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Extending Pedestrian-Friendly Lighting in Brookline:

Recommendations of the Pedestrian Lighting Committee

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Executive Summary

In July 2019, The Pedestrian Lighting committee was charged by the Brookline Select Board to prepare a plan for Brookline to extend pedestrian-friendly lighting along sidewalks with extensive pedestrian activity. The plan presented here amplifies the mandate in Brookline's Complete Streets policy specifying that "Sidewalks and crosswalks should be adequately lit." Most lighting along Brookline streets is designed to primarily to illuminate streets rather than sidewalks. Pedestrians need even, glare-free lighting that enables them to see where they are walking, avoid potential hazards, and recognize other approaching pedestrians. Pedestrians also need to be visible to others, especially when they are in crosswalks.

In contrast to roadway lighting, better lighting for pedestrians is achieved by light poles that are lower, spaced closer together, and with fixtures that place lights over sidewalks. Currently, Brookline has pedestrian-friendly or pedestrian-scale lighting primarily in major commercial areas and along all of Harvard Street.

The Committee proposes that Brookline extend existing pedestrian-scale street lighting so that it serves:

- Commercial areas
- Transportation routes for walking
    - Between commercial areas
    - Connections to public transportation
    - Connections to important destinations such as Brookline High School close to dense commercial and residential development
- Densely developed residential areas that surround commercial areas

Because of its population density, the major focus should be on North Brookline, Beacon Street Corridor, and especially the neighborhood surrounding Coolidge Corner.

To improve pedestrian transportation, the highest priority should be given to addition of pedestrian-scale lighting to:

- Beacon Street between the commercial areas
- Longwood Avenue

The high cost of new street lighting is the major barrier to expansion of the network of pedestrian-scale lighting. Currently, new street lighting by itself costs approximately $3,250,000 per mile. Because of the high cost of stand-alone pedestrian lighting improvement projects, expansion of pedestrian scale lighting will be most feasible when included as part of major road reconstruction projects. Planning is now in progress for roadway improvements for all of Washington Street. Expanded pedestrian-scale lighting should be included on the agenda.

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The Committee also recommends that an item for Pedestrian Scale Lighting be included each year in the Town's Capital Improvement Plan (CIP). Modest annual funding through the CIP would make it possible for the Town to make incremental lighting improvements especially where mature street trees interfere with lighting for pedestrians.

To assure that a long-term program to expand pedestrian scale lighting is implemented effectively, the Committee further recommends that a standing board or committee be charged with overseeing the program. Each year, that entity should be charting progress and recommending new initiatives.

The Committee also recommends a design review process for street improvement projects. A lighting professional should be included as a member of the design review team to help assure that lighting plans serve pedestrians effectively.

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Lighting Definitions

Pedestrian friendly lighting/Pedestrian scale lighting. Pedestrian lights are lights in the right-of-way that primarily function to illuminate pedestrian areas such as sidewalks. The San Francisco Public Utilities Commission defines pedestrian lights as pole-mounted lighting fixtures less than 18 feet tall that are part of a secondary lighting system used to supplement street lighting levels. (San Francisco Public Utilities Commission). Another sources specifies that Pedestrian Scale Lighting means light standards or placement no greater than fourteen (14) feet in height located along walkways. (LawInsider.com)

Roadway /Highway lighting is lighting designed to illuminate roadways including highways and urban streets.

Lighting or **illumination** is the deliberate use of light to achieve practical or aesthetic effects. Lighting includes the use of both artificial light sources like lamps and light fixtures, as well as natural illumination by capturing daylight. (Wikipedia)

Luminance is a photometric measure of the luminous intensity per unit area of light travelling in a given direction. It describes the amount of light that passes through, is emitted from, or is reflected from a particular area, and falls within a given solid angle. (Wikipedia)

Horizontal illuminance describes the amount of light landing on a **horizontal** surface, such a desk or sidewalk. (Google)

vertical illuminance describes the **illuminance** landing on a vertical surface, such as a wall or standing pedestrian (Google)

Lighting uniformity (which translates to the human perception of how evenly illumination is distributed throughout an open uniform area such as a parking lot) is expressed as the ratio of maximum-to-minimum illumination levels. (Google)

A ***foot-candle*** is defined as the illuminance on a one square foot surface from a uniform source of light. ***Foot-candles*** are the most common unit of measure used by lighting professionals to calculate light levels in businesses and outdoor spaces. (LightingDesignLab.com)

luminaire: A complete lighting unit consisting of a lamp or lamps, together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply. Also referred to as a light fixture, fitting, or unit. (LRC, RPI)

high-pressure sodium lamp. Radiation from sodium vapor under high pressure produces visible light. High-pressure sodium lamps are orangish in color appearance, take a few minutes to achieve full light output on lamp startup, and require several minutes to restart if power to the lamp is interrupted, even briefly.

L**uminous efficacy** is a measure of how well a light source produces visible light. It is the ratio of luminous flux to power, measured in lumens per watt in the International System of Units (Wikipedia)

Glare. The loss of visibility and/or the sensation of discomfort associated with bright light within the field of view. (LRC, RPI)

BUG rating. Contemporary lighting systems are designed to minimize three negative dimensions: Backlight, Uplight, and Glare. The term "BUG" was developed by the Illuminating Engineering Society (IES) and International Dark Sky Association to calculate the stray light that escapes from an outdoor light fixture. Backlight is light that is directed to undesired locations. Uplight is light that is directed upwards toward the sky. Uplight contributes to light pollution.

Glare is light that is too strong or too concentrated. Glare interferes with the visibility of objects within the field of vision. Lighting systems are rated on a zero to four BUG scale. Lighting designers seek fixtures with minimal BUG ratings. https://www.accessfixtures.com/what-is-bug-rating-and-why-does-it-matter/

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Charge to committee

In July 2019, The Pedestrian Lighting committee was charged by the Brookline Select Board to prepare a plan for Brookline to extend pedestrian-friendly lighting along sidewalks with extensive pedestrian activity. The committee was asked to determine the fiscal impacts of its findings and recommendations and asked to prepare a plan that can be implemented within the technical, fiscal, and other constraints of the Town. The mission of the committee as specified by the Brookline Select Board is included as Appendix 1.

Pedestrian-scale lighting and Complete Streets Policy. In 2016, Brookline adopted a Complete Streets policy that requires the Town in planning all transportation projects address needs of motorists, pedestrians, cyclists, and users of public transportation. https://www.brooklinema.gov/DocumentCenter/View/10212/Brookline-Complete-Streets-Policy-and-Record-of-Vote-PDF

The Complete Streets policy explicitly includes attention to lighting. Section 3E of the policy states: "Sidewalks and crosswalks should be adequately lit." Through its Complete Streets policy, the Town is already committed to providing attention to lighting for pedestrians as it plans new transportation projects. The recommendations in this report provide guidelines for implementing that mandate.

Background on Street Lighting

Municipal efforts to light streets at night have a long history. Various strategies have been used for centuries to provide municipal lighting including oil lamps and gas lighted fixtures. Electric street lighting was introduced late in the 19th Century. Brookline's original electrical street lighting was introduced and owned by the electrical utility company that served the Town. In Brookline, wooden utility poles have long been used for mounting streetlights. Almost all the wooden poles are owned by private utility companies. The wooden poles are used for multiple purposes including supporting wires for telephone, and cable television. At some point the Town of Brookline began installing cement poles exclusively for street lighting. At present, Brookline owns and maintains all the streetlight fixtures regardless of the ownership of the poles.

Over time, significant improvements have been made in the efficiency and effectiveness of electrical lighting used for street lighting. Electrical lighting technologies that have been used include incandescent, fluorescent, mercury vapor, high pressure sodium, and light emitting diodes (LED). The advantages of LED lights include higher efficacy, that is, lighting emitted per watt of energy and longer rated lamp life. In Brookline, most streetlights have been converted in recent years to LED bulbs. Some use of high-pressure sodium lights continues. This technology is recognizable because it casts an amber light.

Pedestrian Lighting Needs. Pedestrians want to be able to walk safely at night. Pedestrians want to be able to see where they are travelling and want to be able to recognize objects that they encounter as they walk. Pedestrians need to be able to see the surface on which they are walking including the sidewalk, curbs, tree pits, and various potential trip hazards. Pedestrians also need to be able to recognize people who are approaching them on the sidewalk or adjacent to the sidewalk. After dark, pedestrians also need to be visible to others, especially to motorists and cyclists when the pedestrians are crossing streets.

Pedestrian lighting needs are best served by even, glare-free lighting, that provides enough illumination. Even lighting is important because people have difficulty in adjusting quickly to changes in lighting intensity. Lighting sources that are surrounded by very bright light create glare that interferes with the ability of people to see other objects in their field of vision.

Minimizing light pollution. Outdoor lighting can direct light in ways that are unintended and undesirable. Light fixtures intended to illuminate roadways and sidewalks may also direct light in undesired directions. Building occupants, for example, sometimes complain that roadway light fixtures direct light into homes. The term "backlight" is used to describe this negative feature of some roadway lighting fixtures. For environmental reasons, dark skies are important at night. Outdoor lighting fixtures can direct light upward. In doing so, they create uplight, a source of light pollution. Lighting fixtures for roadways and pedestrians should minimize both backlight and uplight.

Brookline's current lighting strategies

Most lighting in the Town's public right of way was designed to provide lighting to streets for safe navigation by vehicular traffic. For this purpose, lights have been placed on utility poles that are 20-24 feet high. Typically, the utility poles are 150 feet apart.

Pedestrians who walking on sidewalks along streets are not well served by lighting designed only to illuminate roads. Roadway lighting design requirements are for illumination on the roadway and these recommendations are less uniform than those requirements for pedestrian walkways. In the past, illumination of the sidewalks was secondary to the goal of providing illuminations for cars, and the results is often uneven, dim lighting farther away from lights. The design of current roadway lighting used in Brookline can produce glare that interferes with the ability of pedestrians to see objects and hazards. The effectiveness of roadway lighting in illuminating sidewalks in Brookline can also be affected adversely by mature street trees whose canopy obstructs the distribution of the light to the sidewalk.

