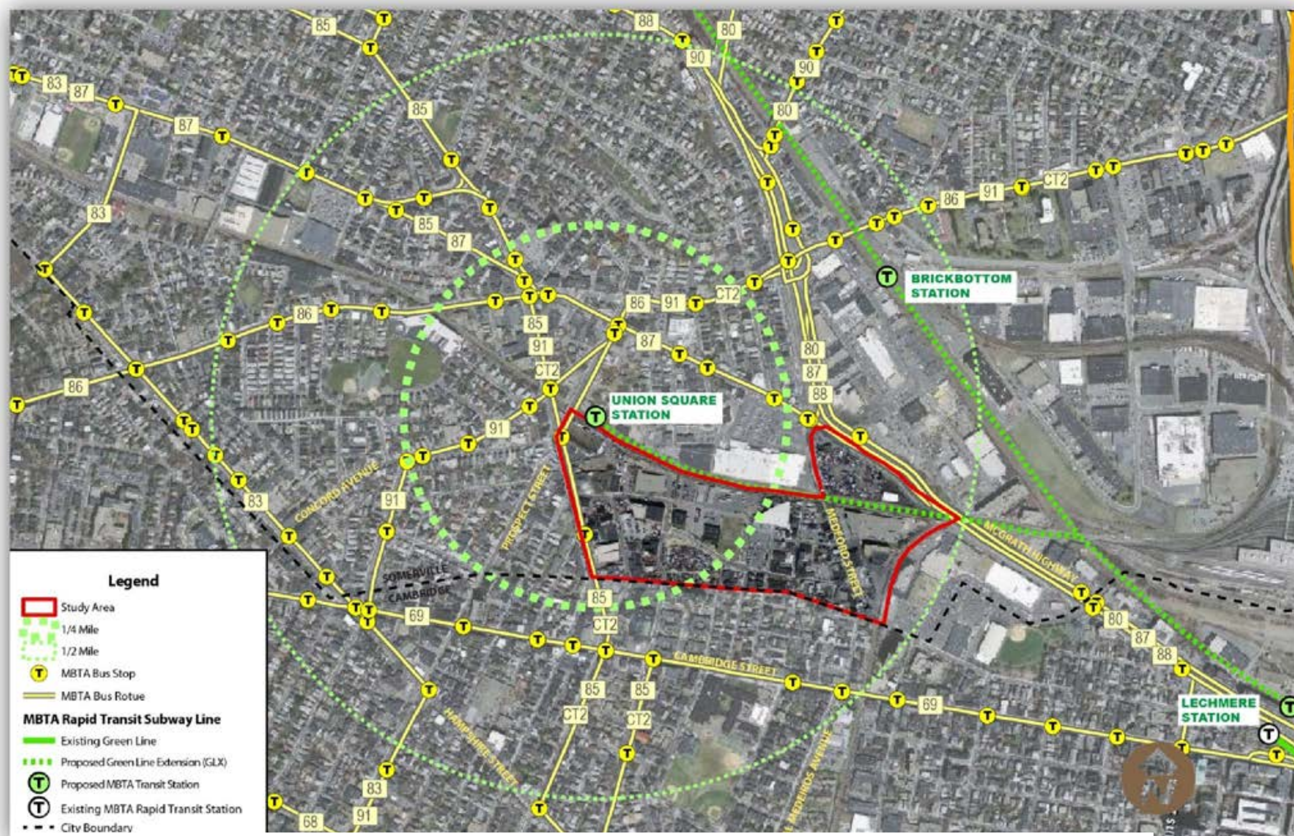


Figure 2. Boynton Yards Study Area

- Facilitate a rational development pattern that allows the stakeholders to maximize the development potential of the area while promoting transit and addressing traffic and congestion;
- Improve access, flow, and safety for all modes of transportation - vehicular, pedestrian, bicycle, MBTA bus service, and the anticipated MBTA Green Line extension;
- Provide proper municipal utility capacity for dense commercial and residential redevelopment; and,
- Reconnect Boynton Yards with adjacent areas by making it more visible and by using open space both to maximize public space and to create pedestrian links.

• Study Area Existing Conditions

The Primary Project Area contains 186 parcels spanning 43 acres. The parcels have a combined assessed value of $84.1 Million and just over a million square feet of built space. The following sections describe the existing conditions in the Study Area.

Land Use and Zoning

Boynton Yards has been a historically important part of the City's economic engine. From its past identity as a meatpacking and slaughter-house hub, and manufacturer of bricks, soap, ice cream and glass, it has long been the source of employment for a largely residential city. The Boynton Yards area is intricately linked to the commerce and activity of Somerville's oldest commercial district, Union Square.

Figure 3. Existing Land Use (2005)

Within the Study Area, existing land use is broken down into four categories as seen in Figure 3: commercial, industrial, multi-family residential, and transportation. Industrial uses occupy approximately half of the 43 acres.

In preparation for the MBTA Green Line extension to Union Square and to develop a plan for the infrastructure that will allow the City to reinforce the identity of Boynton Yards as an employment center, the City updated zoning ordinances in 2009 to promote transit-oriented development (TOD) in Boynton Yards. The City of Somerville Zoning Ordinance details the different uses that are permitted on Study Area parcels; See Appendix A for zoning guidelines for TOD Zones in the Study Area.

Within the Boynton Yards Study Area, the following zoning is permitted at designated parcels, as seen in Figure 4:

- TOD 55
- TOD 70
- TOD 100
- TOD 135
- Business A
- Residence B

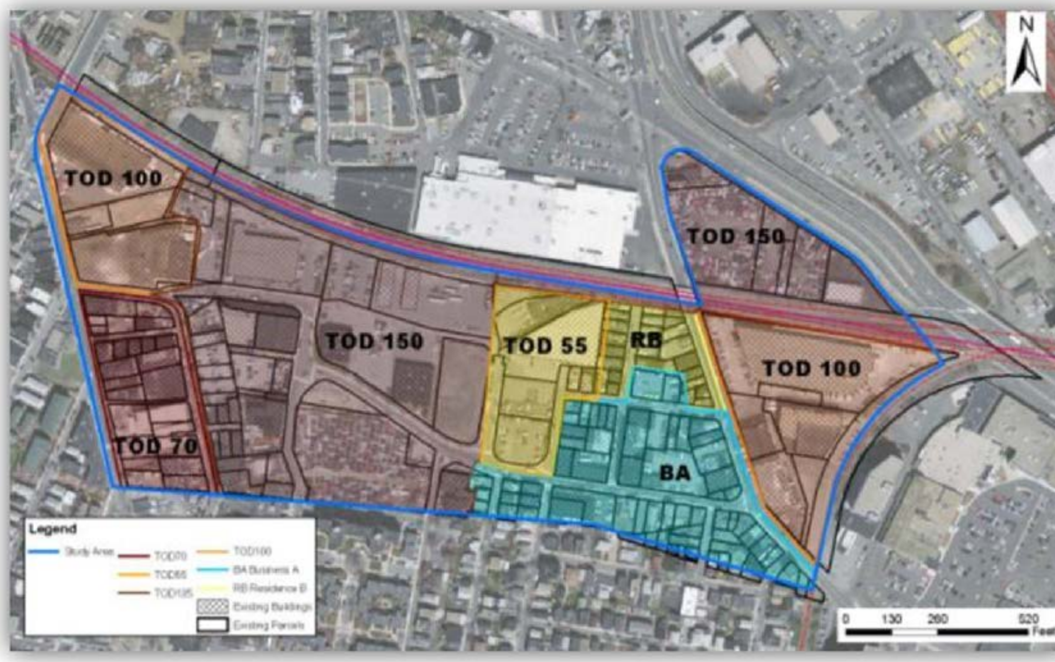


Figure 4. Existing Zoning

Transportation

Auto Traffic

Access into the Boynton Yards Study Area is provided by three major roadways: Webster Street from the west, Medford Street from the east, and Cambridge Street from the south. It is bound by the MBTA Fitchburg Commuter Rail Line to the North. There is limited connectivity thru the Study Area as a result of building locations, one-way versus two-way street configurations, and the railroad right-of-way to the north. South Street, the longest east-west roadway in the Study Area, is two-way from Windsor Street to Harding Street, but then becomes one-way westbound from Harding Street to Medford Street. In addition, Willow Street, Hunting Street, and Harding Street are all one-way in the Study Area. The southern limits of the Study Area represent the City Line, with the City of Cambridge to the south, so improvements on north-south roadways addressed in this study are limited to the City of Somerville.

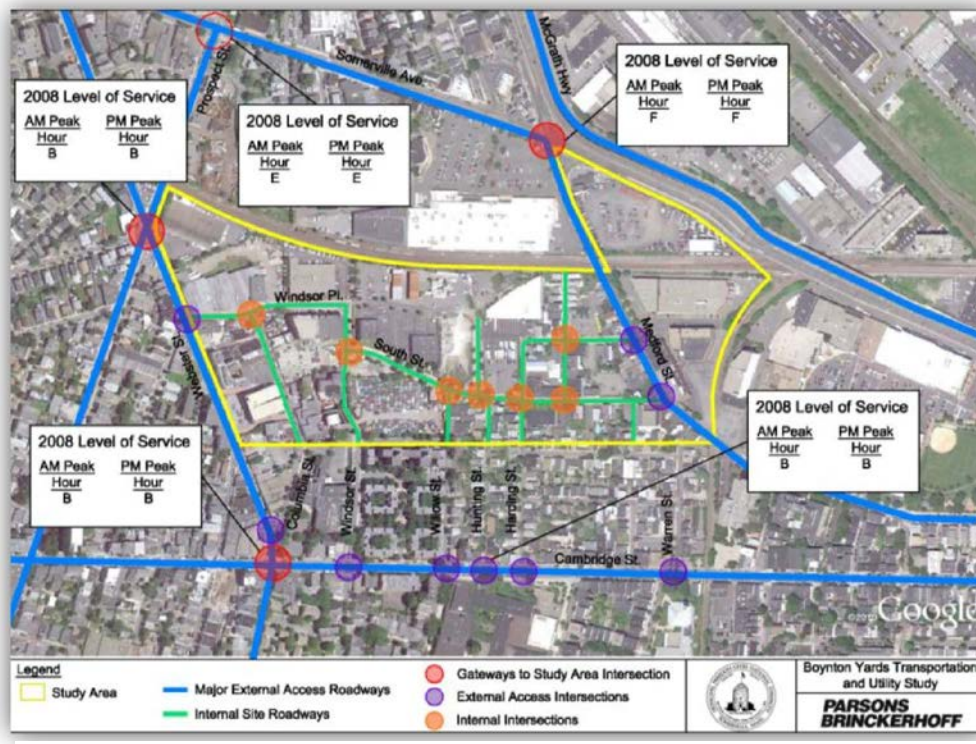


Figure 5. Existing Traffic Operations

The 2010 Union Square Functional Design Report prepared for the City of Somerville provided analysis of existing intersection traffic operations adjacent to the Study Area, with 2008 as the existing conditions analysis year.

The delay at an intersection corresponds to an approach and intersection Level of Service (LOS), defined in the *2010 Highway Capacity Manual* (HCM). LOS is an index used to grade intersection operations and ranges from LOS A (free flow conditions with minimum traffic delay) to LOS F (long delays, intersection at capacity). Delay represents a measure of driver discomfort, frustration, fuel consumption, and lost time. Based on the National Standards Highway Guide, the recommended LOS is C, a condition of stable flow.

The intersections of Somerville Avenue and Prospect Street and Somerville Avenue and Medford Street/McGrath Highway, which carry traffic to/from I-93 and McGrath Highway, currently operate at LOS E and F respectively for the AM and PM Peak periods as seen in Figure 5. Other intersections adjacent to the Study Area, including Webster Street and Prospect Street, Webster Street and Cambridge Street, and Cambridge Street and Hunting Street, operate at an acceptable LOS B in the peak periods.

In addition to vehicular traffic in and adjacent to the Study Area, transit access is provided by the MBTA bus routes and future MBTA Green Line Station. There are seven existing MBTA bus routes (69, 80, 85, 87, 88, 91, and CT-2) that provide service within 1/2 mile of the Study Area in both Somerville and Cambridge, as seen in Figure 6. The Green Line Extension Project, which includes the construction of Union Square Station has been approved by the MassDOT Board and is expected to open by mid-2017.

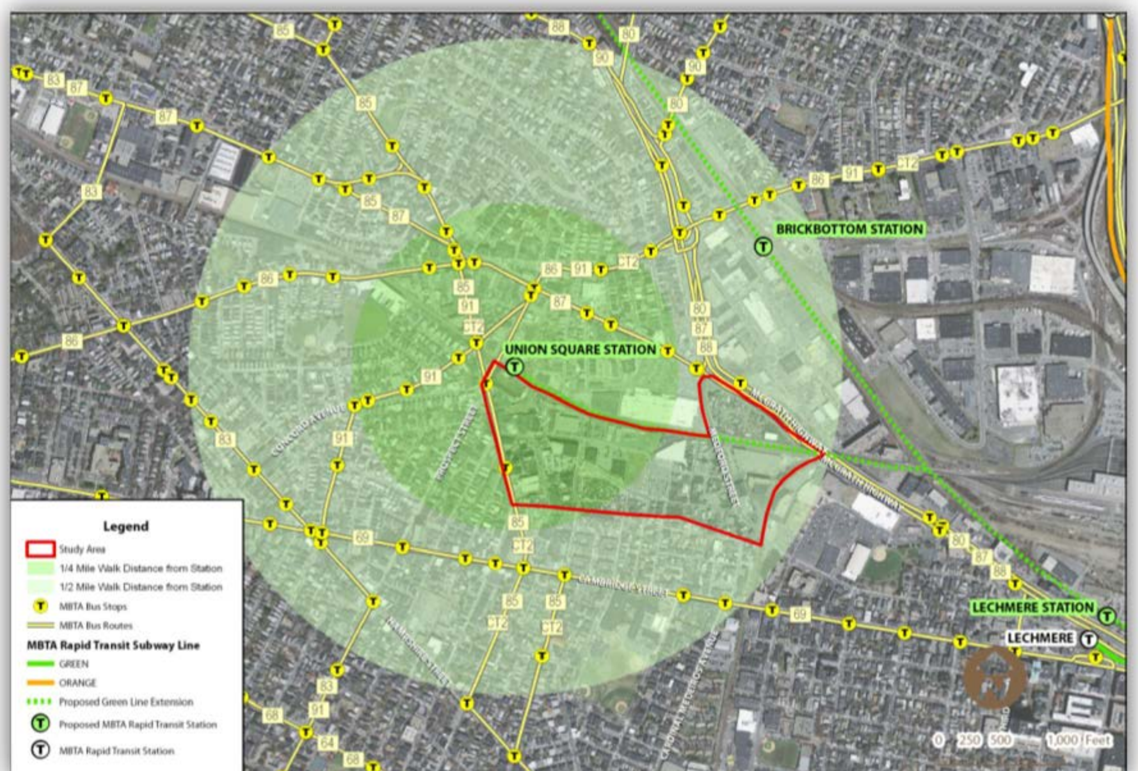


Figure 6. MBTA Transit Service Adjacent to Study Area

Bicycle and Pedestrian Traffic

Bicycle and pedestrian counts were conducted at the following four intersections within the Study Area and on the adjacent arterials of Webster Avenue, Prospect Street, and Medford Street in Spring 2011 to understand passerby and through traffic during the AM and PM peak hours as seen in Figure 7 and 8:

- Webster Avenue & Prospect Street
- South Street & Windsor Street
- South Street & Harding Street
- South Street & Medford Street

The heaviest bicycle and pedestrian flows were on the arterials, with higher volumes traveling southbound on Prospect Street, Webster Avenue, and Medford Street in the AM peak period and higher volumes traveling northbound in the PM peak period.

Bicycle and pedestrian traffic within the Study Area was limited, although the heaviest movements were to/from the commercial areas on Windsor Street. Counts were low on South Street and on the eastern half of the study area adjacent to the existing residential areas of Boynton Yards.

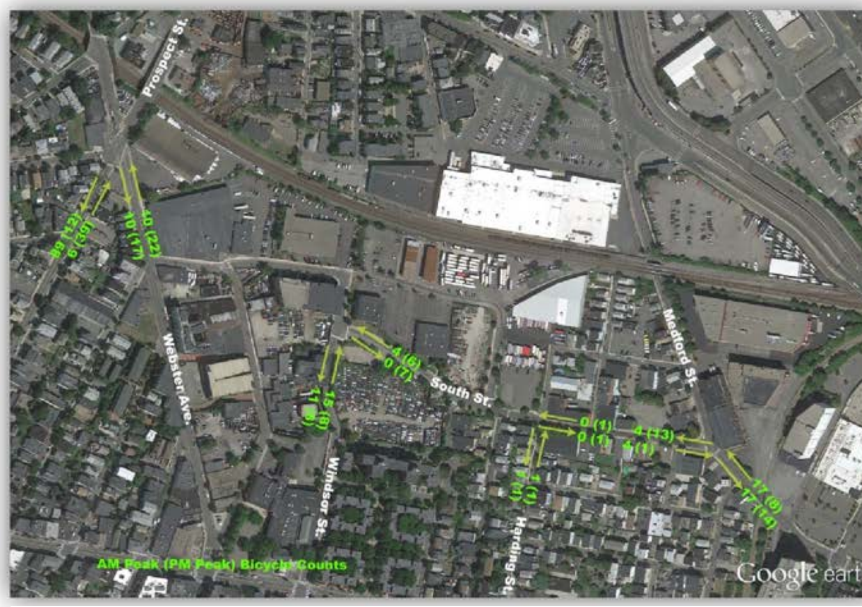


Figure 7. Peak Hour Bicycle Counts (2011)

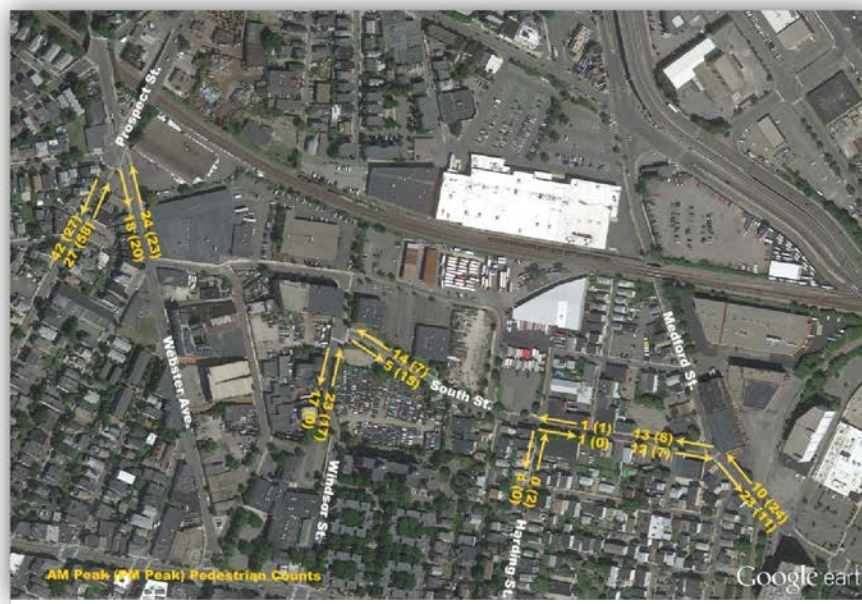


Figure 8. Peak Hour Pedestrian Counts (2011)

Water Supply

The City of Somerville municipal water system is fed by the Eastern Spot Pond Supply Main (ESPSM) of the Massachusetts Water Resources Authority (MWRA) as shown in Figure 9. This water transmission supply main (also known as MWRA Section 4) runs along the western perimeter of the Study Area on Webster Avenue. MWRA Meter #37 is located on Webster Avenue between Prospect and Tremont Streets. It feeds a 20-inch municipal main in Webster Avenue.

This 20-inch line, in turn, feeds a 16-inch line in Columbia Street, which serves as the principal water supply main for the Boynton Yards area. The 16-inch line continues east across the northern portion of Boynton Yards, in Windsor Place and a private way over to Ward Street. A 16-inch branch of the line runs to the south in Windsor Street, connecting to the relocated South Street in the middle of the Study Area.

With the exception of these 16-inch lines, the remainder of Study Area is served by smaller and older water mains, typically 6 to 10 inches. The report *Water Distribution System and Capital Improvements for Somerville, Massachusetts, April 2012* by Kleinfelder/SEA identifies several fire flow failure nodes in the Study Area (shown as orange squares in Fig 10). The interior water mains are not adequately sized for existing fire flow demands (defined as a hydrant flow of 2,000 gpm at 20 psi residual pressure). High-rise construction allowable under current zoning requires greater residual pressure for sprinkler systems. In lieu of such pressure, a fire pump would need to be provided to pressurize the sprinkler system.

The 2012 study also recommends improvements for the Windsor Avenue main, including replacing the section between Columbia Street and the Cambridge line, as well as cleaning and lining the main running from Meter 37 towards Union Square.

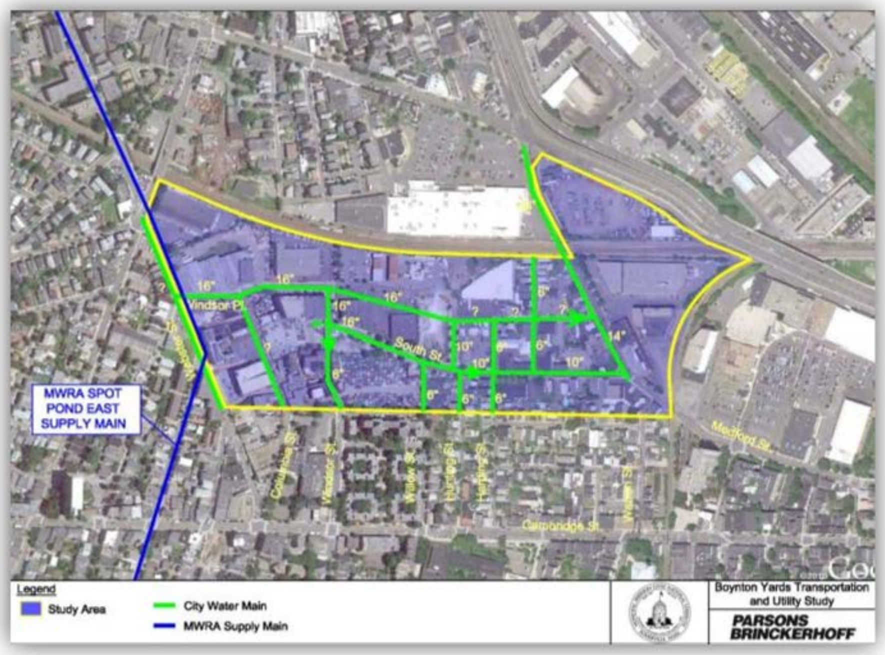


Figure 7. Existing Water Supply

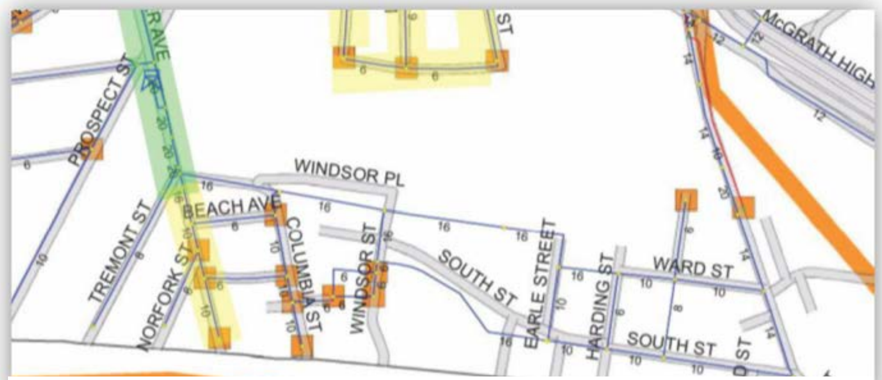


Figure 8. Area Map with Recommendations for 2006 CIP from *Water Distribution System and Capital Improvements for Somerville, Massachusetts, April 2012* by Kleinfelder/SEA

Storm Drainage System

Storm drainage from the Study Area is handled by a system of mostly combined sewers, where storm water mixes with sanitary sewage. Ultimately wet weather storm flows discharge either to the Charles River or the MWRA Deer Island Treatment Facility via connections to the MWRA Cambridge Main Interceptor at "MWRA-18" east of Medford Street along McGrath Highway.

Lack of Storm-Sanitary Separation

In the upper map at the right (Figure 11), the combined sewers are indicated in orange. The combined sewers in Boynton Yards also receive storm flow from an area to the west and south (show in brown on the upper map).

The South Street reconstruction project introduced a separated local storm drain line (in red in the upper and lower maps). However, it connects to a 48-inch combined sewer in Medford Street, and thus there is no true storm separation in this area. Nevertheless, a substantial portion of the Study Area is served by a local separated storm, as indicated by the area of green shading in the lower map.