Pedestrian-Friendly or Pedestrian Scale Lighting

The goal of pedestrian-friendly or pedestrian-scale lighting is to provide even illumination on the walking surfaces, increased illumination levels at crosswalks which are points of pedestrian/vehicular conflict, and good vertical illumination that is lighted specifically for pedestrians.

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In contrast to roadway lighting, better lighting for pedestrians is achieved by light poles that are lower, spaced closer together, and with fixtures that place lights over sidewalks. Pedestrians are best served by fixtures that produce good illumination without glare. Lighting that is exclusively for pedestrians is usually about 12 feet in height or lower.

In practice where efforts are made to provide good lighting on sidewalks that are along two-lane streets, lighting strategies are used to serve both streets and sidewalks (BEGA Application Guide, 2016). In this case, poles are somewhat lower than poles for roadway lighting but higher than lighting that it uses for areas used exclusively for pedestrians. When the aim is to illuminate both streets and sidewalks, poles are placed closer together than when the only concern is roadway lighting. In Brookline, the existing lighting on Harvard Street is a good example of lighting designed to illuminate both the street and sidewalks.

Existing Pedestrian Scale Lighting

Brookline already has some pedestrian scale lighting that serves to illuminate both streets and sidewalks. Most of this lighting is in Brookline Village (Pearl Street, Station Street and a portion of Washington Street), all of Harvard Street, and Beacon Street within the St. Mary's, Coolidge Corner, and Washington Square commercial areas. In Brookline Village and along Harvard Street, the utility poles average 75 feet apart and between 12 and 15 feet in height. Some similar light poles are in place in Washington Street immediately southeast of the Beacon Street intersection. In the commercial areas on Beacon Street, the utility poles hold two light fixtures. One of the fixtures is placed on an arm high in the sky and hung over the street. A second, lower arm holds a fixture over the sidewalk.

There is also variation in the types of lighting used. On Harvard Street LED lighting is used within Brookline Village and Between Beacon Street and the Ridley School. Between School/Aspinwall and Harvard Street and again North of the Ridley School, high-pressure sodium lighting is used. The amber lights produce less glare than lights and are probably more acceptable to occupants of lower floors of residential buildings than the brighter LED lights.

Brookline also has some pedestrian-scale lighting that illuminates both streets and sidewalks at school entrances. One is on Pierce Street in front of the historic Pierce School building and another is at the Harvard Street driveway entrance to the Ridley School. The fixtures used at the two locations are different. In front of the historic Pierce School building an "acorn" fixture is used that is like those used on Station Street. At the entrance to the Ridley School a non-traditional fixture is used. LED lights are installed at both locations.

Aims

We propose that Brookline extend existing pedestrian-scale street lighting so that it serves all commercial areas, residential streets that are important for pedestrian transportation in the more densely developed portions of North Brookline, and high-density residential areas

adjacent to commercial areas. The aim is to assure that residents who live in the most densely developed portions of the Town are served by pedestrian-scale lighting within that sector and along walking routes that lead to important destinations nearby. (Brookline High School is an important example of a key destination that is close to but outside of the more densely developed portions of North Brookline.) The initiative would also assure that all crosswalks in that area have adequate pedestrian lighting.

The report identifies locations where improved lighting is desirable. The report does not provide recommendations on how improved lighting should be provided. More specifically, it does not address the question whether existing lighting should be replaced or whether additional lighting be introduced to supplement existing lighting. The premise of the report is that the Town will engage lighting experts to design projects to improve lighting in the locations identified in this report.

Time horizon for improvements in lighting for pedestrians. Progress in improving lighting for pedestrians should be measured in decades. The existing network of electric street lighting developed over a century. The fact that many streets continue to be served by lights placed on wooden utility poles reflects the age and slow evolution of street lighting. Brookline has many miles of streets that merit pedestrian-scale lighting. Currently the Town has perhaps two miles of streets with pedestrian-scale lighting. Doubling the mileage of pedestrian-scale lighting within a decade would be a substantial accomplishment. Accomplishing improvements on all the streets identified in this report will require many years.

Approaches to an Expanded Network of Pedestrian-Scale Lighting

Because the demand for new pedestrian-scale lighting is great and the cost of new lighting is high, a strategic approach to expansion is recommended here. Priority should be given to areas with high population density, many walking destinations, and well-developed public transportation. In effect, priority should be given to:

- **Commercial areas**
- **Transportation routes for walking**
    - **Within commercial areas**
    - **Between commercial areas**
    - **Connections to public transportation**
- **Densely developed residential areas that surround commercial areas**

Major Focus on North Brookline, Beacon Street Corridor, and Coolidge Corner

This report is focused on North Brookline because of its dense development and population concentration. The Beacon Street corridor receives particular attention because of its population density, strong public transportation, and commercial development. The Green-Line trolley on Beacon Street is important historically for both the population density and commercial development along Beacon Street. Some pedestrian traffic is to and from C-line

stops. The trolley service also makes Beacon Street important as a pedestrian route. Coolidge Corner deserves particular attention because it is Brookline's largest commercial area. Coolidge Corner is defined by Beacon Street and Harvard Street, the two most important streets for walking in Brookline. The #66 bus route on Harvard Street is the second-most heavily travelled bus route in the metropolitan area.

Pedestrian-scale lighting in and around commercial areas. Commercial areas thrive on the presence of pedestrians. Good pedestrian-scale lighting helps greatly to make a commercial vibrant after dark. As indicated above, Brookline already has considerable pedestrian-scale lighting in its main commercial areas in North Brookline, that is, Coolidge Corner, Brookline Village, St. Mary's, Washington Square, and JFK Crossing. Some minor commercial areas lack pedestrian-scale lighting. Each of the commercial areas is discussed briefly below.

Coolidge Corner. Pedestrian-scale lighting is in place on Harvard Street within Coolidge Corner. It is also in place on Beacon Street from Charles Street to Centre Street. Extension of pedestrian-scale lighting on Beacon Street in Coolidge Corner is needed between Centre Street and Marion Street. The commercial area also includes several side streets that lack pedestrian-scale lighting: Webster Street, a portion of Sewall Avenue, a portion of Longwood Avenue, Charles Street, and a portion of Green Street. Pedestrian-scale lighting should be provided on these streets both to strengthen the commercial area and to support pedestrians travelling to and from the densely developed residential area surrounding Coolidge Corner.

Brookline Village. A good deal of pedestrian-scale lighting is in place in Brookline Village on its principal streets, that is, all of Harvard Street and a portion of Washington Street. When the Gateway East project is completed, pedestrian scale lighting will be in place on Washington from the Boston line past the Harvard Street intersection to 688 Washington. On the northeast side of Washington Street, pedestrian-scale lighting extends only to Holden Street. Some of the side streets in Brookline Village have pedestrian-scale lighting, notably, Station Street, Pearl Street, and Pierce Street.

The highest priority for Brookline Village is extension of pedestrian-scale lighting on Washington Street northwest so that it includes the commercial area at the School-Cypress intersection.

St. Mary's. The St. Mary's commercial area is limited to Beacon Street. Pedestrian-scale lighting is in place in the St. Mary's commercial area.

Washington Square. Commercial activity is limited to Beacon Street and Washington Street. Pedestrian-scale lighting is in place within Washington Square on Beacon Street and Washington Street immediately southeast of Beacon Street.

JFK Crossing. Commercial activity is limited to Harvard Street. Pedestrian-scale lighting is in place on Harvard Street.

Other commercial areas

Commonwealth Avenue/Boston University West. While Commonwealth Avenue is in Boston, the buildings on the south side of the street are in Brookline. Some of the commercial activity extends into the side streets south of Commonwealth Avenue. This section of Commonwealth Ave. has new pedestrian-scale lighting. Pedestrian-scale lighting is desirable on Amory Street, St. Paul Street, and Pleasant Street between Commonwealth Ave. and Dummer Street. On Babcock Street, the block between Commonwealth Ave. and Winslow Road is well lit with closely spaced roadway lighting.

Hamilton Square. This small commercial area near the Boston border is best known as the location of Clear Flour bakery. To illuminate the commercial area, pedestrian-scale lighting is needed on portions of Thorndike Street and Lawton Street.

Cypress Street in Whisky Point. A loose commercial area along Cypress Street immediately south of Boylston Street serves an older, walkable neighborhood. Although Boylston Street is generally considered to be the boundary between North Brookline and South Brookline, the Whisky Point neighborhood has characteristics like Brookline Village and is geographically close to Brookline Village. This commercial area merits the same attention as the minor commercial areas north of Boylston Street. Residents of the neighborhood would probably welcome pedestrian-scale lighting on Cypress Street between Walnut Street and High Street.

Walnut & High. There is some commercial activity immediately south of the Boylston-Washington intersection on Walnut Street and High Street. Some of it will receive pedestrian-scale lighting through the Gateway East project. This commercial cluster should be considered an extension of the Brookline Village commercial area.

Boylston Street Corridor. Boylston Street between Washington Street and Brington Road is commercial. The street is dominated by high volume motor vehicle traffic. The street is currently under study by the Town's Planning and Community Development department. Installation of pedestrian-scale lighting should be included in comprehensive planning for the commercial area.

Streets Important for Walking as a Mode of Transportation.

Major walking routes. Pedestrian-scale lighting is needed on routes through town that are important for walking as a form of transportation. The three most important streets for walking as a mode of transportation are Beacon Street, Longwood Avenue, and Harvard Street.

Beacon Street. Beacon Street is the main East-West corridor in North Brookline. Its length within Brookline is approximately 2.5 miles. Within Brookline, Beacon Street has three commercial areas: St. Mary's, Coolidge Corner, and Washington Square. Beacon Street also connects to the Cleveland Circle commercial area on the Brookline-Brighton border. The distances between the commercial areas are all less than one mile. As indicated above, Beacon Street has pedestrian-scale lighting within the St. Mary's, Coolidge Corner, and Washington

Square commercial areas. New pedestrian-scale lighting is needed to connect the four commercial areas.