The 48-inch Medford Street combined sewer discharges to a 72-inch combined sewer in Somerville Avenue, which, in turn, flows to a regulator (MWRA-18), located east of the intersection of Medford Street and Somerville Avenue. Dry weather flow plus a portion of wet weather flow discharges to the MWRA Cambridge Main Interceptor (CMI), which ultimately discharges to the MWRA Deer Island Treatment Facility. Wet weather overflows from MWRA-18 flow east along a major combined sewer overflow pipe in McGrath and O'Brien Highways to the MWRA Prison Point Pump Station at North Point in Cambridge. From the pump station, a 24-inch dry weather force main discharges to the MWRA's

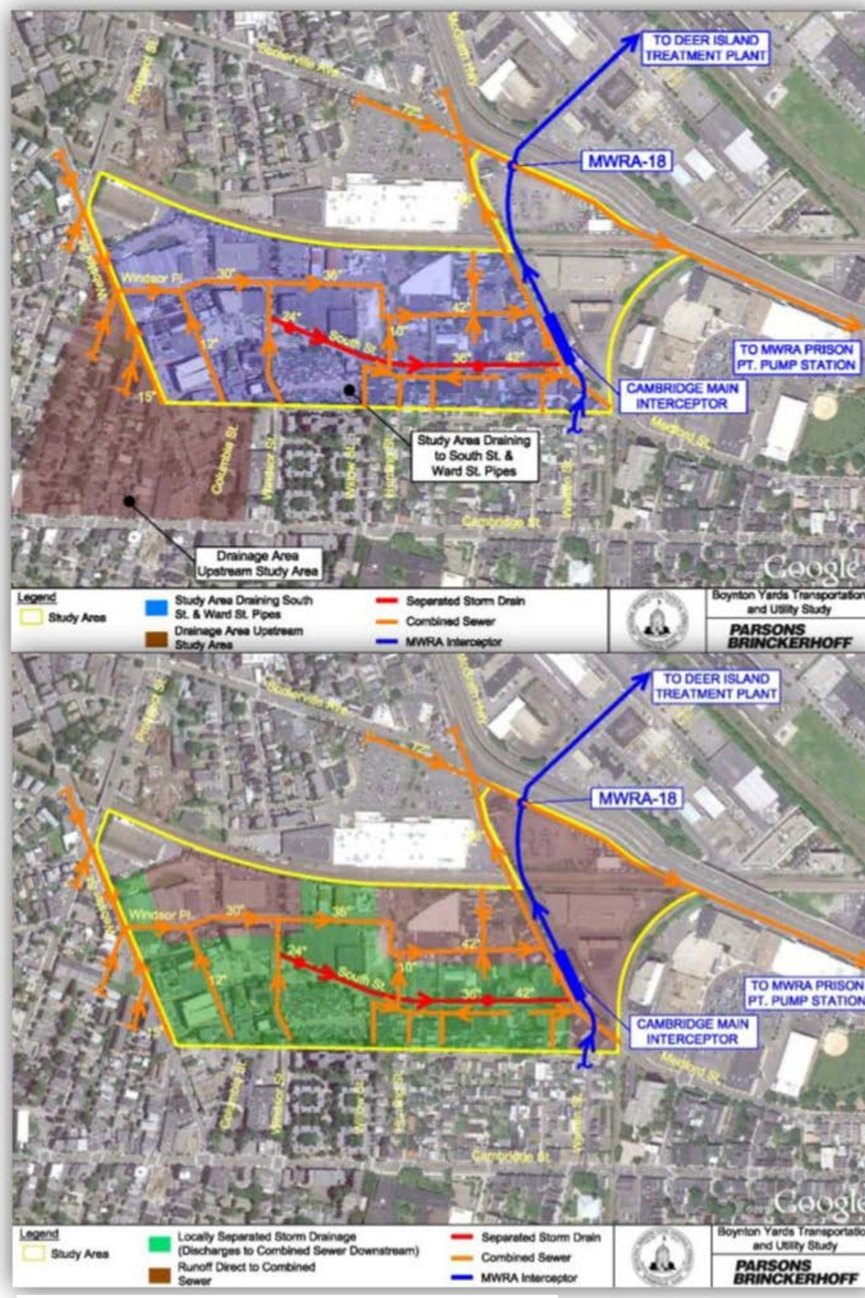


Figure 9. Existing Storm Drainage System

Charlestown branch sewer while a 96-inch wet weather force main discharges to the Charles River downstream of the dam.

Limited Hydraulic Capacity

The existing storm drainage system capacity is limited by the lack of a free discharge, as well as the limited capacity of the CMI. The Boynton Yards area and the lands downstream of it are filled tidelands, mostly salt marshes associated with the Millers River. Therefore, the existing pipes downstream of the Study Area are very flat, restricting their hydraulic capacity.

Contributing to the drainage problem is the issues at combined sewer overflow SOM 010 on Inner Belt Road. The regulator at SOM 010 was originally design to send only dry weather flow into the MWRA's CMI sewer while wet weather flow would go into the "old stone conduit" which begins at Inner Belt Road and runs to the east along the at-grade Yard 10 lead track and eventually discharges to what is left of the Millers River. However, as described in the MBTA North Terminal Area Drainage Study, this conduit is mostly filled with sediment. Therefore much of the wet weather flow from Washington Street and Inner Belt surcharges the regulator and floods the MWRA's CMI, causing tailwater effects in all combined sewers back throughout the Boynton Yards area and even back to Central Square in Cambridge.

Sanitary Sewer System

In both maps at the right (Figure 12), the combined sewers are indicated in orange, while the separated sanitary sewers are indicated in red. While the storm drainage system flows entirely towards Medford Street, the sanitary sewershed is split. The brown area in the upper map flows to Medford Street and MWRA-18 while the green area flows to Webster Street and ultimately to MWRA-17.

While most of the storm drainage in the Study Area discharges to combined sewers, portions of the existing sanitary sewer system is separated from pipes carrying wet weather flow.

In the local Study Area, there are separated sanitary sewers in the Webster Street corridor, as well as along South Street where separated line were constructed in the 1990s. The lower map indicates the properties that are served by separated sewer lines in green, whereas the brown areas are served by combined sewers.

Throughout the Study Area, all dry weather sanitary discharges to the MWRA CMI and the Deer Island Treatment Plant. Existing capacity is limited by the capacity of the CMI, which is taxed by wet weather flows from Cambridge and Somerville.

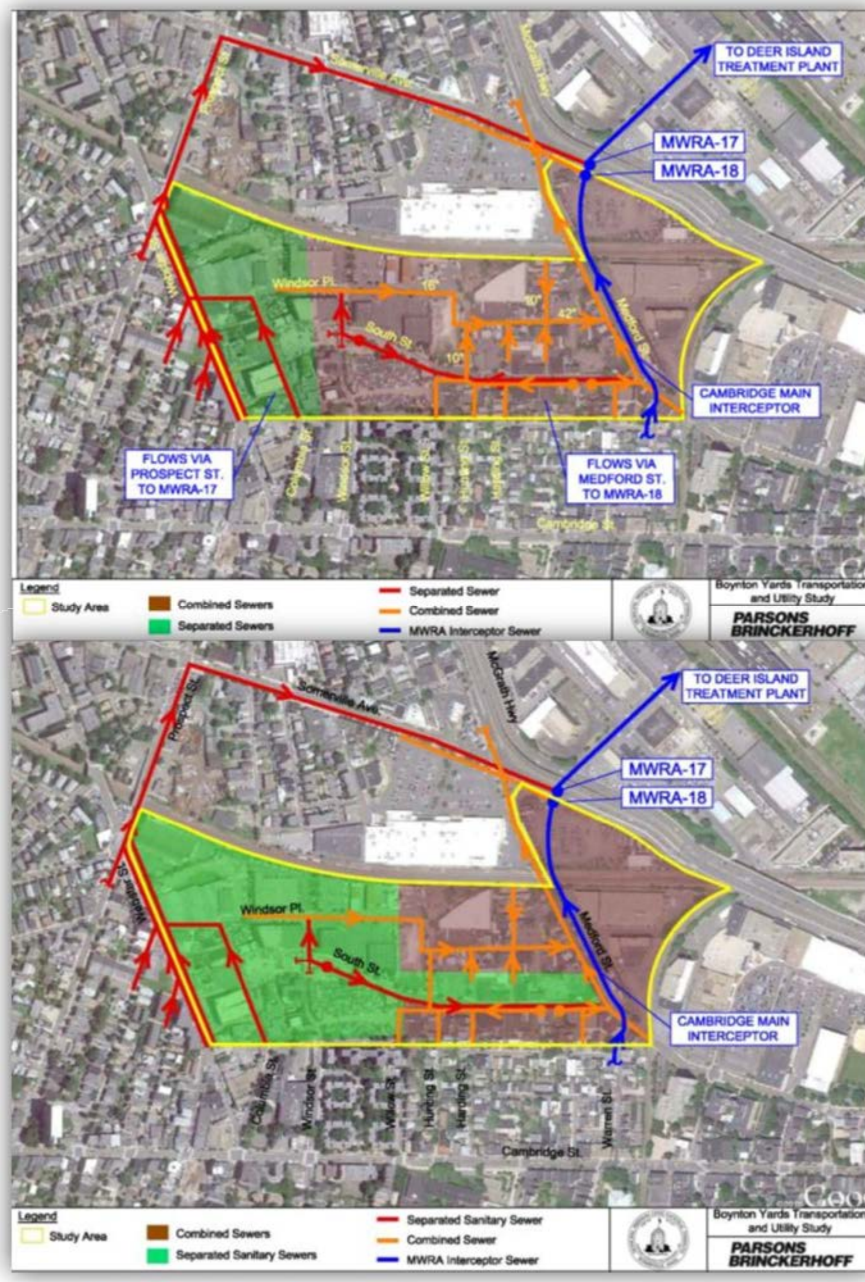


Figure 10. Existing Sanitary Sewer System

- ## Alternatives Analysis

Although a number of different scenarios are considered in this report, it should be noted that the City's stated preference is for the majority of new growth in both Boynton Yards and nearby Union Square be in the area of commercial development. Both the City's long range planning document "SomerVision" and the 2012 Union Square Revitalization Plan identify Boynton Yards as the site of at least 2,500 new jobs over a twenty year period. Having been identified by SomerVision as an area to be transformed, Boynton Yards' proximity to research centers such as Kendall Square and major educational institutions suggests that Boynton Yards could be developed as a campus style setting. The City's goal in seeking a Master Development Partner for nearby Union Square might serve as an opportunity to work in concert with a Master Developer for the planning and growth of Boynton Yards.

Zoning and Build Out Estimate

The total land area potentially available for redevelopment in Boynton Yards is 1,265,000 square feet. Eliminating the existing roadway footprint (207,750 square feet), leaves 1,057,250 square feet of residual area for redevelopment. Based on the existing zoning in the area, Table 1 describes the maximum potential build out.

Table 1. Zoning & Build Out Estimate

Zoning	Lot Area	Floor Area Ratio (FAR)	Residual Area	Gross Square Footage (GSF)
TOD 55	290,000	3	242,374	727,121
TOD 70	160,000	4	133,723	534,893
TOD 100	160,000	4	133,723	534,893
TOD 135	655,000	6	547,430	3,010,864
TOTAL	1,265,000	-	1,057,250	4,807,771

Roadway Configurations

In order to provide access to the new development parcels, evaluation of potential roadway configurations was a key element. Providing connectivity of roadways, direct links, multiple points of entry, and minimizing dead-ends were goals of the roadway network in order to improve accessibility and reduce vehicle travel times in the Study Area. Connectivity both internally within in the Study Area and externally with Webster Avenue and Medford Street are important for accessibility of new development. Areas with direct paths also increase the likelihood of pedestrian and bicycle trips. Since the Study Area is bound by the MBTA Fitchburg Commuter Rail Line to the North and the City of Cambridge to the South, the critical connections that could be defined by this study were the east-west connections between the two feeder roadways:

Webster Avenue and Medford Street. In all of the scenarios presented in the following sections there are two east-west roadways recommended to maximize connectivity through and within the Study Area.

The first roadway is the realignment and extension of the existing South Street so it runs continuously between Webster Avenue and Medford Street; currently it ends at a T-intersection with Windsor Street in the Study Area. Realigning the roadway will provide a continuous link in the south portion of the Study Area. The second recommended roadway is the east-west connection of the existing Ward Street (off Medford Street) and Columbia Street (off Webster Avenue) in the northern portion of the Study Area. This roadway has modified alignments in the different scenarios presented below but is referred to as North Street. The connections of these two east-west roadways will result in four primary entrances to the study area: Medford Street & South Street, Medford Street & North Street, Webster Avenue & South Street, and Webster Avenue & North Street.

In addition to the traffic benefits of connectivity, there are also urban design benefits. New, highly visible street corridors connecting Webster Avenue and Medford Street will allow passerby's on Webster Avenue and Medford Street to see clearly into the Boynton Yards site, provides access to parking and pick-up/drop-off areas, and will create a boulevard with well landscaped sidewalks and bicycle facilities that create an identity for the district and could serve new ground level retail development.

Building Typology

The building forms shown in the illustrative site plans and 3-D diagrams for each of the alternatives described in subsequent sections are based on specific building typologies. While the footprints, floor plates, and heights accurately reflect these typologies, the plans are considered to be site capacity analyses and are not illustrative designs reflecting architectural intent. The precise footprint, setbacks, stepbacks, roofline, and building façade articulation, as well as loading and service zones, will be addressed in the next phase of planning. In some cases, the building volumes could be split or joined to create more flexible floor plates that respond to the market.

Retail

It is assumed that ground floor retail will be incorporated into select buildings at the northwest corner of the site along Webster Avenue and North Street, and into buildings fronting Medford Street. The retail footprint varies from 80' to 100' in depth and first floor height is assumed to be 20'.

Residential

The apartment buildings are 60' deep and vary considerably in length. The building designs assume dwelling units of 880 gross square feet.

Research and Development (R&D)

The R&D buildings feature very large floor plates of approximately 100,000 square feet with the exception of Scenario 1. In that scenario two smaller R&D buildings could be connected to create a 60,000 square foot floor plate. The maximum size of these buildings is 500,000 to 600,000 square feet.

Office

The optimal office floor plate depth is 90'-100' and the total square footage of each floor plate varies from 15,000 to 30,000 square feet. For most office buildings the total square footage is in the 50,000-100,000 square foot range for the smaller buildings and 150,000 to 300,000 square feet for the larger buildings.

Parking Structures

The parking garages are all either 120' or 180' wide. The optimal length would be in the 300' to 325' range although some of the parcels restrict the length.

Limitations of Building in Air Rights over Railroad

In developing the scenarios described in this section, consideration was given to the feasibility of air-rights development over the MBTA Fitchburg Line railroad tracks for the parcels adjacent to Prospect Street as seen in Figure 13. The GLX would add two Green Line tracks to the two existing commuter rail tracks. Such air rights development would require rights from the MBTA as well as provide technical challenges including the following:

- Varied column spans: The center column line, which runs between the Green Line and commuter rail tracks, is organized on a slight curve. While the column line to the north (and maybe to the south as well) could be straight, the curved center column line would result in spans of varying length. This variable length would require the use of transfer beams, increasing structural inefficiency and construction cost.
- Rail Operations: Because of the need to avoid interruptions in service to both the Green Line and commuter rail below, much of the construction would have to occur during off-hours, rather than during regular operating hours. Additional liability insurance would be required as a result of building over active rail lines. Also, fire separation would be required between the transit use and any residential or commercial use. These considerations would also add to construction costs.
- Limited Frontage: If the building were to be just on the air-rights, it would have very little frontage on Prospect Street. *If it were built as a connection between buildings north and south of the tracks, this would not be an issue.*
- Vertical Circulation: Vertical circulation (stairs, elevators, escalators and fire stairs) all would need to come down to ground on the parcels north or south of the tracks, resulting in asymmetric floor circulation, whereas ideally vertical circulation would be located in a centralized core of the floorplate.

For these reasons, and given the large amount of unencumbered land on both sides of the tracks, for the purposes of this evaluation, building on air-rights is not considered in these scenarios. Nevertheless, to illustrate one alternative to provide connectivity between commercial office or R & D buildings that may be located north and south of the tracks, a pedestrian bridge is illustrated as an option in Scenarios 2 and 3.

Figure 11. Potential Air Rights Development

Alternatives Development

The maximum build out described in Table 2 is based on zoning alone, but initial analysis of peak hour trip generation and parking distribution showed that the potential gross square footage that is attainable in the Study Area is constrained by the number of cars that can get into the area and the resulting amount of square footage that is occupied by parking. Assuming that there are four primary entrances to the Study Area from the City of Somerville (two off of both Webster Street and Medford Street as described in the roadway configuration section above), it was estimated that approximately 2,000 vehicles could turn into/out of the Study Area during AM and PM peak hours based on the turning capacity[1] and existing traffic on Webster Street and Medford Street[2].

---

[1] FHWA *Signalized Intersection Informational Guide* Table 117, rule of thumb capacity for left turn with no exclusive turn lanes is 125 vehicles per hour per lane. Right turn capacity of 375 vehicles per hour per lane estimated based on 2010 Union Square Functional Design Report excess capacity. A planning level lane capacity of 800 vehicles per hour was utilized.

[2] A full traffic impact study will be necessary to determine the actual lane capacities entering the Study Area, the need for left or right turn lanes at intersections, whether traffic signalization is needed to improve intersection operations, the existing amount of traffic currently going into the Study Area which will go away, and whether additional capacity into the Study Area is attainable via Cambridge Street.

Three different scenarios were studied to evaluate the potential development opportunities and roadway alternatives that are possible based on different land use criterion and parking assumptions. The alternatives that are described focus on the area of Boynton Yards located between Webster Street and Medford Street. Based on the goal criterions for each alternative, potential massing was studied to determine possible location and size of development that could occur with different development goals for the area.

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition, describes the number of vehicles arriving in the peak hour based on land use. The following peak hour arrival assumptions were applied to determine the maximum gross square footage of development that is possible based on the traffic capacity:

- Residential: 21% Peak Hour Arrivals
- Research & Development (R&D): 86% Peak Hour Arrivals
- Office: 88% Peak Hour Arrivals

The number of parking spaces required in the Study Area was calculated based on guidelines provided in the ITE Parking Generation Manual, 4th Edition. The parking demand will be highest mid-day with the following mid-day parking demand by use type:

- Residential: 44% Parked Midday
- R&D: 100% Parked Midday
- Office: 100% Parked Midday

The following sections describe each of the alternatives and the impacts they will have on transportation and utilities:

Scenario 1

Scenario 1, shown in Figure 14 creates a base plan assuming that there is the potential to redevelop all of the study area parcels with the exception of the new 84 Webster Avenue residential complex and its associated parking garage, the residential area in the northeast corner of the project area north of the existing Ward Street, and the residential area in the southeast corner south of South Street. The base land use breakdown and parking assumptions were provided by the City of Somerville are explained in the following sections.

Land Use Breakdown

The following land use assumptions were used for Scenario 1.

- 30% Residential
- 45% R&D
- 25% Office

Scenario 1 can be characterized as a boulevard with linked squares. North Street, the landscaped, pedestrian friendly boulevard links a series of rectangular and triangular plazas and squares sited between buildings and at key intersections.

Parking Assumptions

The following parking assumptions were applied based on historical parking demands in other areas of Somerville. As a result of the new MBTA Green Line station in Union Square, the City of Somerville's goal is for 40% of trips generated by R&D and Office usage in Boynton Yards will arrive by non-auto modes. The following parking assumptions were applied:

- Residential: 1 Space per Unit (1000 SF)
- R&D: 1 Space per 583 SF
- Office: 1 Space per 417 SF

Development Potential

Based on the City of Somerville's goal land use breakdown and the estimated number of cars that can be accommodated in the peak hour, the gross square footage (GSF) of development was estimated at 1.6 Million, which is broken down by use in Table 2.

Table 2. Scenario 1 – Development Summary

	Use Mix[1]	Total Cars[2]	Peak Hr Cars[3]	GSF[4]
Residential	30%	480	101	480,000
R&D	45%	1,235	1,062	720,000
Office	25%	959	844	400,000
TOTAL		2,674	2,007	1,600,000

[1]City of Somerville Goal for Scenario [2]Total Cars = GSF / Parking Allotment by Use (See Parking Assumptions Above)
[3]Peak Hour Cars = Total Cars * Peak Hour Arrival Assumptions by Use (See Page 22) [4]GSF = Total GSF * Use Mix

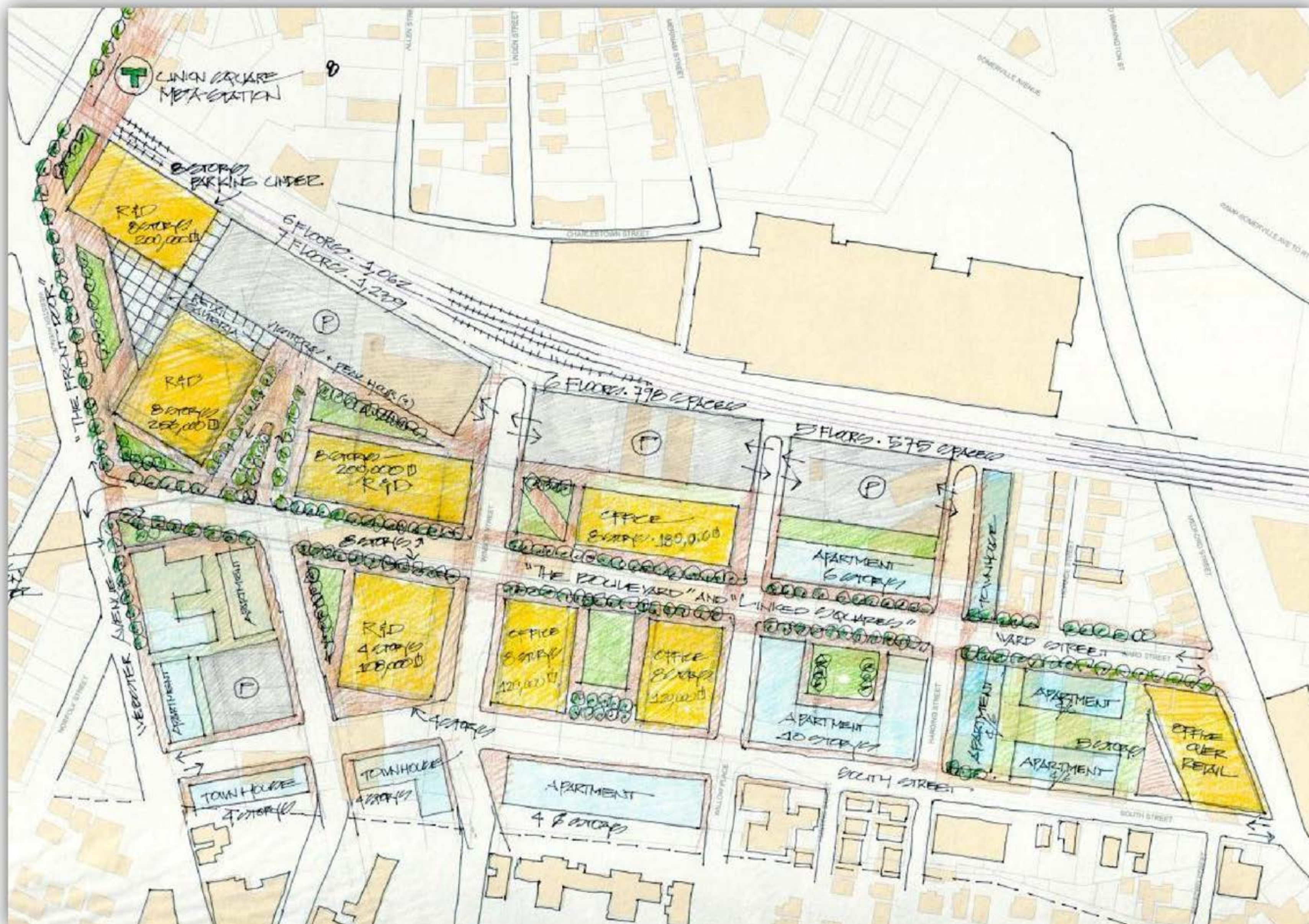


Figure 12. Scenario 1

Roadway Description and Cross Section

Scenario 1 utilizes North Street as the main Boulevard in the Study Area and improves connectivity of South Street between Webster Street and Medford Street. North Street is 68-feet total in width, with two 13.5-foot sidewalks, one 9-foot on-street parking lane, two 11-foot travel lanes, and two five-foot bicycle lanes. South Street is 50-feet total in width, with two 10-foot sidewalks, one 8-foot on-street parking lane, and two 11-foot travel lanes.

This scenario addresses the often heard comment, "Boynton Yards is invisible – you don't know it's there", by creating North Street, the new, highly visible straight street corridor connecting Webster Avenue with Medford Street. North Street serves three purposes: (1) the new North Street allows passersby on Webster and Medford to see clearly into the Boynton Yards site and to see most of the new commercial and residential frontage within; (2) it serves as the primary street for access to the new parking garages and building service areas as well as for pick up and drop off in front of most of the new development sites; (3) it would be designed as a boulevard with well landscaped sidewalks and would create an identity for the district as well as serving as the primary street for ground level retail development and pedestrian/bicycle access within the district and to and from the new Union Square MBTA Station.

Parking

Based on the parking assumptions for each of the land use categories and the midday parking demand provided by ITE, it is estimated that the maximum number of parking spaces required at the peak parking demand is 2,405 spaces. Based on the assumption of 350 SF per parking vehicle (including both parking stall and circulation), an estimated 842,000 GSF is required for parking.

Traffic Impacts

A preliminary review of potential traffic impacts based on roadway configuration, parking locations, and proposed development was completed[3]. Some of the initial impacts of Scenario 1 that could restrict meeting the goal capacity of the Study Area are the following as shown in Figure 15:

[3] A full traffic impact study will be necessary to determine the actual lane capacities entering the Study Area, the need for left or right turn lanes at intersections, whether traffic signalization is needed to improve intersection operations, the existing amount of traffic currently going into the Study Area which will go away, and whether additional capacity into the Study Area is attainable via Cambridge Street.

- Many of the patrons entering the study area will be looking for parking. If all the parking is located against the railroad tracks, more traffic would use North Street to enter the Study Area, which may lead to congestion on North Street and on Webster Street and Medford Street turning into the study area
- A rule of thumb is that you can exit 800 right turn vehicles an hour free flow from a parking structure[4]. Based on the size, location, and access points to/from the parking structures off Windsor Street and Earle Street, there is the potential for congestion during peak arrival and departure periods.
- North Street and South Street are located in close proximity which may impact their ability to distribute traffic into the study area.