Beacon Street has continuous high-density residential development outside of the commercial areas. The density is particularly great between St. Mary's and Coolidge Corner and between Coolidge Corner and Washington Square. Residential development is also great on some streets close to Beacon Street, especially surrounding Coolidge Corner. The dense residential development is closely associated with the "C-line" trolley service on Beacon Street. In part, sidewalks on Beacon Street are important for connections to trolley service. However, there is significant pedestrian traffic that is independent of the trolley service. Some of the pedestrian traffic involves trips from residences in the Beacon Street corridor to the commercial areas within the corridor. Some of it is for travel between the commercial areas. Since the commercial areas are less than a mile apart, walking between them is feasible.

On the north side, Beacon Street needs additional pedestrian-scale lighting between 1080 Beacon Street and Charles Street, between Centre Street in Coolidge Corner and Westbourne Terrace (Washington Square), and West of Tappan Street. On the South side, Beacon Street needs additional pedestrian-scale lighting between Carlton Street and Charles, between Park Street and Washington Street, and west of Winthrop Road. These portions of Beacon Street are served by highway lighting, that is tall poles set far apart with emphasis on illumination of a wide road. Some of the poles are set in the median strip. Much of Beacon Street in these areas also has extensive mature tree planting that interfere with lighting of sidewalks. On the north side of Beacon Street between Amory Street and Powell Street, there are no light poles in the tree lawn. Similarly, west of Dean Road, all the light poles are in the median strip.

Since Beacon Street roadway lighting is adequate, a Beacon Street Pedestrian lighting project is likely to call for pedestrian-scale lighting to be added along sidewalks on both sides of the street to fill gaps between existing poles.

Longwood Avenue. Longwood Avenue connects Coolidge Corner and the Harvard University Medical area immediately east of the Boston-Brookline line. The street is less than a mile in length. There is no public transportation on Longwood Avenue. The sidewalks are used extensively for commuting on foot from Brookline to and from the Harvard Medical area. Land use along Longwood Avenue is mostly residential. (The block between Harvard Street and Sewall Avenue is commercial.) Housing on Longwood Avenue is varied in scale including both single-family homes and several large multi-family developments. All of Longwood Avenue is a high priority for pedestrian-scale lighting.

Harvard Street. Harvard Street connects Washington Square, Coolidge Corner, JFK Crossing, and a neighborhood commercial area in Alston at the intersection of Harvard and Commonwealth Ave. Within Brookline, Harvard Street is 1.3 miles in length. All of Harvard Street currently has pedestrian-scale lighting.

Secondary pedestrian transportation routes. Other streets in North Brookline are also important as transportation routes. Both major and secondary transportation routes should be served by pedestrian-scale lighting. The following are streets of secondary importance for pedestrian transportation:

- **Park Street** connects Coolidge Corner and Washington Street. It is a significant walking route for those walking from Coolidge Corner to Brookline High School (via Greenough Street).
- **Pleasant Street** connects Coolidge Corner and the West campus of Boson University. It travels almost entirely through an area of densely developed multi-family residential buildings.
- **St. Paul Street** connects Brookline Village, Beacon Street, Winthrop Square Park, Knyvet Square, and the West Campus of Boston University. There is extensive multi-family residential development particularly on the west side of St. Paul Street.
- **Babcock Street** connects Coolidge Corner with a commercial area on Commonwealth Avenue and the proposed West Station in Alston. Babcock Street was recently refurbished with emphasis on both bicycle and pedestrian accommodations. Crosswalks were added where there had been none. Pedestrian lighting was also improved by installation of some new closely spaced highway lights on cement poles near crosswalks. Except near Harvard Street and Commonwealth Avenue, the lights are all either on the west or the east side of the street. In other words, the lights are intended to illuminate the sidewalks on both sides of the street.
- **Freeman Street** between Babcock Street and St. Paul Street. Freeman Street is a significant east-west connector. Currently Freeman Street has unusually sparse lighting.
- **St. Mary's Street** connects the St. Mary's commercial area on Harvard Street with the Commonwealth Avenue commercial area and Boston University. The west side of St. Mary's street is in Brookline.
- **Davis Avenue** connects Brookline high school, Cypress playground, Emerson Garden, and Brookline Village.
- **Tappan Street** connects the school to both Cypress Street and Beacon Street west of Washington Square
- **Cypress Street** connects civic center with Brookline High School, Brookline Hills D-line station, Boylston Street corridor, and Cypress commercial area south of Boylston Street.
- **Washington Street** connects Gateway East, Brookline Village, Washington Square, and Commonwealth Avenue in Brighton. Washington Street is particularly important for pedestrian transportation within Brookline Village where the street already has some pedestrian-scale lighting. Some extension of pedestrian-scale lighting on Washington Street is recommended.
    - Between Park and Greenough Streets pedestrian-scale lighting should be added to support pedestrian traffic between Coolidge Corner and Brookline High School.

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- Between Winthrop Path and 686 Washington. This expansion will extend existing pedestrian-scale lighting southeast of Washington Square.
- Between Beacon Street and Salisbury Road. This portion will provide pedestrian-scale lighting to the new Driscoll School.

Access to public transportation. Pedestrian-scale lighting should be provided for those approaching public transportation stops. For the most part, the proposed network of sidewalks with pedestrian-scale lighting will provide adequate lighting for users of public transportation as they approach and leave transit stops. Since all of Beacon Street will be included, all Cleveland Circle Green line stops in Brookline will be connected. Attention to Amory Street, St. Paul Street, Pleasant Street, and Babcock Street near the Commonwealth Avenue commercial area will also provide pedestrian-scale lighting to users of the Boston College Green Line. Harvard Street is already adequately lit for users of the #66 bus route. Lighting at Riverside Green line stations in Brookline merits attention for each station:

- Longwood. The portion of Chapel Street that connects the Longwood Riverside Line Station and Longwood Avenue is well lit with a dense cluster of highway lighting.
- Brookline Village. Pedestrian-scale lighting is in place on both Station Street and Pearl Street.
- Brookline Hills. Proposed improvements for access to Brookline High School should adequately address needs of users of the Brookline Hills station.
- Beaconsfield. The proposed improved lighting on a portion of Dean Road will link the Beaconsfield Station to improved lighting on Beacon Street.

Streets important for pedestrian access to Brookline High School. Although the high school is outside the most densely developed portions of North Brookline, the high school is an important destination for those who live within the most densely developed areas. The high school is also close enough to be walkable. The distance between Coolidge Corner and the High School via Parks Street and Greenough Street is less than a mile. The distance between the High School and Beacon Street west of Washington Square is less than one mile. The streets that are most important for access to the high school from densely developed neighborhoods are:

Greenough Street
Tappan Street
Cypress Street
Davis Street

Residential neighborhoods surrounding commercial area. Some commercial areas in North Brookline are surrounded by high-density residential development. Residents of these neighborhoods are likely to make extensive use of sidewalks for transportation. Many of them are likely to prefer to have pedestrian-scale lighting within their entire neighborhoods. The residential density may be enough to justify the costs of the neighborhoods discussed below:

Coolidge Corner. Pedestrian-scale lighting should be added to all or part of the following streets where they have dense residential development. (Some of these streets have already been identified as being important for pedestrian transportation.)

- Marion
- Vernon
- Park
- Webster Street
- Alton Place
- Stearns Road
- Littell Road
- Sewall Avenue
- Longwood Avenue
- James Street
- Pleasant Street
- Parkman Street
- John Street
- Green Street
- Babcock Street
- Centre Street
- Winchester Street
- Summit Avenue
- Short Street

St. Mary's Commercial Area

The only dense residential development near the St. Mary's commercial area and off Beacon Street is on Carlton Street between Beacon Street and Monmouth Street and perhaps on Monmouth Street east of Carlton.

JFK Crossing

There is dense residential development on Williams Street, Centre Street, Winchester Street, and Fuller Street. The Brookline Senior Center is located on Winchester Street between Williams and Fuller. Center Communities of Brookline operates a senior residence at 100 Centre Street and is planning another between Williams and Fuller. Pedestrian scale lighting should be extended to include Centre Street, Williams Street, Winchester Street (from Beacon to Fuller), and Fuller Street between Harvard Street and Winchester Street.

Washington Square

In addition to the dense residential development along Beacon Street near Washington Square, there is dense development south of Beacon Street, especially west of the Washington Street

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intersection. The residential streets with enough density to be good candidates for pedestrian-scale lighting are:

- Fairbanks Street between Beacon Street & Washington Street
- University Road immediately south of Beacon Street
- Winthrop Road immediately south Washington Street
- Tappan Street immediately south of Beacon Street
- Dean Road between Beacon Street and Beaconsfield
- Garrison Road
- Claflin Road
- Rawson Road between Garrison and Claflin Road

Crosswalks. Pedestrians need to be able to cross streets safely. To do so, pedestrians must be visible to motorists when they are in cross walks. Further, pedestrians should be visible to motorists as pedestrians approach crosswalks since motorists are required to yield to pedestrians. Lighting designers recommend that lights be placed so that pedestrians are illuminated for approaching motorists. In effect, lighting designers recommend a light for each crosswalk. Brookline's existing approach is to place a single highway light close to each intersection. As much as possible, the approach is to maximize illumination over the intersection. To some extent, pedestrians may be illuminated by a second light placed near the intersection. Approaching motorists do not necessarily have a good view of pedestrians in crosswalks or pedestrians approaching crosswalks. The need for improved lighting is particularly great at unsignalized intersections. At signalized intersections, pedestrians are relatively safe during the "walk" phase of the signal cycle. At unsignalized intersections without stop signs, motorists are free to proceed unless they see pedestrians. Because of the need for motorists to have a good view of pedestrians, the need for good lighting is particularly great at unsignalized intersections.

As plans are developed for the expanded network of sidewalks with pedestrian scale lighting, it is important that illumination of crosswalks be considered in placement of new light poles.

An assessment is needed also of the adequacy of illumination of pedestrians in unsignalized crossings of Harvard Street between the School/Aspinwall intersection and Beacon Street.

Street lighting costs

The high cost of new street lighting is the major barrier to expansion of the network of pedestrian-scale lighting. Several variables contribute to the cost of new lighting. Electricity for new lighting is supplied by wires placed in conduits that are placed below sidewalks. Where new wiring is needed, existing sidewalks must be removed, conduits installed, and the sidewalks replaced. New lights also require electrical infrastructure, post foundations, poles,

and lighting fixtures. Lighting professionals are employed to design new lighting projects. Police details during construction may add 15% to project costs.