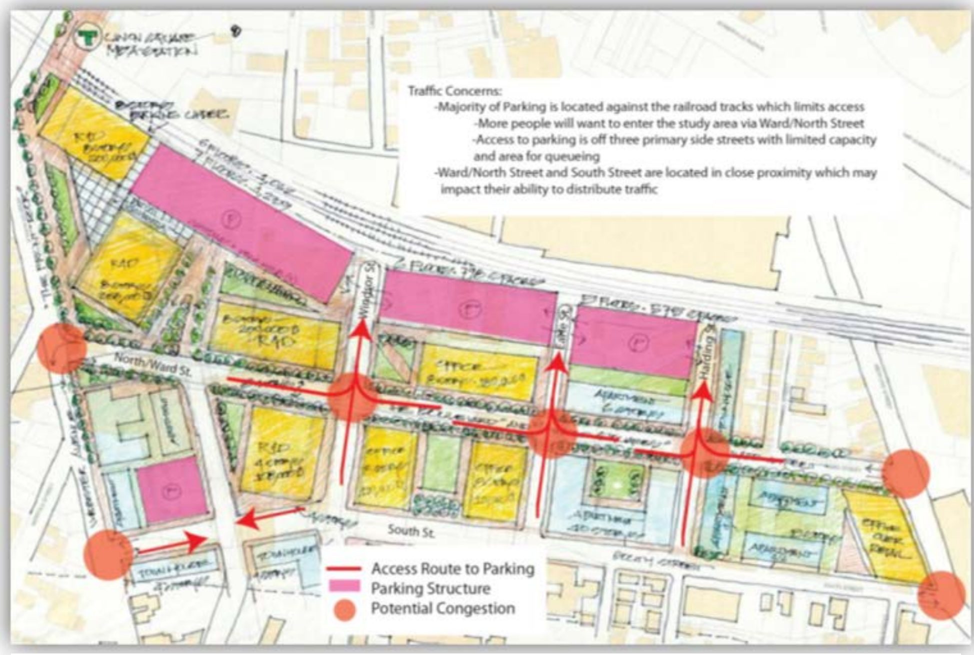


Figure 13. Scenario 1 Traffic Impacts

Utility Impacts

__Domestic Water & Sewer Demand:__ For planning purposes, water and sewer demand are considered equal. Domestic water demand is calculated by standard factors per use. Local factors, developed by the City's water system consultant Kleinfelder, are used in lieu of the statewide rates in 314 CMR 3.15 (Sewer Connection Regulations):

[4] Chrest, A.P., Smith, M., Bhuyan, S., Igbal, M., & Monahan, D. (2001). Parking Structures 3rd Edition: Planning, Design, Construction, Maintenance, & Repair.

Table 3. Estimation of Domestic Water & Sewer Demand

	GSF	Residential Units	Water Use/Unit[1]	Average Daily Demand	Maximum Daily Demand	Population	Peaking Factor	Peak Flow
Residential	480,000	400	200 gpd/unit	40,000 gpd		800		
R&D[2]	720,000	N/A	0.093 gpd/GSF	67,000 gpd		2,160		
Office[2]	400,000	N/A	0.093 gpd/GSF	37,200 gpd		1,600		
TOTAL	1,600,000			144,200 gpd	191,700 gpd	4,560	3.0	400 gpm

Notes:

1. Assumes average 1,200 SF and 2 persons per residential unit. Assumes 3 per 1,000 SF for R&D and 4 per 1,000 SF for Office.
2. Office and R&D from Water Resources Engineering. Residential is a blended rate (averaging apartment and townhouse demands) from 2006 Somerville Water System study by Kleinfelder.
3. Daily peaking factor is 1.33, based on 2006 Somerville Water System study by Kleinfelder.
4. All figures are rounded for planning purposes.

Total Water Demand: Total water demand includes domestic uses (bathrooms, kitchens, irrigation), process (e.g., for R&D, this can be several times the domestic demand) and fire flow. For planning purposes, we use a factor of 4 for R&D process water demand. The actual demand depends on the actual R&D processes. The fire flow is a standard fire flow of 2,000 gpm, as recommended in the letter report for the City by Kleinfelder dated May 1, 2013.

Table 4. Estimation of Total Water Demand

	Basis	Peak Water Demand	Peak Sewer Demand
Domestic	See Table 3	400 gpm	400 gpm
Process	67,000 gpd x R&D factor (4.0) x peak factor (3.0)	700 gpm	700 gpm
Fire	Standard fire flow	2,000 gpm	N/A
TOTAL		3,100 gpm	1,100 gpm (2.5 cfs)

Water Supply: Water supply from the MWRA Meter #37 will be adequate. Due to the reconfiguration of City streets, increased water demand, and age of existing water mains, local water mains will likely be replaced, based on water system modeling of the actual development proposal.

Storm and Sewer Systems: Due to the reconfiguration of City streets, new lines will be required throughout much of the Study Area. Storm – sewer separation should be implemented within the Study Area. The peak sewer flow can be handled by nominal pipe sizes within the project area (8 to 12 inch diameter).

Table 5. Estimation of Storm Runoff for Existing and Scenario 1

		Existing	Scenario 1
Runoff Volume	10-year	12.2 Acre-feet	12.5 Acre-feet
	25-year	15.0 Acre-feet	15.2 Acre-feet
	100-year	19.2 Acre-feet	19.4 Acre-feet

Scenario 1 will result in slightly more runoff when compared to the existing conditions.

Scenario 2

Scenario 2, shown in Figure 16 aims to keep the existing 561 Windsor building in additional to the residential areas described in Scenario 1 (84 Webster Avenue residential complex and its associated parking garage, the residential area in the northeast corner of the project area north of the existing Ward Street, and the residential area in the southeast corner south of South Street) while realigning streets and creating new development parcels. It also evaluates the opportunity for a pedestrian bridge across the railroad tracks to Parcel D2 and development in the Ward Street neighborhood.

Land Use Breakdown

The goal of Scenario 2 is to increase the office and residential uses in the Study Area and reduce R &D. It utilizes a central park to create green space in the study area. The following land use assumptions were applied:

- 40% Residential
- 15% R&D
- 45% Office

Scenario 2 is characterized by a large central park, defined by North Street, South Street, Winsor Street, and Willow Place extended. The park is fronted by mid-rise apartments, office buildings and, potentially, an R&D building. North Street makes a dog leg around 561 Winsor Street, and is less prominent than in Scenario 1. A series of pedestrian ways link the park and its ring of higher density mixed-use buildings to the new MBTA Union Square Station. These connected walkways start from the northwest corner of the park, continue behind 561 Winsor, go north on Columbia Street and through a mall between a set of related mixed-use buildings (office and ground floor retail) in the large parcel anchoring the northwest corner of the Boynton Yards site. The mall terminates at Webster Avenue next to the MBTA Union Square Station.

Parking Assumptions

Scenario 2 utilized the same parking assumptions that were applied to Scenario 1. The following parking assumptions were applied:

- Residential: 1 Space per Unit (1000 SF)
- R&D: 1 Space per 583 SF
- Office: 1 Space per 417 SF

Development Potential

Based on the goal land use breakdown and the number of cars that can be accommodated in the peak, the gross square footage (GSF) of development was estimated at 1.6 Million, as described in Table 6.

Table 6. Scenario 2 – Development Summary

	Use Mix[1]	Total Cars[2]	Peak Hr Cars[3]	GSF[4]
Residential	40%	640	134	640,000
R&D	15%	412	354	240,000
Office	45%	1,727	1,519	720,000
TOTAL		2,778	2,008	1,600,000

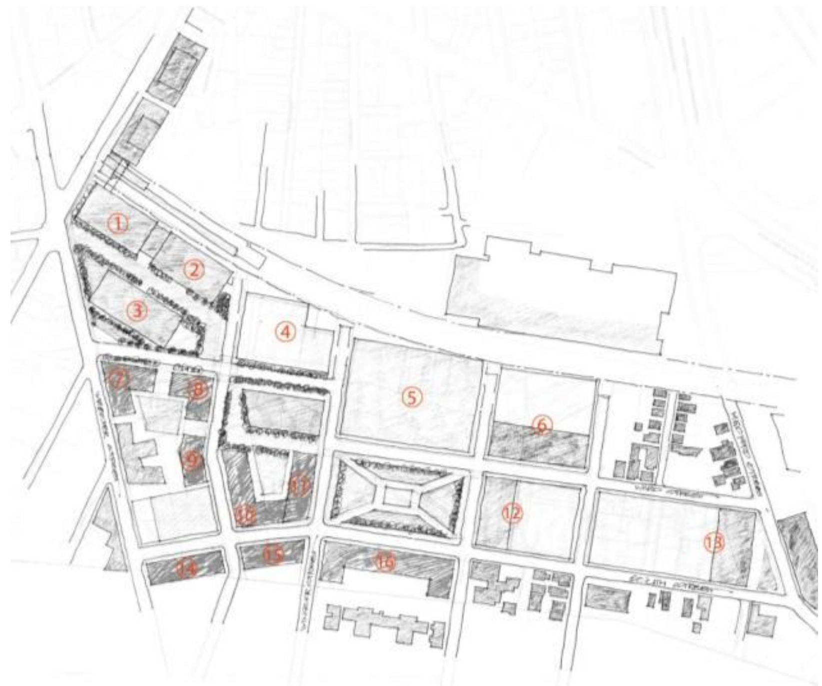
[1]City of Somerville Goal for Alternative
[2]Total Cars = GSF / Parking Allotment by Use (See 'Parking Assumptions' Above)
[3]Peak Hour Cars = Total Cars * Peak Hour Arrival Assumptions by Use (See Page 22)
[4]GSF = Total GSF * Use Mix

Figure 14. Scenario 2

Table 7 describes the estimated uses and parking under Scenario 2.

Table 7. Scenario 2 Uses

Parcel Number	Area (Sq Ft)	Function	Story's	Gross Square Footage	Unit/ Parking	Key
1	20,000	Office	8	160,000		
2	20,000	Office	8	160,000		
3	250,000	Office	6	150,000		
4	40,200	Parking	5	201,000	574	
5	97,200	R&D	3	291,600		
6	64,800	Parking	4	194,400	555	
		Office	4	64,800		
		Office	3	72,900		
		Parcel 6 TOTAL	7	332,100		
7	13,200	Housing	5	66,000	75	
8	10,800	Housing	5	54,000	61	
9	8,400	Housing	5	42,000	48	
10	17,400	Housing	7	121,800	138	
11	11,400	Housing	12	136,800	155	
12	468,000	Parking	4	187,200	535	
		Office	3	48,600		
		Parcel 12 TOTAL	7	235,800		
13	79,200	Parking	4	273,600	782	
		Office	4	43,200		
		Office	3	48,600		
		Parcel 13 TOTAL	7	365,400		
14	12,060	Housing	5	60,300	69	
15	10,200	Housing	5	51,000	58	
16	24,000	Housing	5	120,000	136	
TOTAL HOUSING					740	
TOTAL PARKING					2,446	



Roadway Description and Cross Section

Scenario 2 keeps the existing 561 Windsor Building, so it requires North Street to wrap around the building. North Street and South Street are the primary access routes into and out of the study area. North Street is 68-feet total in width, with two 13.5-foot sidewalks, one 9-foot on-street parking lane, two 11-foot travel lanes, and two five-foot bicycle lanes. South Street is 50-feet total in width, with two 10-foot sidewalks, one 8-foot on-street parking lane, and two 11-foot travel lanes.

Parking

Based on the parking assumptions for each of the land use categories and the midday parking demand provided by ITE, it is estimated that the maximum number of parking spaces required at the peak parking demand is 2,420 spaces, which is met by the 2,446 spaces provided based on the parking locations and sizes described in Table 8. Based on the assumption of 350 SF per parking vehicle (including both parking stall and circulation), an estimated 856,100 GSF is required for parking based on the parking provided.