Many of Brookline's streetlights receive electrical current from wires strung on wooden utility poles. Distribution of electricity through overhead wires is much less expensive than underground wiring. Currently on two-lane streets, all utility poles are often on one side of streets. Ideally, pedestrian-scale lighting is provided for sidewalks on both sides of streets. The cost information that is provided here is for new metal poles with underground wiring with the expectation lighting is provided on both sides of streets.

The cost of lighting for the recently completed Pearl Street project provides useful information for estimating costs of future lighting projects when they are part of comprehensive street improvement projects. The project provided both pedestrian and roadway lighting for a two-lane roadway. The poles were set an average of 65 feet apart. The project required 32 pedestrian poles with acorn luminaires. Project costs included design engineering services and Brookline police details. The project was not charged for services of Town engineering staff. The total cost was $618,185. The cost per 100 linear feet was $61,818. The cost per pole was $19,318. The cost per mile would be roughly $3,250,000.

Also informative is the lighting cost for the Gateway East project. The area included is High Street east to Pond Avenue. The project will include the Walnut Street extension, and portions of High Street and Juniper Street. The lighting will serve both the sidewalks and at least 4 lanes of vehicle traffic. The Brookline Transportation Department considers this typical urban arterial roadway with pedestrian lighting. Some poles will be nearly 30 feet high and hold two fixtures. A higher fixture will be set over the roadway. A lower fixture will illuminate the sidewalk. The project will involve 55 poles spaced an average of 100 feet apart. The total cost of the lighting system will be $1,478,495. The cost per 100 linear foot will be close to $55,000. The cost per light pole installation will be close to $27,000.

Various strategies might be used to reduce the cost of improved lighting.

- Add new poles selectively to supplement existing highway lighting
- Add pedestrian-scale fixtures to existing wooden poles
- Add pedestrian-scale wooden poles with overhead wiring on streets with wooden utility poles

Financing new lighting. The way recent projects have been financed provides insights about the way future improvements might be financed. The Pearl Street lighting was financed through the larger Pearl Street renovation project. Funding came from two major sources: Chapter 90, State funds that come to Brookline annually and mitigation funds provided by Children's Hospital. The mitigation funds stem from the community impact of the Children's Hospital office building project that is under construction in the area. The Gateway East project is being funded through a combination of state and federal funds.

Some new pedestrian-scale lighting might be financed through the Town's Capital Improvement program (CIP). A new spending category might be created for an initiative to improve pedestrian lighting. The CIP regularly includes expenditures for road rehabilitation. In Fiscal year 2021, the Town is proposing a budget of $3,600,00 for road rehabilitation from a combination of local and state funds. The CIP for the 2021 fiscal year proposes an expenditure of $336,000 for sidewalk repair. In a highly constrained fiscal environment, the creation of a new category for pedestrian lighting improvements funded at $200,000 per year would be a major accomplishment. Unfortunately, an annual budget of $200,000 for pedestrian lighting improvements might yield little more than 10 new poles a year.

The high cost of stand-alone pedestrian lighting improvement projects makes it clear that pedestrian scale lighting should be included as part of major road reconstruction projects. The cost of installation of pedestrian-scale lighting will be substantially lower when sidewalks are being replaced for other reasons and when police details will be present for other reasons.

A separate CIP item for pedestrian-lighting improvements will be most valuable for small projects to improve lighting incrementally on streets with mature street trees that create serious dark spots for pedestrians.

Residents are likely to prefer continuous pedestrian-scale lighting when they walk at night. To provide continuous pedestrian-scale lighting, the Town would have to provide pedestrian-scale lighting in all commercial areas, along major and minor streets, and throughout the more densely developed neighborhoods. Extraordinary funding would be necessary. Residents will have to address the question whether improved lighting is important enough to be worth the price.

Neighborhood-level improvements will largely benefit residents of those neighborhoods affected. Residents of the Town as a whole may be reluctant to finance projects that will largely benefit residents of particular neighborhoods. Creation of lighting improvement districts should be considered. Residents of districts would agree to tax themselves to finance street lighting improvements. Some neighborhoods would make improvements; others would not.

The proposed plan will be implemented gradually with emphasis as follows:

1. Major streets in commercial areas
    a. Coolidge Corner (Beacon Street between Centre and Marian)
    b. Brookline Village (Washington Street between Holden and the Cypress/School intersection)
2. Major streets important for pedestrian transportation
    a. Beacon Street between the commercial areas
    b. Longwood Avenue
3. Minor commercial areas
    a. Commonwealth Ave./B.U. West
    b. Hamilton Square

    c. Cypress Street
4. Secondary streets important for pedestrian transportation
5. Neighborhoods surrounding major commercial areas
    a. Coolidge Corner
    b. Brookline Village
    c. Washington Square
    d. JFK Crossing
    e. St. Mary's
6. Neighborhoods surrounding minor commercial areas
    a. Commonwealth Ave./B.U. West
    b. Hamilton Square
    c. Whisky Point (Cypress street south of Boylston Street)
7. Brookline High School as a significant walking destination

Lighting within neighborhood parks. The committee's mandate was to examine lighting along streets. Nevertheless, concerns about lighting on paths in neighborhood parks in densely developed portions of Brookline. Parks are a destination for some residents after dark, especially dog walkers. Some neighborhood parks have pedestrian-scale lighting along paths. Knyvet Square, Longwood Park, Linden Square, and St. Mark's park are examples of parks with pedestrian-scale lighting. Some neighborhood parks are illuminated only by lights outside of the parks. Winthrop Square and Emerson Garden are examples of parks without any lights along paths within them. The recently refurbished Pierce Playground has only roadway lighting; it does not have pedestrian scale lighting along its paths. The Park and Recreation Commission may want to consider the merits of pedestrian-scale lighting when it makes improvements in neighborhood parks.

Attention to Pedestrian Scale Lighting in Street Renewal Projects

The expertise of lighting professionals is needed in the design of lighting for street improvement projects. As indicated above, major expansion of pedestrian-scale lighting is likely to take place only on projects that make comprehensive improvements to streets in compliance with Complete Streets policy. Lighting needs can be addressed in many ways. The challenges in assuring that pedestrian needs are great. To assure that pedestrian lighting needs are adequately addressed, we recommend that a design review committee with professional pedestrian lighting expertise be appointed to oversee the planning and implementation of comprehensive street improvement projects.

Design review committees are well established in Brookline to oversee both major building projects and park rehabilitation projects. Street improvement projects will also benefit from the guidance of design review committees. Design review promises to assure better attention not only to pedestrian lighting but also other dimensions of street improvement projects.

Policy Guidance for Implementation.

Because of the long time-horizon for implementation of improvements in street lighting, the Select Board should identify a board or committee to provide policy oversight. The oversight group should select locations for new projects, advocate for funding, and evaluate effectiveness of projects. The oversight group should be sensitive to changes within commercial areas, in residential density, and in transportation patterns. If, for example, there is evidence of greater reliance on walking as a mode of transportation at night, the implementation schedule should be accelerated with priority given to the areas in which there is most walking at night. The Select Board should determine whether long-term policy guidance is better provided by an existing board or committee or whether a new entity should be formed for this purpose.

Appendices

1. Mission of Pedestrian Lighting Committee as specified by Brookline Select Board
2. History of street lighting in Boston
3. Pedestrian scale residential lighting on Buswell Street in Boston
4. Maps

References

BEGA Application Guide, 2016. https://cdn.bega-us.com/userfiles/files/Application_Guide_Web.pdf

Glossary. Lighting Research Center, **Rensselaer** Polytechnic Institute.
https://www.lrc.rpi.edu/resources/publications/lpbh/091Glossary.pdf

Appendix 1. Mission

1. Warrant Article 22 of the May 2019 Annual Town meeting was a Resolution that was approved by a vote of Favorable Action by Town Meeting. The Resolution requested that the Select Board appoint a committee to develop a Plan to extend pedestrian-friendly lighting along sidewalks with extensive pedestrian activity. The Resolution further requested that the committee be charged to determine the extent to which there is public demand for improved lighting for pedestrians, identify locations where improved pedestrian lighting is most needed, and examine costs of installation and operation of new pedestrian-friendly street lighting and report it recommendations to a future Town Meeting.

2. To carry out the wishes of Town Meeting as expressed in the Resolution, the Select Board hereby establishes the Select Board Committee on Pedestrian Friendly Lighting to Study issues raised by or related to the Resolution. The Committee's Study shall include, without limitation, the items listed above in the first paragraph. The Committee shall present the results of its Study, its recommendations, and a proposed Plan in a Report to the Select Board. The Committee shall then submit its Report for publication in the Combined Reports of a subsequent Town Meeting.

3. In conducting its Study, the Committee shall consult with the Deputy Town Administrator and/or the Assistant Town Administrator on the fiscal impacts of its findings and recommendations. The Committee shall also consult with other Town professional staff as

appropriate to develop recommendations and a Plan that can be implemented within the technical, fiscal, and other constraints of the Town.

Appendix 2 History of Street Lighting in Boston

The Street Lighting History in Boston in the City of Boston Archives provides some insights about the likely pattern of development of street lighting in Brookline. (There is probably no equivalent documentation of street lighting history in Brookline.)

Prior to 1828, oil lamps were used to light Boston's streets. In 1828, coal gas lamps were introduced by the Boston Gas Company. The first electric streetlamps were introduced in 1882. During the 1890s the city began to convert oil lamps to gas lamps that used naptha gas, a gasoline derivative. By 1913, all gas lamps in Boston proper had been converted to electric lamps. However, Boston continued to use gas lamps in its residential districts. The last gas lamps were installed in residential districts in 1948. During the 1940s, vapor electric lamps were also installed on many major Boston streets.

During the first half of the 20th century, outside vendors maintained the city's gas lamps, but in 1958, the City took over gas lamp maintenance. Four years later, the city began to change electric lamps in historic neighborhoods back to gas lamps. Electric to gas changeovers continued into the 1990s.

Over time, the number of city-owned streetlights increased. During the 1990s, the City rebuilt some streetlamps that had been installed in the 1970s, replacing cobra head styles with "period style" designs. In 2002, Boston made a large purchase of streetlights from Boston Edison.