Traffic Impacts

A preliminary review of potential traffic impacts based on roadway configuration, parking locations, and proposed development was completed[5]. Some of the initial impacts of Scenario 2 that restrict capacity of the Study Area shown in Figure 17 are the following:

- North Street wrapping around the existing 561 Windsor Building will reduce the capacity of through traffic in Study Area since two turns will be required to cut through the Study Area. The additional of turns will reduce vehicular speeds and increase travel time. Left turns at stop controlled intersections will have lower priority in

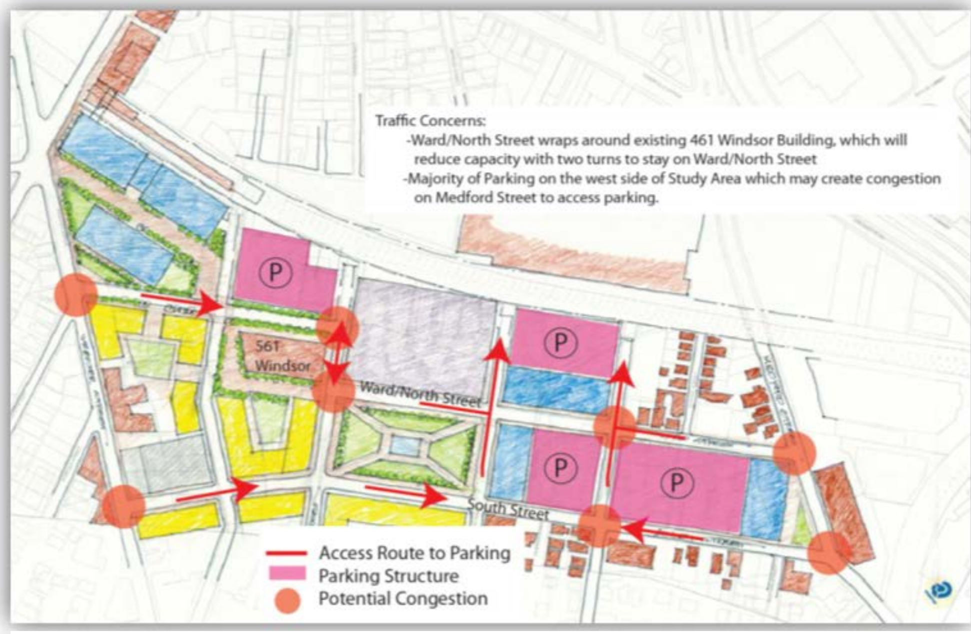


Figure 15. Scenario 2 Traffic Impacts

[5] A full traffic impact study will be necessary to determine the actual lane capacities entering the Study Area, the need for left or right turn lanes at intersections, whether traffic signalization is needed to improve intersection operations, the existing amount of traffic currently going into the Study Area which will go away, and whether additional capacity into the Study Area is attainable via Cambridge Street.

turns versus right turn movements which may increase travel time thru the study area as well.

- As described in Table 7, more parking is located on the east side of the study area (Parcels 6, 12, 13) versus the west side of the study area (Parcel 4), which creates potential for capacity concerns on Medford Street entering the study area to access parking.

Utility Impacts

Domestic Water & Sewer Demand: For planning purposes, water and sewer demand are considered equal. Domestic water demand is calculated by standard factors per use. Local factors, developed by the City's water system consultant Kleinfelder, are used in lieu of the statewide rates in 314 CMR 3.15 (Sewer Connection Regulations):

Table 8. Estimation of Domestic Water & Sewer Demand

	GSF	Residential Units	Water Use/Unit[1]	Average Daily Demand	Maximum Daily Demand	Population	Peaking Factor	Peak Flow
Residential	640,000	530	200 gpd/unit	106,000 gpd		1,060		
R&D[2]	240,000	N/A	0.093 gpd/GSF	22,300 gpd		720		
Office[2]	720,000	N/A	0.093 gpd/GSF	67,000 gpd		2,880		
TOTAL	1,600,000			195,300 gpd	259,700 gpd	4,660	3.0	540 gpm

Notes:

1. Assumes average 1,200 SF and 2 persons per residential unit. Assumes 3 per 1,000 SF for R&D and 4 per 1,000 SF for Office.
2. Office and R&D from Water Resources Engineering. Residential is a blended rate (averaging apartment and townhouse demands) from 2006 Somerville Water System study by Kleinfelder.
3. Daily peaking factor is 1.33, based on 2006 Somerville Water System study by Kleinfelder.
4. All figures are rounded for planning purposes.

Total Water Demand: Total water demand includes domestic uses (bathrooms, kitchens, irrigation), process (e.g., for R&D, this can be several times the domestic demand) and fire flow. For planning purposes, we use a factor of 4 for R&D process water demand. The actual demand depends on the actual R&D processes. The fire flow is a standard fire flow of 2,000 gpm, as recommended in the letter report for the City by Kleinfelder dated May 1, 2013.

Table 9. Estimation of Total Water Demand for Scenario 2

	Basis	Peak Water Demand	Peak Sewer Demand
Domestic	See Table 8	540 gpm	540 gpm
Process	22,300 gpd x R&D factor (4.0) x peak factor (3.0)	200 gpm	200 gpm
Fire	Standard fire flow	2,000 gpm	N/A
TOTAL		2,740 gpm	740 gpm (1.6 cfs)

Water Supply: Water supply from the MWRA Meter #37 will be adequate. Due to the reconfiguration of City streets, increased water demand, and age of existing water mains, local water mains will likely be replaced, based on water system modeling of the actual development proposal.

Storm and Sewer Systems: Due to the reconfiguration of City streets, new lines will be required throughout much of the Study Area. Storm – sewer separation should be implemented within the Study Area. The peak sewer flow can be handled by nominal pipe sizes within the project area (8 to 12 inch diameter).

Table 10. Estimation of Storm Runoff for Existing and Scenario 2

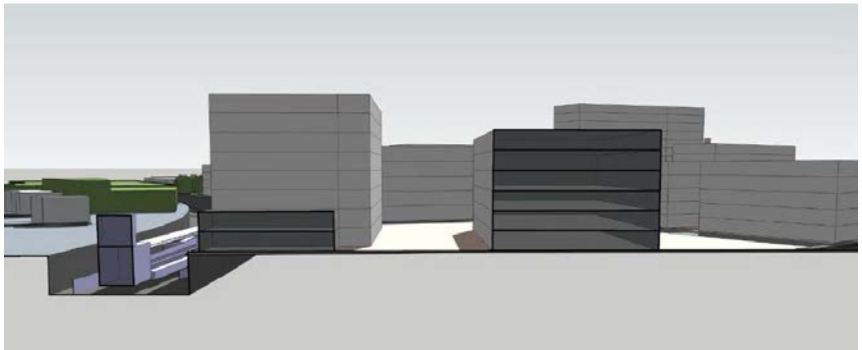
		Existing	Scenario 2
Runoff Volume	10-year	12.2 Acre-feet	12.5 Acre-feet
	25-year	15.0 Acre-feet	15.3 Acre-feet
	100-year	19.2 Acre-feet	19.4 Acre-feet

Scenario 2 will result in slightly more runoff when compared to the existing conditions.

3D Renderings

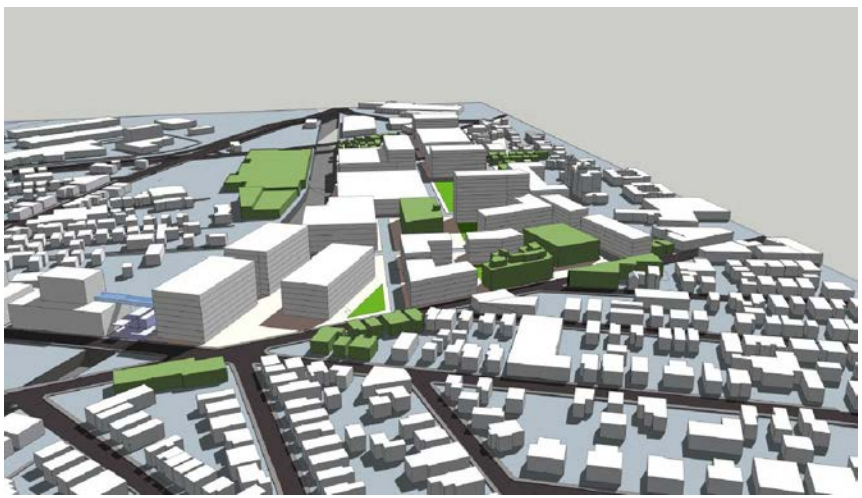
To understand the scale of the potential development, 3D renderings were created for Scenario 2 as seen in Figure 18 (For full page graphics, see Appendix B).

A. Section of the Northwest Parcel



B. Birdseye View from the Southeast Corner

D. Birdseye View from the West



D. Birdseye View from the Northwest Corner

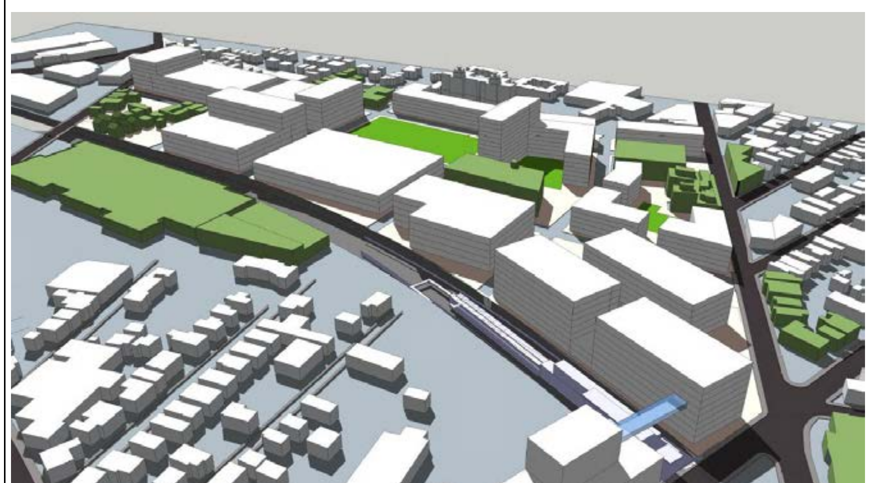


Figure 16. 3D Renderings of Scenario 2

Scenario 3

Scenario 3, shown in Figure 19 aims to keep the existing 561 Windsor building while realigning streets and creating new development parcels. This scenario provides narrow parcels adjacent to the railroad to provide a linear North Street. It also evaluates the opportunity for a pedestrian bridge across the railroad tracks to Parcel D2 and development in the Ward Street neighborhood.

Land Use Breakdown

The goal of Scenario 3 was to have a high allocation of R&D development in the Study Area. Green space is provided along North Street and in spot parks. The following land use assumptions provided by the City of Somerville were applied:

- 30% Residential
- 50% R&D
- 20% Office

Scenario 3 was developed with larger parcels to accommodate large R&D Building floorplates. The new North Street, similar to Scenario 1, is located further north to create the large parcels between North and South Streets. A series of small parks and squares are integrated into the residential blocks west of Windsor Street, and there are triangular entry plazas along both Webster Avenue and Medford Street. These plazas front active ground floor uses in the northwest and southwest corners of the site and can accommodate outdoor commercial activities.

Parking Assumptions

An additional goal of Scenario 3 is to utilize more aggressive parking assumptions by applying transportation demand management measures (TDM) such as flex hours for R & D and office developments. The following parking assumptions were applied based on comparisons to other recent developments adjacent to transit such as North Point:

- Residential: 1 Space per 2 Units (2000 SF)
- R&D: 1 Space per 1,675 SF
- Office: 1 Space per 1,250 SF

Development Potential

Based on the goal land use breakdown and the number of cars that can be accommodated in the peak, the gross square footage (GSF) of development was estimated at 3.0 Million, as described in Table 11.

Table 11. Scenario 3 Development

	Use Mix[1]	Total Cars[2]	Peak Hr Cars[3]	GSF[4]
Residential	30%	450	95	900,000
R&D	50%	896	636	1,500,000
Office	20%	480	374	600,000
TOTAL		1,826	1,105	3,000,000

[1]City of Somerville Goal for Alternative
[2]Total Cars = GSF / Parking Allotment by Use (See 'Parking Assumptions' Above)
[3]Peak Hour Cars = Total Cars * Peak Hour Arrival Assumptions by Use (See Page 22)
[4]GSF = Total GSF * Use Mix

Figure 17. Scenario 3 Development

Table 12 describes the estimated uses and parking under scenario 3.

Table 12. Scenario 3 Development Potential

Parcel Number	Area (Sq Ft)	Function	Story's	Gross Square Footage	Unit/ Parking	Key
1	984,000	Parking	2	105,600	302	
		Retail	2	91,200		
		R&D	5	492,000		
		Parcel 1 TOTAL	7	688,800		
2	41,400	Parking	4	165,600	473	
3	33,300	Office	12	399,600		
4	234,000	Office	12	280,800		
5	25,200	Office	12	302,400		
6	22,800	Housing	7	159,600	181	
7	12,000	Housing	7	84,000	95	
8	11,400	Housing	12	136,800	155	
9	12,600	Housing	7	88,200	100	
10	122,400	R&D	5	612,000		
11	81,600	Parking	4	326,400	935	
12	122,400	Retail	1	34,000		
		R&D	1	88,400		
		R&D	4	489,600		
		Parcel 12 Total	5	612,000		
13	13,200	Housing	7	92,400	105	
14	14,400	Housing	7	100,800	114	
15	34,200	Housing	7	239,400	272	
TOTAL HOUSING					922	
TOTAL PARKING					1,710	

Roadway Description and Cross Section

Scenario 3 provides linear access on North Street as the main Boulevard in the Study Area and improves connectivity of South Street between Webster Street and Medford Street. North Street is 68-feet total in width, with two 13.5-foot sidewalks, one 9-foot on-street parking lane, two 11-foot travel lanes, and two five-foot bicycle lanes. South Street is 50-feet total in width, with two 10-foot sidewalks, one 8-foot on-street parking lane, and two 11-foot travel lanes.

Parking

Based on the parking assumptions for each of the land use categories and the midday parking demand provided by ITE, it is estimated that the maximum number of parking spaces required at the peak parking demand is 1,574 spaces, which is met by the 1,710 spaces provided based on the parking locations and sizes described in Table 12. Based on the assumption of 350 SF per parking vehicle (including both parking stall and circulation), an estimated 598,500 GSF is required for parking based on the parking provided.