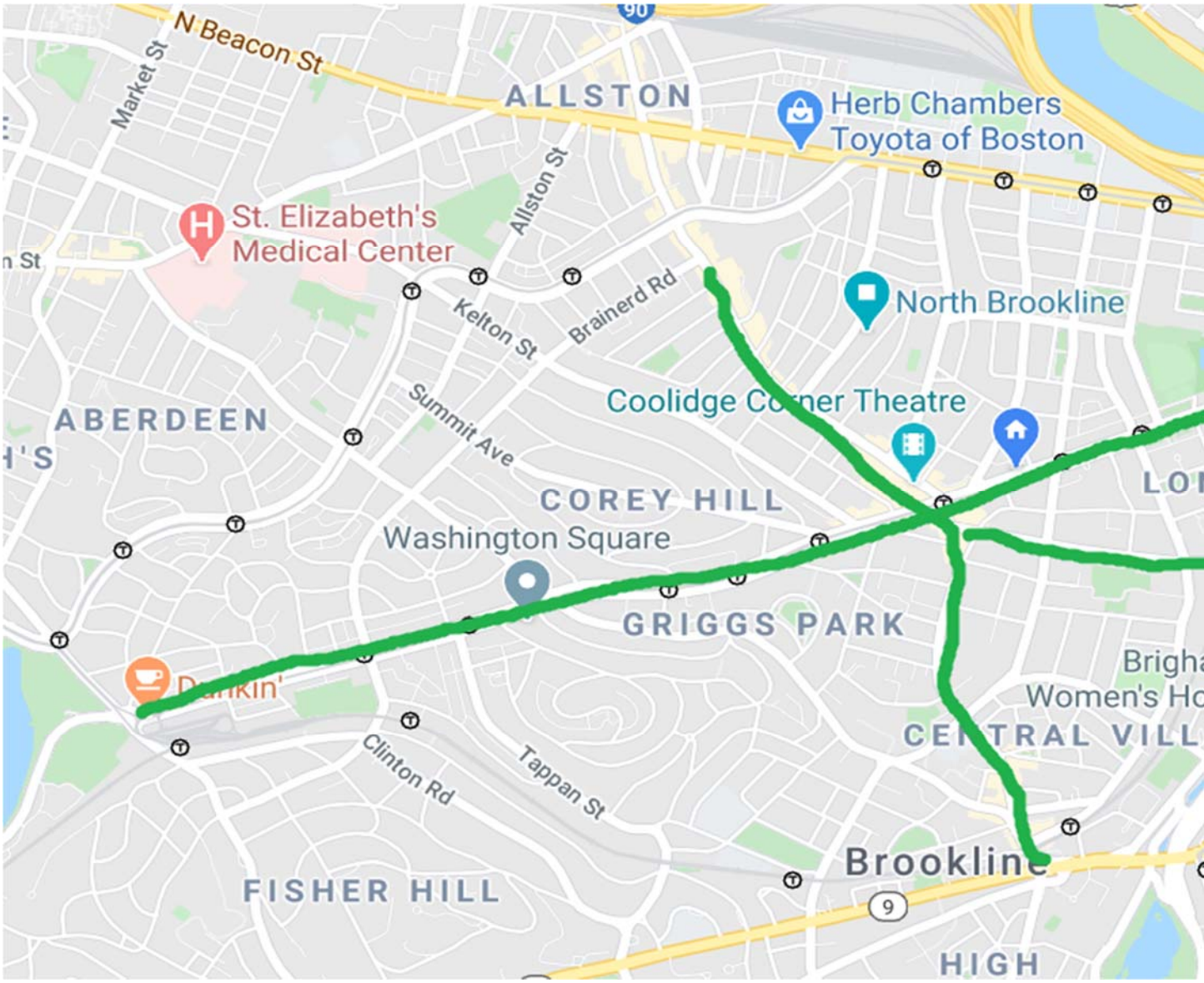
Appendix 3. Pedestrian scale residential lighting on Buswell Street in Boston

Buswell Street in Boston has good contemporary pedestrian lighting. Buswell Street is two blocks long running between St. Mary's Street and Mountfort Street. Buswell Street connects with Ivy Street. On Buswell street the poles are set 90 feet apart. The poles are cement. The poles are lower than standard roadway cement poles used along Brookline streets. The fixtures are somewhat like cobra lights in appearance; they direct all of the light downward without the glare produced by cobra lights. All of the buildings on Buswell Street are medium sized apartment buildings. All are probably owned by B.U. Street trees on Buswell Street are few; none are large enough to interfere with sidewalk lighting.

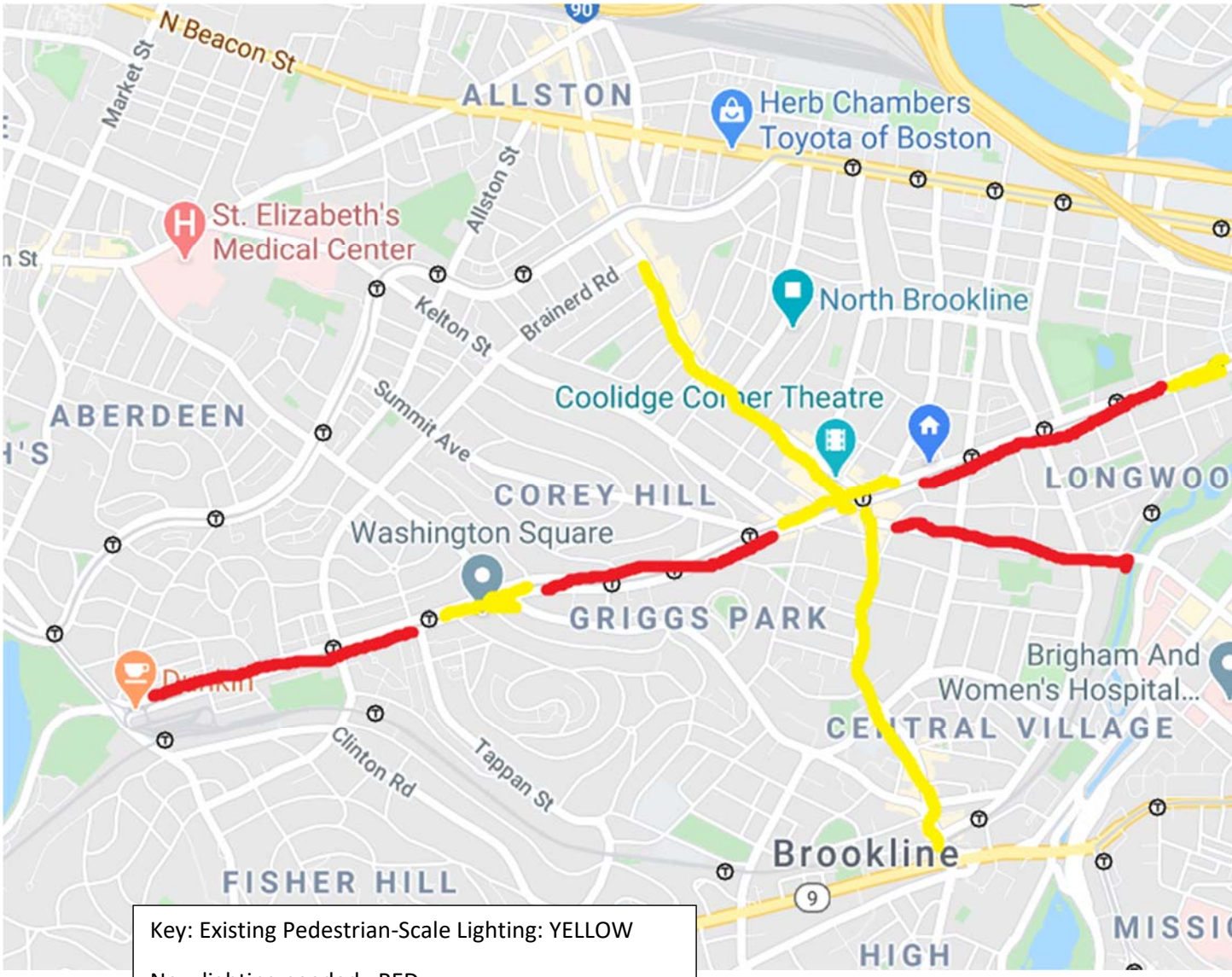
DRAFT

Main Walking Routes in North Brookline:

Beacon Street, Harvard Street, Longwood Avenue



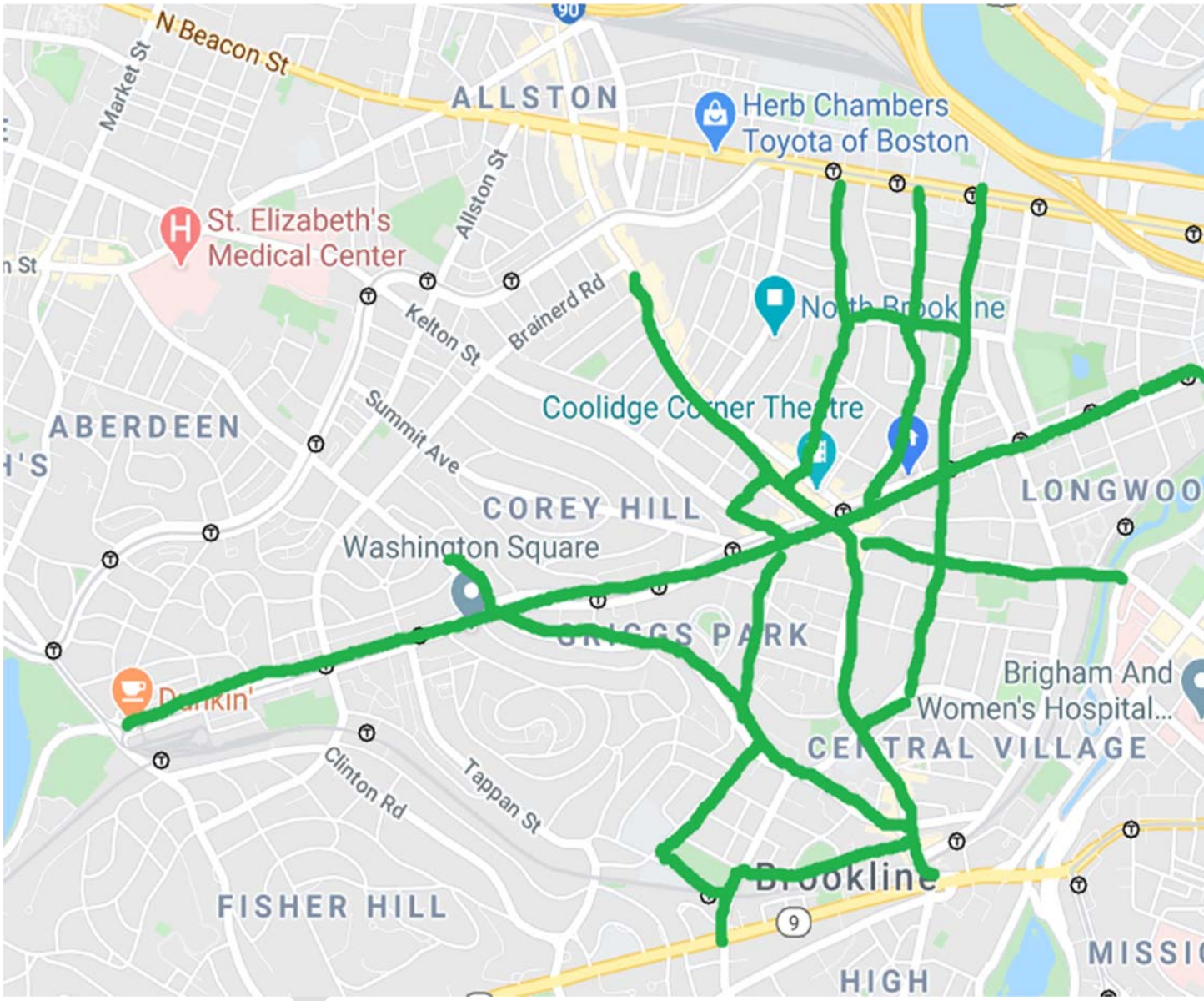
Main Walking Routes with and without Pedestrian-Scale Lighting



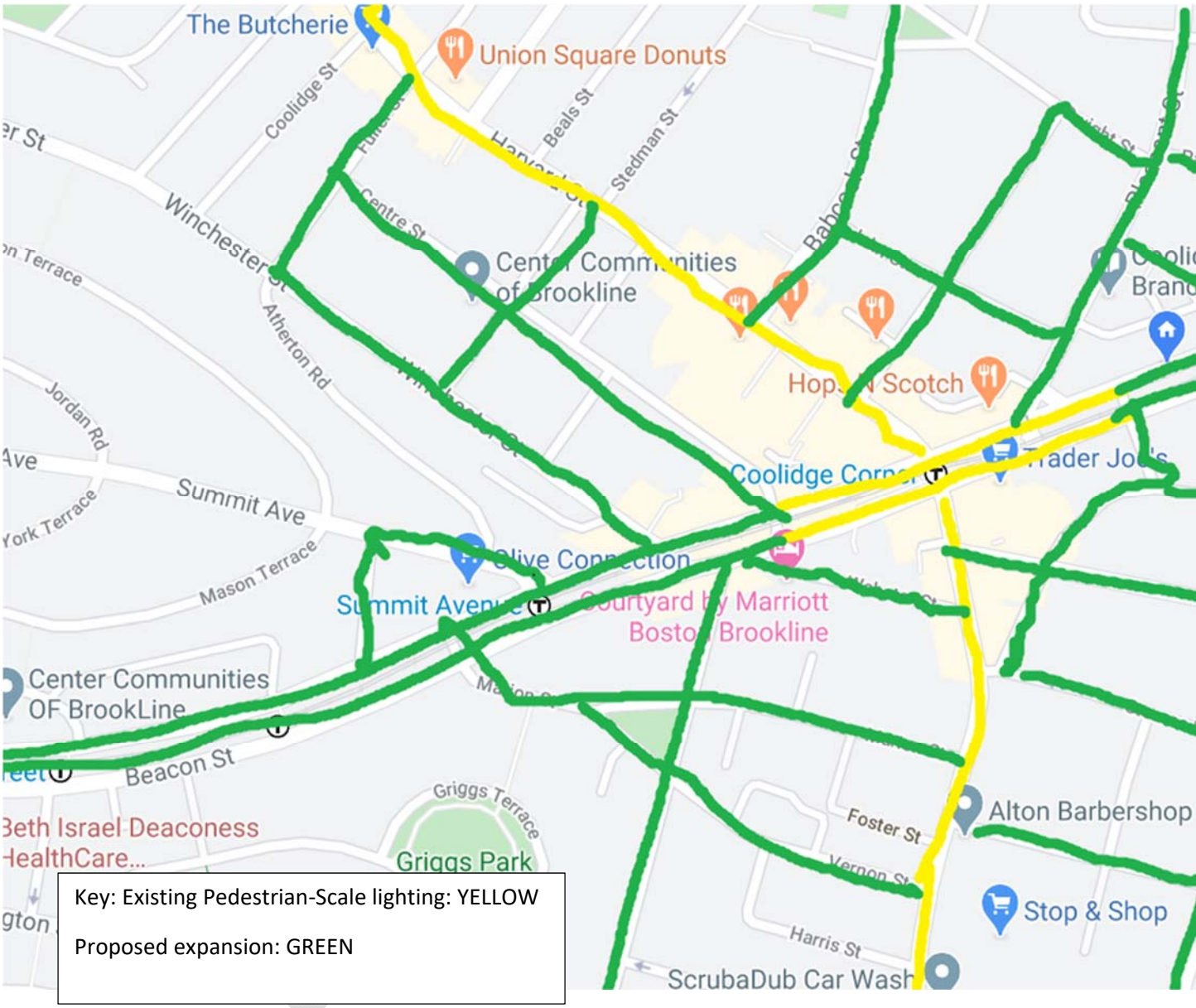
Key: Existing Pedestrian-Scale Lighting: YELLOW

New lighting needed: RED

Expanded Walking Routes in North Brookline



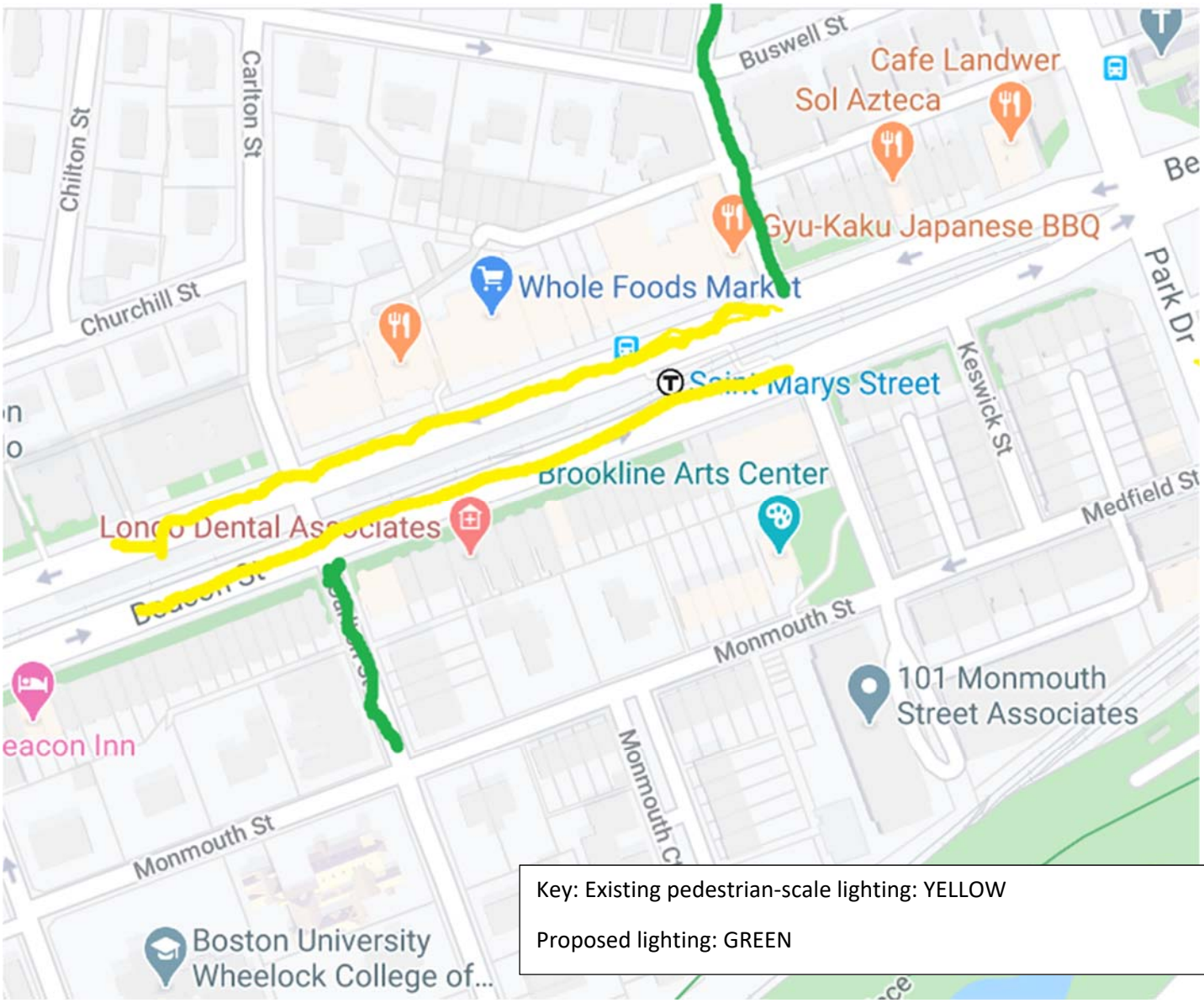
Coolidge Corner Neighborhood with Expanded Pedestrian Lighting



Key: Existing Pedestrian-Scale lighting: YELLOW

Proposed expansion: GREEN

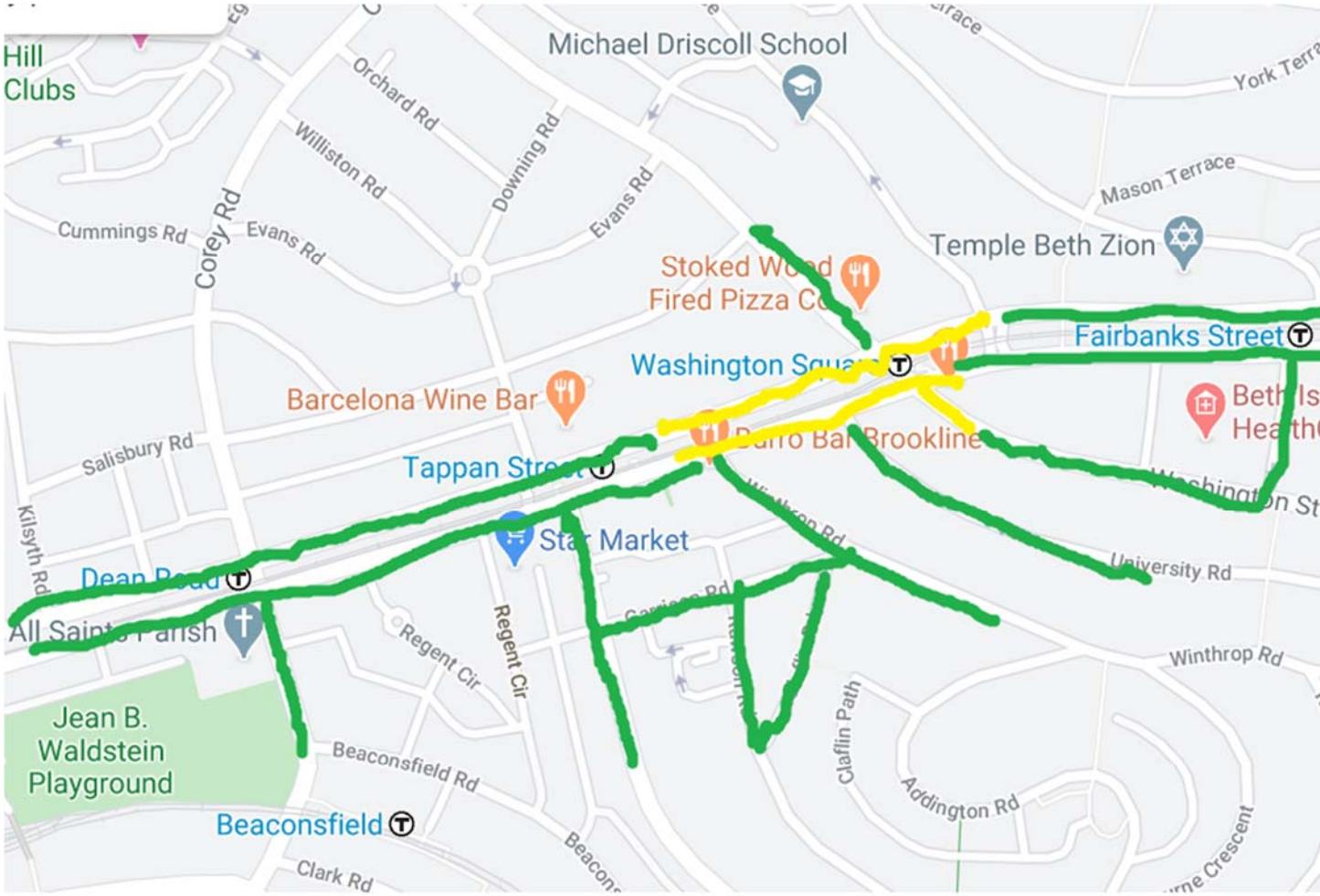
St. Mary's Neighborhood: Existing & Proposed Pedestrian-Scale Lighting



Key: Existing pedestrian-scale lighting: YELLOW

Proposed lighting: GREEN

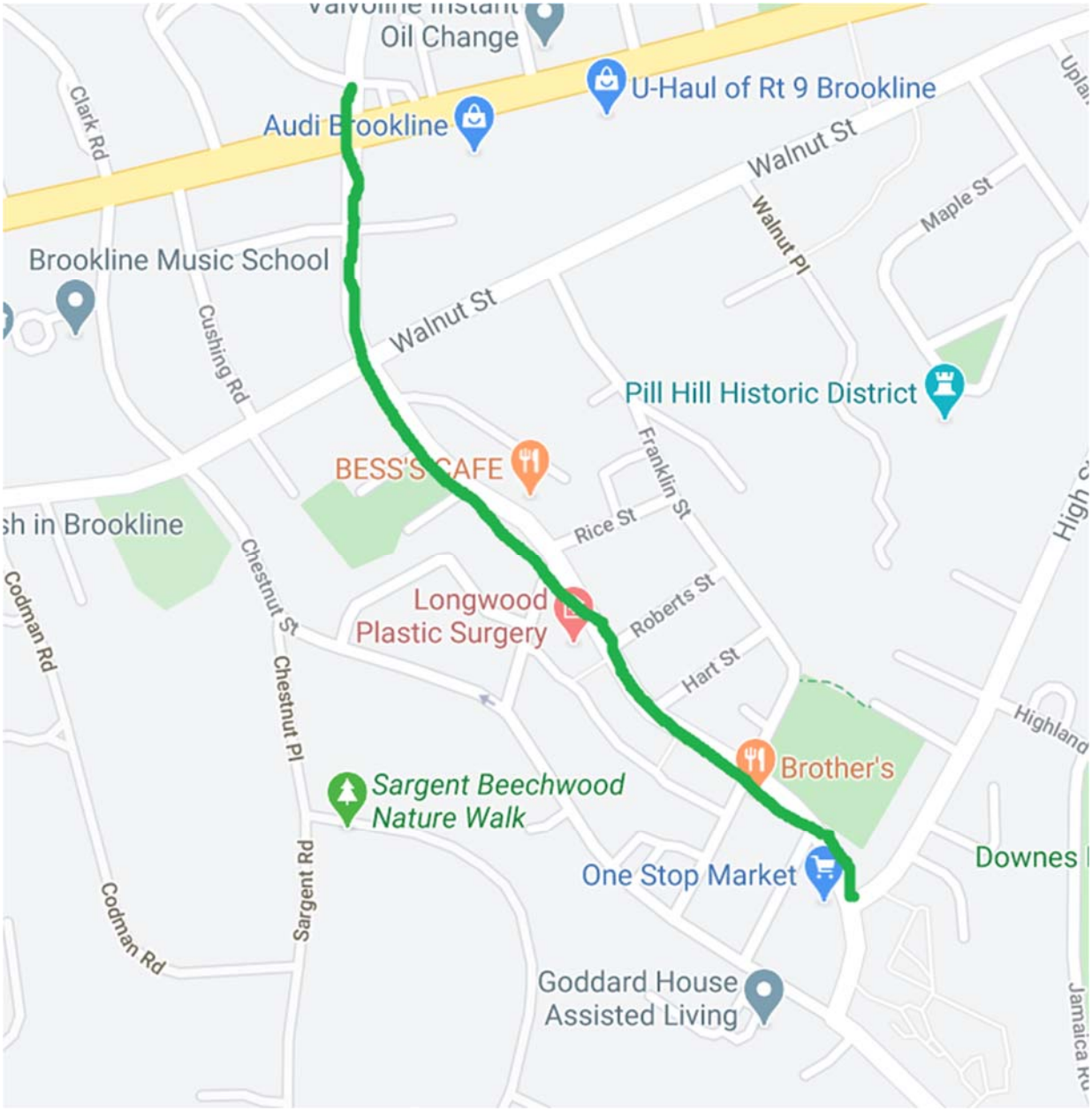
Washington Square Neighborhood: Proposed Expanded Pedestrian-Scale Lighting



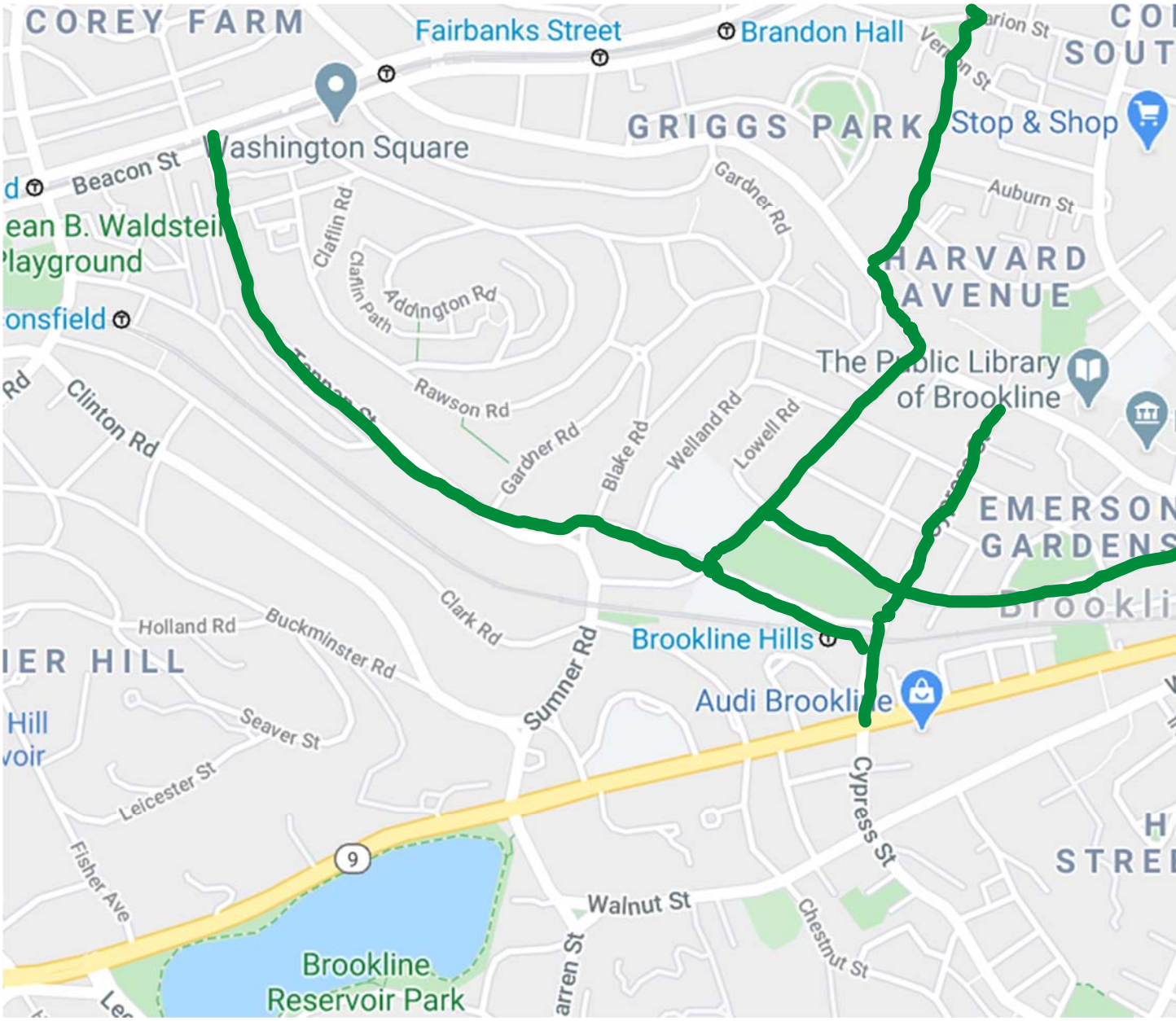
Key: Existing Pedestrian Scale Lighting: YELLOW