Traffic Impacts

A preliminary review of potential traffic impacts based on roadway configuration, parking locations, and proposed development was completed[6]. Some of the initial impacts of Scenario 3 as seen in Figure 20 that may restrict capacity of the Study Area are the following:

- Many of the patrons entering the study area will be looking for parking. With two of the primary parking garages located in Parcel 1 and 2 against the railroad tracks, more traffic may use North Street to enter the Study Area, which could lead to

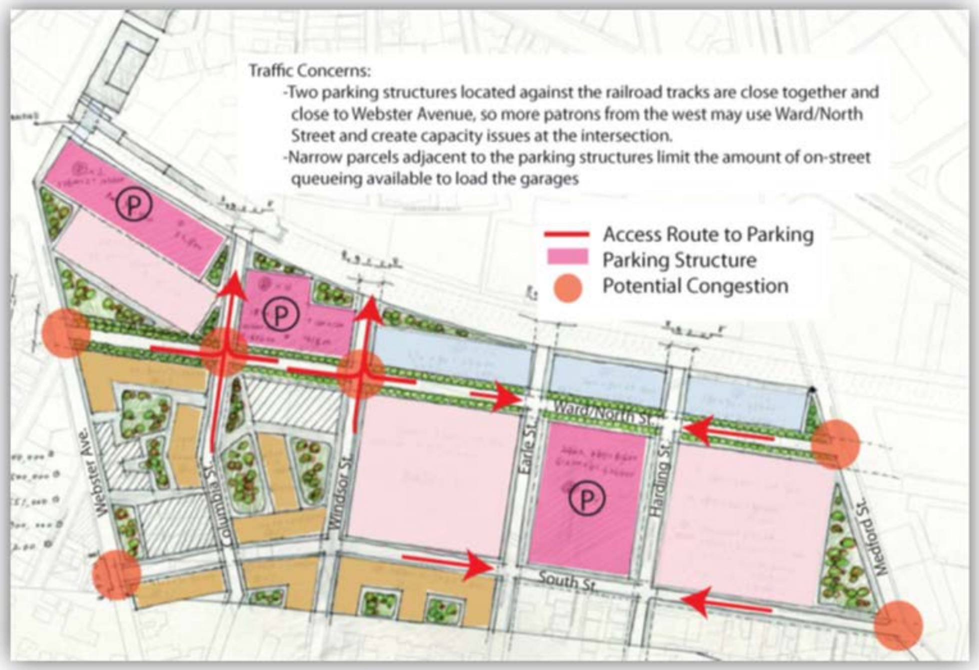


Figure 18. Scenario 3 Traffic Impacts

[6] A full traffic impact study will be necessary to determine the actual lane capacities entering the Study Area, the need for left or right turn lanes at intersections, whether traffic signalization is needed to improve intersection operations, the existing amount of traffic currently going into the Study Area which will go away, and whether additional capacity into the Study Area is attainable via Cambridge Street.

congestion on North Street and on Webster Street turning into the study area.

- Narrow parcels adjacent to the parking structures limit the amount of on-street queuing available to load the garages.

Utility Impacts

Domestic Water & Sewer Demand: For planning purposes, water and sewer demand are considered equal. Domestic water demand is calculated by standard factors per use. Local factors, developed by the City's water system consultant Kleinfelder, are used in lieu of the statewide rates in 314 CMR 3.15 (Sewer Connection Regulations):

Table 13. Estimation of Domestic Water & Sewer Demand

	GSF	Residential Units	Water Use/Unit[1]	Average Daily Demand	Maximum Daily Demand	Population	Peaking Factor	Peak Flow
Residential	900,000	750	200 gpd/unit	150,000 gpd		1,500		
R&D[2]	1,500,000	N/A	0.093 gpd/GSF	140,000 gpd		4,500		
Office[2]	600,000	N/A	0.093 gpd/GSF	56,000 gpd		2,400		
TOTAL	3,000,000			346,000 gpd	460,000 gpd	8,400	3.0	960 gpm

Notes:

1. Assumes average 1,200 SF and 2 persons per residential unit. Assumes 3 per 1,000 SF for R&D and 4 per 1,000 SF for Office.
2. Office and R&D from Water Resources Engineering. Residential is a blended rate (averaging apartment and townhouse demands) from 2006 Somerville Water System study by Kleinfelder.
3. Daily peaking factor is 1.33, based on 2006 Somerville Water System study by Kleinfelder.
4. All figures are rounded for planning purposes.

Total Water Demand: Total water demand includes domestic uses (bathrooms, kitchens, irrigation), process (e.g., for R&D, this can be several times the domestic demand) and fire flow. For planning purposes, we use a factor of 4 for R&D process water demand. The actual demand depends on the actual R&D processes. The fire flow is a standard fire flow of 2,000 gpm, as recommended in the letter report for the City by Kleinfelder dated May 1, 2013.

Table 14. Estimation of Total Water Demand for Scenario 3

	Basis	Peak Water Demand	Peak Sewer Demand
Domestic	See Table 13	960 gpm	960 gpm
Process	140,000 gpd x R&D factor (4.0) x peak factor (3.0)	1,170 gpm	1,170 gpm
Fire	Standard fire flow	2,000 gpm	N/A
TOTAL		4,130 gpm	2,130 gpm (4.7 cfs)

Water Supply: Water supply from the MWRA Meter #37 will be adequate. Due to the reconfiguration of City streets, increased water demand, and age of existing water mains, local water mains will likely be replaced, based on water system modeling of the actual development proposal.

Storm and Sewer Systems: Due to the reconfiguration of City streets, new lines will be required throughout much of the Study Area. Storm – sewer separation should be implemented within the Study Area. The peak sewer flow can be handled by pipe sizes in the range of 12 to 18 inches within the project area.

Table 15. Estimation of Storm Runoff for Existing and Scenario 3

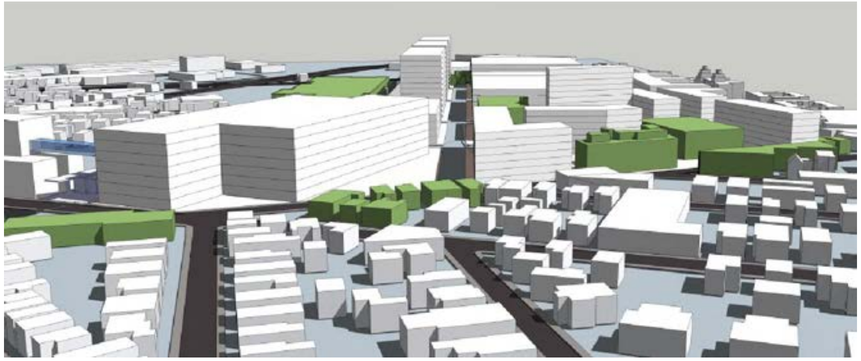
	Design Storm	Existing	Scenario 3
Runoff Volume	10-year	12.2 Acre-feet	14.1 Acre-feet
	25-year	15.0 Acre-feet	17.0 Acre-feet
	100-year	19.2 Acre-feet	21.3 Acre-feet

Scenario 3 will result in 10% to 15% more runoff when compared to the existing conditions.

3D Renderings

To understand the scale of the potential development, 3D renderings were created for Scenario 3 as seen in Figure 21 (For full page graphics, see Appendix C).

A. View from the West



B. Birdseye View from the Southeast Corner

D. Birdseye View from the West

D. Birdseye View from the Northwest Corner

Figure 19. 3D Renderings of Scenario 3

Comparison of Alternatives

Table 16 provides a comparison of the land use, traffic and parking, and utility metrics that were presented in the previous sections.

Table 16. Comparison of Alternatives

	Category	Scenario 1	Scenario 2	Scenario 3
Land Use	Land Use Breakdown	30% Residential 45% R&D 25% Office	40% Residential 15% R&D 45% Office	30% Residential 50% R&D 20% Office
	Gross Square Feet (GSF) Development	1,600,000	1,600,000	3,000,000
Traffic & Parking	Parking Assumptions	Residential: 1 Space/Unit R&D: 1 Space/583 SF Office: 1 Space/417 SF *40% Transit Mode Share	Residential: 1 Space/Unit R&D: 1 Space/583 SF Office: 1 Space/417 SF *40% Transit Mode Share	Residential: 1 Space/ 2 Units R&D: 1 Space/1,675 SF Office: 1 Space/1,250 SF *40% Transit Mode Share
	Total (Peak Hour) Cars	2,674 (2,007)	2,778 (2,008)	1,826 (1,574)
	Midday Parking Demand	2,405	2,420	1,574
Utilities	Domestic Water & Sewer: Average Daily Water Demand	144,200 gallons/day	195,300 gallons/day	346,000 gallons/day
	Domestic Water & Sewer: Max Daily Water Demand	191,700 gallons/day	259,700 gallons/day	460,000 gallons/day
	Domestic Water & Sewer: Peak Flow	400 gallons/minute	540 gallons/minute	960 gallons/minute
	Total Peak Water Demand	3,100 gallons/minute	2,740 gallons/minute	4,130 gallons/minute
	Total Peak Sewer Demand	1,100 gallons/minute	740 gallons/minute	2,130 gallons/minute
	Runoff Volume	10 yr- 12.5 Acre-feet 25 yr- 15.2 Acre-feet 100 yr- 19.4 Acre-feet	10 yr- 12.5 Acre-feet 25 yr- 15.2 Acre-feet 100 yr- 19.4 Acre-feet	10 yr- 14.1 Acre-feet 25 yr- 17.0 Acre-feet 100 yr- 21.3 Acre-feet

- ## Recommendations

Recommended Plan

Transportation Recommendations

Key elements that will improve traffic flow into and thru the study area include the following:

- Linear streets will increase the capacity to accommodate vehicles within the Study Area.
- Disperse parking to fully utilize the capacity on both Webster Street and Medford Street into the Study Area and on North Street and South Street in the Study Area.
- Evaluate the number and location of parking structure entrances to facilitate loading and unloading of structures and limit potential for queuing on adjacent roadways.
- Encourage a high transit usage to reduce parking demand in the Study Area.
- Consider Transportation Demand Management (TDM) strategies such as alternative work schedules.

Utility Recommendations

Water Supply

Infrastructure: Local water supply is more than ample due to the proximity of MWRA Meter 37. However, the existing local water mains are mostly old and undersized. A May 1, 2013 letter report by Kleinfelder recommended a minimum size of 8 inches for the local water mains, based on providing adequate residual pressure with a fire flow of 2,000 gpm. This fire flow exceeds the maximum water demand for domestic and process needs for any of the proposed scenarios, and therefore it is the controlling consideration for modeling. However, for the types high rise construction and dense development allowable under current zoning, we would recommend more robust criteria:

- Provide minimum residual pressure for sprinkler systems in at least a four-story R&D building to avoid the need for fire pumps
- Provide adequate residual pressure for fire flow with one link in local network out of service
- Provide minimum 12-inch diameter water mains for both North and South Streets and at least two north-south connections.

The exact sizes of the mains will be based on water system modeling based on the actual configuration of the development and the actual water demands for each of the building uses.

Policy: The City should enact policy in the form of development guidelines that encourage water conservation through the use of low flow fixtures and possible use of gray water where appropriate.

Storm Drainage Management

Infrastructure: Those portions of the Study Area not presently separated should be provided with new separated storm drainage lines within the Study Area and continuing to MWRA-17. New local storm drains will be required along the new street network. Minimum size should be 12 inches. The exact sizes of new storm drains will be determined by the configuration of the development and flows from private development sites.

To minimize flow from the public right-of-way, consider low impact design features such as:

- Pervious pavement and/or feature strips along sidewalks to infiltrate stormwater.
- Grass strips along sidewalks for filtration and infiltration.
- Rain gardens near sidewalks or in public open spaces.
- Open ponds or other surface water bodies in open spaces (e.g., water bodies in NorthPoint's Central Park).
- Pervious pavement in parking lanes.
- Minimize flow from private development: see policy recommendations below.

For that stormwater runoff that does reach the municipal stormwater pipes, provide one or more forms of detention to reduce the downstream impacts. Consider in-line stormwater detention and treatment systems, as developed by the City of Cambridge. These will keep municipal facilities within the street layout and avoid the taking of potentially developable properties for municipally-owned stormwater management facilities. Also consider off-line facilities within public open spaces.

Policy: The City should enact policy in the form of development guidelines that encourage low impact designs and minimizing site runoff to the municipal stormwater system. Our calculations indicate that for the various development scenarios, approximately 70% of the stormwater in the municipal pipes would be from private properties without innovative on-site stormwater management. The City should consider the following policies to encourage aggressive stormwater management on development sites:

- Each redeveloped site must practice low impact design (LID) principals as contextually applied to an urban environment. Encourage policies such as:
    - Green roofs
    - Impervious pavements within site

    - Use of rain gardens, infiltration swales, and site ponds, as space allows
    - Encourage lot coverage of 75% or less to allow for more pervious site cover
    - On-site reuse of stormwater for irrigation, toilet flushing, or other appropriate uses (e.g., MIT Stata Center)
    - Require on-site detention and treatment prior to discharge to the municipal storm drain
- Encourage structured parking, and consider centralized structured parking shared by various developments. These measures will minimize the total impervious cover associated with parking.
- Encourage alternative transportation including improving transit connections, pedestrian walkways and bicycle facilities to minimize parking requirements and thereby minimize site impervious cover associated with parking.
- Storm drainage connection permits should carry requirements for stormwater management (e.g., consider site plan requirements of Boston Water and Sewer Commission).
- Alternatively, consider a city-wide ordinance requiring stormwater management for redevelopment projects.
- Another alternative would be a zoning overlay district requirement for stormwater management.
- In either case, require each development to have on-site stormwater management facilities upstream of any connection to the municipal storm drainage system. Provide threshold or target maximum flows for various storm events.