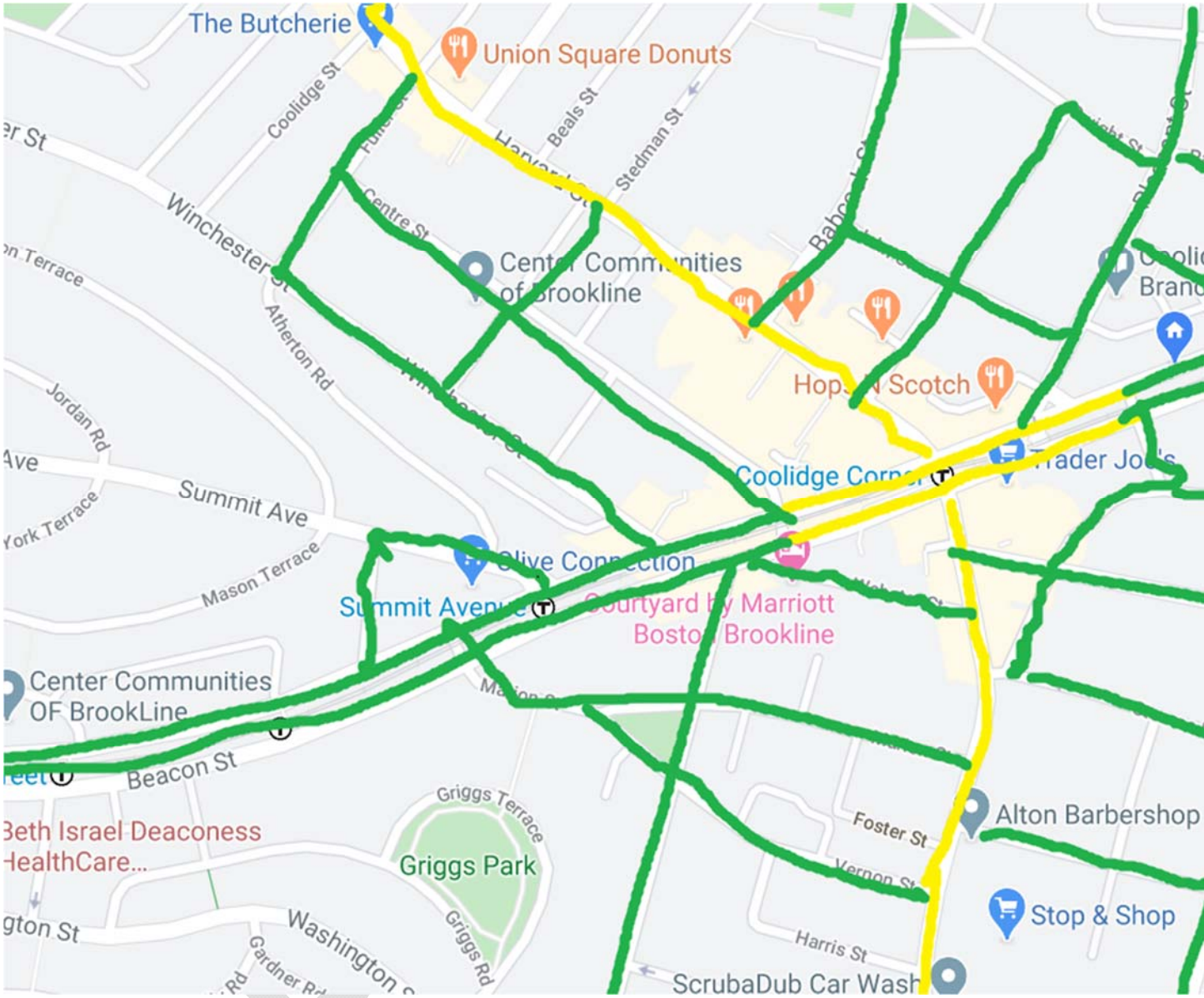
Proposed expansion: GREEN

Proposed Pedestrian Scale Lighting on Cypress Street South of Boylston Street

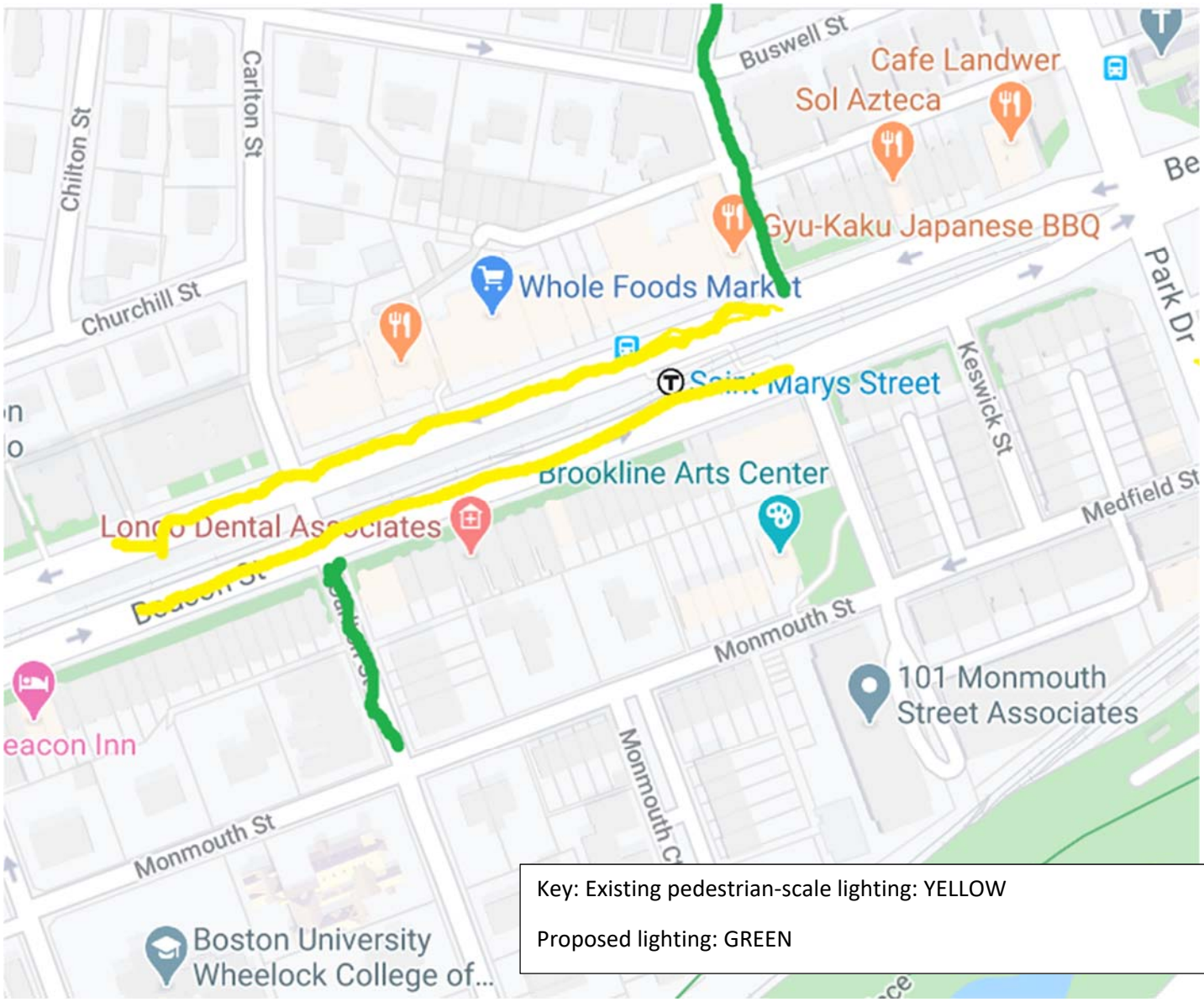


Proposed Walking Routes to Brookline High School




The Butcherie
Union Square Donuts
Coolidge St
Beals St
Stedman St
Winchester St
Centre St
Atherton Rd
Jordan Rd
Summit Ave
Mason Terrace
Coolidge Corner
Trader Joe's
Olive Connection
Courtyard by Marriott Boston Brookline
Center Communities OF BrookLine
Beacon St
Griggs Terrace
Griggs Park
Griggs Rd
Foster St
Alton Barbershop
Stop & Shop
Harris St
ScrubaDub Car Wash
Washington St
Gardner Rd

St. Mary's Neighborhood: Existing & Proposed Pedestrian-Scale Lighting



Key: Existing pedestrian-scale lighting: YELLOW

Proposed lighting: GREEN