Sanitary Sewer

Infrastructure: Those portions of the Study Area not presently separated should be provided with new separated sanitary sewer lines within the Study Area and continuing to MWRA-17 and 18. New local sewers will be required along the new street network. Minimum size should be 8 inches. The exact sizes of new sewers will be determined by the configuration of the development. New separated sewers should be connected with the existing separated sewer on South Street.

Policy: The City should enact policy in the form of development guidelines that encourage water conservation through the use of low flow fixtures and possible use of gray water where appropriate.

Preliminary Cost Estimate

A preliminary cost estimate was prepared based on unit costs from February 2014 for roadway paving, sidewalks, curbing, drainage, water mains, sanitary sewer, and street lighting. The cost estimate is for the roadways and public utilities within the Boynton Yards Study Area only. Additional roadway and traffic signal work may be required on Webster Street and Medford Street to provide sufficient capacity into the Study Area. Table 17 provides the street widths that were assumed and Table 18 provides cost estimates.

Table 17. Street Width and Length Assumptions for Cost Estimate

Street	Length (feet)	Roadway Width (feet)	Sidewalk Width (feet)	Roadway square feet	Area of Roadway square feet	Area of Sidewalk square feet	Sidewalk square feet
North St.	1,820	41	27	74,620	8,291	49,140	5,460
South St.	1,840	30	20	55,200	6,133	36,800	4,089
Columbia St.	900	22	16	19,800	2,200	14,400	1,600
Windsor St.	750	22	16	16,500	1,833	12,000	1,333
Willow St.	730	20	12	14,600	1,622	8,760	973
Hunting St.	580	20	12	11,600	1,289	6,960	773
Harding St..	730	20	12	14,600	1,622	8,760	973
Horace St.	540	20	12	10,800	1,200	6,480	720
TOTAL	7,890	195	127	217,720	24,191	143,300	15,922

Table 18. Preliminary Cost Estimate

Item	Quantity	Units	Unit Costs (Feb '14)	Estimated Costs	Assumptions
PAVING, SIDEWALK, CURBING					
Full Depth Construction	24,191	square yard	$82	$1,983,671	
Concrete Sidewalks	15,922	square yard	$55	$875,722	
Granite Curb	15,780	linear foot	$35	$552,300	2x's length of roadway
Traffic Signage & Striping	7,890	linear foot	$10	$78,900	$10 per LF of roadway
Subtotal				$3,490,593	
DRAINAGE					
Catch Basin	54	each	$4,500	$243,000	2 per 300 LF of roadway
Manhole	33	each	$5,500	$181,500	1 per 250 LF of roadway
Storm Drain Pipe	7,890	foot	$220	$1,735,800	pipe = length of roadway
Underground Detention	3	each	$1,500,000	$4,500,000	1 tank per 2500 LF roadway
Subtotal				$6,660,300	
WATER MAINS					
Major Water Mains (12")	7,890	linear foot	$250	$1,972,500	pipe = length of roadway
Major Gate Valves (12")	32	each	$6,500	$208,000	4 per intersection
Hydrants	28	each	$4,500	$126,000	1 per 300 LF of roadway
Subtotal				$2,306,500	

Table 18 (continued). Preliminary Cost Estimate

Item	Quantity	Units	Unit Costs (Feb '14)	Estimated Costs	Assumptions
SANITARY SEWER					
Sewer Pipes	7,890	linear foot	$ 100	$ 789,000	pipe = length of roadway
Manhole	28	each	$ 4,500	$ 126,000	1 per 300 LF of roadway
Subtotal				$ 915,000	
STREET LIGHTING					
Roadway Lighting with One Luminaries	135	each	$ 6,550	$ 877,500	1 pole per 120 LF each side of road
Concrete Pole Foundation	135	each	$ 1,400	$ 189,000	1 per pole
Precast Electric Handhole	135	each	$ 1,200	$ 162,000	1 per pole
Lighting Control Cabinet	2	each	$ 14,500	$ 29,000	1 per 6000 LF
Conductors	237	CLF	$ 250	$ 59,175	3 per LF
Street Lighting Conduit	158	CLF	$ 1,250	$ 197,250	2 per LF
Subtotal				$ 1,513,925	
Subtotal of All Items				$ 15,886,318	
25% Contingency				$ 3,721,580	
TOTAL				$ 18,607,898	
SAY				$ 19,000,000	

Appendix A- Zoning Ordinance- TOD Dimensions (City of Somerville Zoning Ordinance Table 6.5F)

Appendix A- Zoning Ordinance- TOD Dimensions (City of Somerville Zoning Ordinance Table 6.5F)

Dimensions and Use Standard	TOD-55	TOD-70	TOD-100	TOD-135
Minimum Lot Size (sf)	15,000[6]	25,000[6]	25,000[6]	50,000[6]
Minimum lot area/dwelling unit (sf)	600	450	450	450
Maximum Ground Coverage (%)	80	80[7]	80[7]	80
Landscaped Area, minimum percent of lot (%)	10	15[7]	15[7]	20
Floor Area Ration (FAR)				
Minimum FAR	N/A	N/A	3.1	3.1
Maximum FAR	3	3.5 (4 Green)[1 2]	3.5 (4 Green)[1 2]	4.5 (5.5 Green)[1 2]
Maximum Height (ft)	55	55 (70 Green)[1]	85 (100 Green)[1]	120 (135 Green)[1 3]
Minimum front, side, rear yard (ft)	0[4]	0[4]	0[4]	0[4]
Minimum Frontage (ft)	50	100	140	140
Permitted Use Clusters	A,B,C,D,E,F,G,I,J	A,B,C,D,E,F,G,I,J	A,B,C,D,E,F,G,I,J	A,B,C,D,E,F,G,H, I,J
Arts Related Uses Requirement	None	5% of gsf	5% of gsf	5% of gsf
Inclusionary Housing Requirement	15%	15%	15%	17.5%
Tapering Height (ft)	N/A	55	55	N/A
Upper Level Setback (ft)	N/A	15	25	N/A
Upper Level Maximum Floorplate (%)	N/A	N/A	36	N/A
Usable Open Space Requirement (can count towards landscaping)[5]	N/A	10	10	15

[1]FAR and maximum height may be increased for certified green buildings pursuant 6.5.G.2

[2]Developable square footage shall remain the same when a Development contributes to public infrastructure even when lot size is reduced (pursuant 6.5.G.3)

[3]Maximum height may be increased to 150' when minimum open space is dedicated pursuant 6.5.G.4

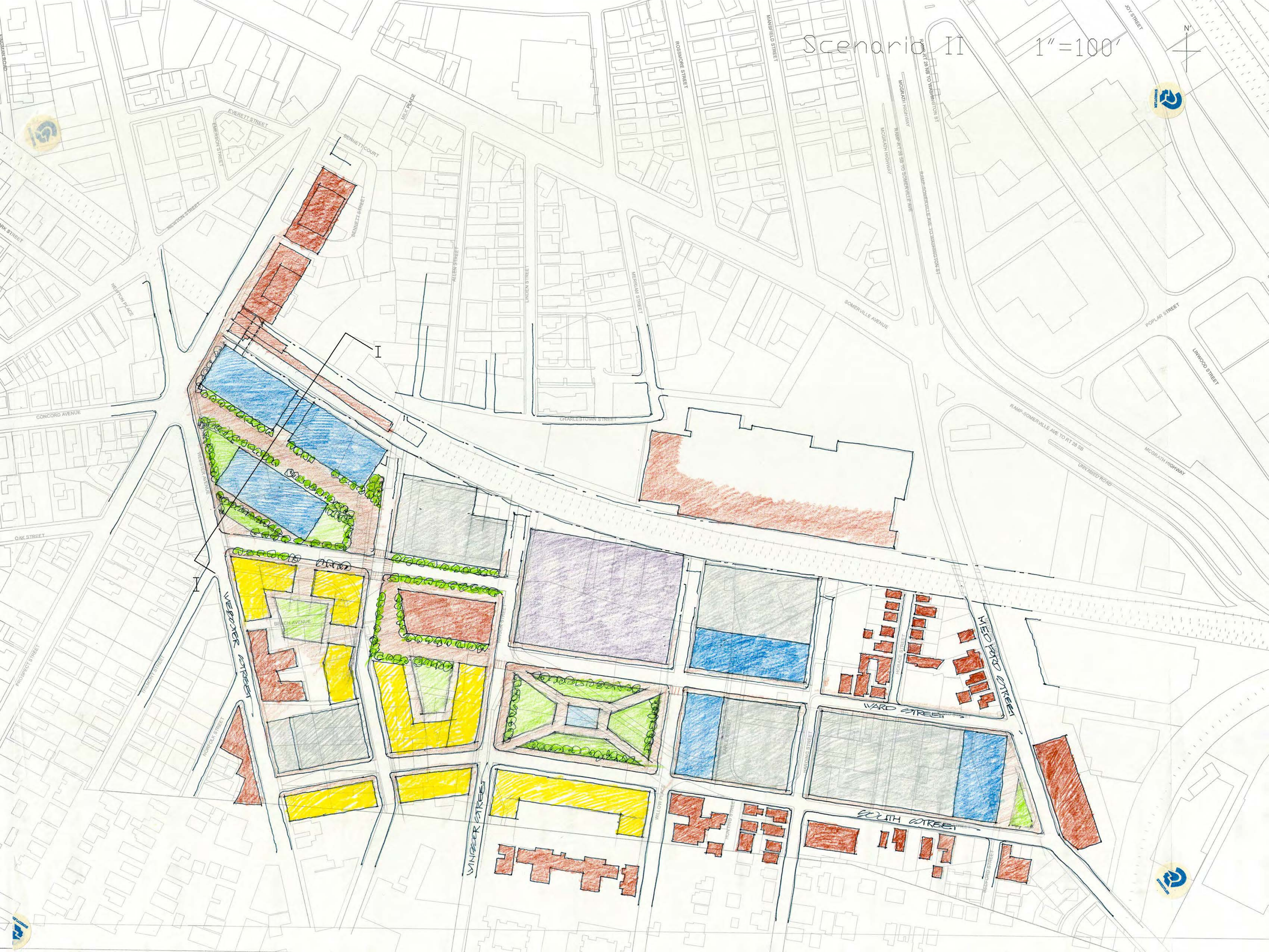
[4]Transition requirements apply for parcels abutting a residential districts (RA, RB, or RC) pursuant 6.5.G.5

[5]Usable open space must comply with the standards set forth in Article 17

[6]Minimum Lot Area may be reduced as provided in 6.5.G.18

[7]Amount of Usable Open Space, Landscaping and Ground Coverage may be altered per 6.5.G.9

Appendix B- Scenario 2- 3D Renderings


Scenario II
1"=100'
N
I
I
WEBSTER STREET
WINDSOR STREET
WARD STREET
SOUTH STREET
MEDFORD STREET
COLUMBIA STREET
BEECH AVENUE
WEBSTER AVENUE
CONCORD AVENUE
OAK STREET
PROSPECT STREET
NORFOLK STREET
WILLOW PLACE
SOMERVILLE AVENUE
CHARLESTOWN STREET
POPLAR STREET
LINWOOD STREET
JOY STREET
ROSSMORE STREET
MANSFIELD STREET
MCGRATH HIGHWAY
EVERETT STREET
EMERSON STREET
BENNETT COURT
BENNETT STREET
MILK PLACE
ALLEN STREET
LINDEN STREET
MERRIAM STREET
NEWTON PLACE

Appendix C- Scenario 3- 3D Renderings

Scenario III
1"=100'
N
SCENARIO II.
OFFICE: 623,160 > 600,000
R&D: 1,675,200 > 1,500,000
PARKING: 597,600 > 551,000
HOUSING: 930,800 > 900,000
RETAIL: ~~34,000~~ 125,200
P BRIDGE
R&D × 5
P × 4
370 × 90 = 33300
33300 × 12 = 399600
260 × 90 = 23,400
23400 × 12 = 280800
280 × 90 = 25200
25200 × 12 = 302400
360 × 340 = 122,400
122,400 × 5 = 612000
240 × 340 = 81600
81600 × 4 = 326400
34200 × 7 = 239,400
12600 × 7 = 88200
14400 × 7 = 100800
13200 × 7 = 92400
22,800 × 7 = 159600
9119
CONCORD AVENUE
OAK STREET
WEBSTER AVENUE
SOMERVILLE AVENUE
CHARLESTOWN STREET
MCGRATH HIGHWAY