

3.0 ASSESSMENT OF DEVELOPMENT REVIEW COMPONENTS

Section 3

3.0 ASSESSMENT OF DEVELOPMENT REVIEW COMPONENTS

3.1 Urban Design

3.1.1 Introduction and Urban Design Principles

The primary urban design objective of Boston University Medical Center is to create a cohesive medical campus thoughtfully integrated into the surrounding urban fabric and neighborhoods. Since the merger of Boston City Hospital and University Hospital in 1996, sensitive design, careful open space planning, and conscientious site and streetscape enhancements along the campus periphery have supported this objective. Various improvement projects, implemented under the previous master plan, refined the presence and aesthetic of the BUMC Campus, specifically along Harrison Avenue.

The Proposed Projects are designed within the context of important urban planning principles. These principals include:

- ◆ Transform the Albany Street campus image;
- ◆ Complement the existing context massing, scale, and materials;
- ◆ Create a clear and welcoming sense of arrival;
- ◆ Enhance open spaces on the campus, both short and long-term;
- ◆ Develop pedestrian friendly street edges;
- ◆ Enable connectivity between parking and existing buildings;
- ◆ Integrate sustainable design principles and operations; and
- ◆ Plan proactively for future growth and transformation.

The master plan goals, combined with the previously applied design principles, will enrich the physical image of the BUMC Campus, improve the integration with the surrounding neighborhood, and elevate the perceptions of the Boston University Medical Center by its users, particularly on Albany Street.

3.1.2 Urban Design – Moakley Cancer Center Addition

Moakley Cancer Center Addition - Existing Context and Project Location

The Proposed Moakley Cancer Center Addition will be located on the West Campus along East Concord Street within the center of the BUMC Campus.

Currently East Concord Street plays an important role within the BUMC Campus by providing a link to the boundary residential neighborhoods located to the north, while fostering one of the campuses most important north/south pedestrian and vehicular connections. The Street is composed of academic buildings varying in scale and style, a large open green space along its east side, and the 710 Parking Garage located at the

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corner of Albany Street. Additionally there is a MBTA bus stop located along East Concord Street adjacent to the project site.

The project site is located on the open space directly east of the existing Moakley Cancer Center and has frontage along East Concord Street. The north face is located along the Moakley and Menino Drop-off drive and is aligned with the northern edge of the existing Moakley Cancer Center building. The south face is also aligned with the existing building and has frontage along Shapiro Drive. The east face abuts East Concord Street further defining the existing pedestrian travel path while creating a distinct bookend to the green behind the Talbot building.

Moakley Cancer Center Addition - Massing and Height

The height and massing are dictated by both programmatic need and existing contextual cues. The project height and massing will be consistent with, and relate to, the existing Moakley Cancer Center building. The building will be 3-stories at approximately 50 feet above grade, aligning with the current height of the Moakley Cancer Center. There will be roof screen to define a sense of hierarchy consistent with the existing Moakley Cancer Center building. The overall height of building with the new roof screen will be approximately 66 feet in height from grade. This is approximately 15 feet lower than the adjacent existing penthouse. Contemporary design of hierarchy and planer expression will be extended from the existing Moakley Cancer Center building to further integrate the architecture with the surrounding context.

The north and south facades of the addition are aligned with the existing Moakley Cancer Center building, helping to strengthen the east-west pedestrian corridor connecting The Moakley Cancer Center with the Boston University Medical School Campus. The east face of the addition engages the sidewalk along East Concord Street further defining the pedestrian experience along the street edge. The building will also create shelter for the relocated MBTA bus stop and for traversing pedestrians along East Concord Street by providing an architecturally integrated canopy.

Moakley Cancer Center Addition - Material Image

Currently the existing Moakley Cancer Center successfully integrates itself within the neighboring historic context through the meaningful use of a simplified material palette. Brick, metal and glass curtain wall are applied in a way that resemble the typical architecture of the South End while simultaneously creating its own contemporary image. The new Moakley Cancer Center Addition will look to extend the currently successful approach of the existing building.

The exterior treatment will be predominantly comprised of red brick and glass curtain wall systems. Small scale punched openings are proposed along the east and south facades relating to the smaller scale and historic presence along East Concord Street. A large-scale vertical window opening along East Concord Street will provide a visual bookend to the horizontal expression created by the smaller punched windows. The north facade will be

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composed of glass curtain wall relating to the existing Moakley Cancer Center north elevation.

Moakley Cancer Center Addition - Vehicle Access and Circulation

Patient and vehicular access for the Moakley Cancer Center Addition will be via the existing Moakley Cancer Center entrances located along the drop-off to the north of the building.

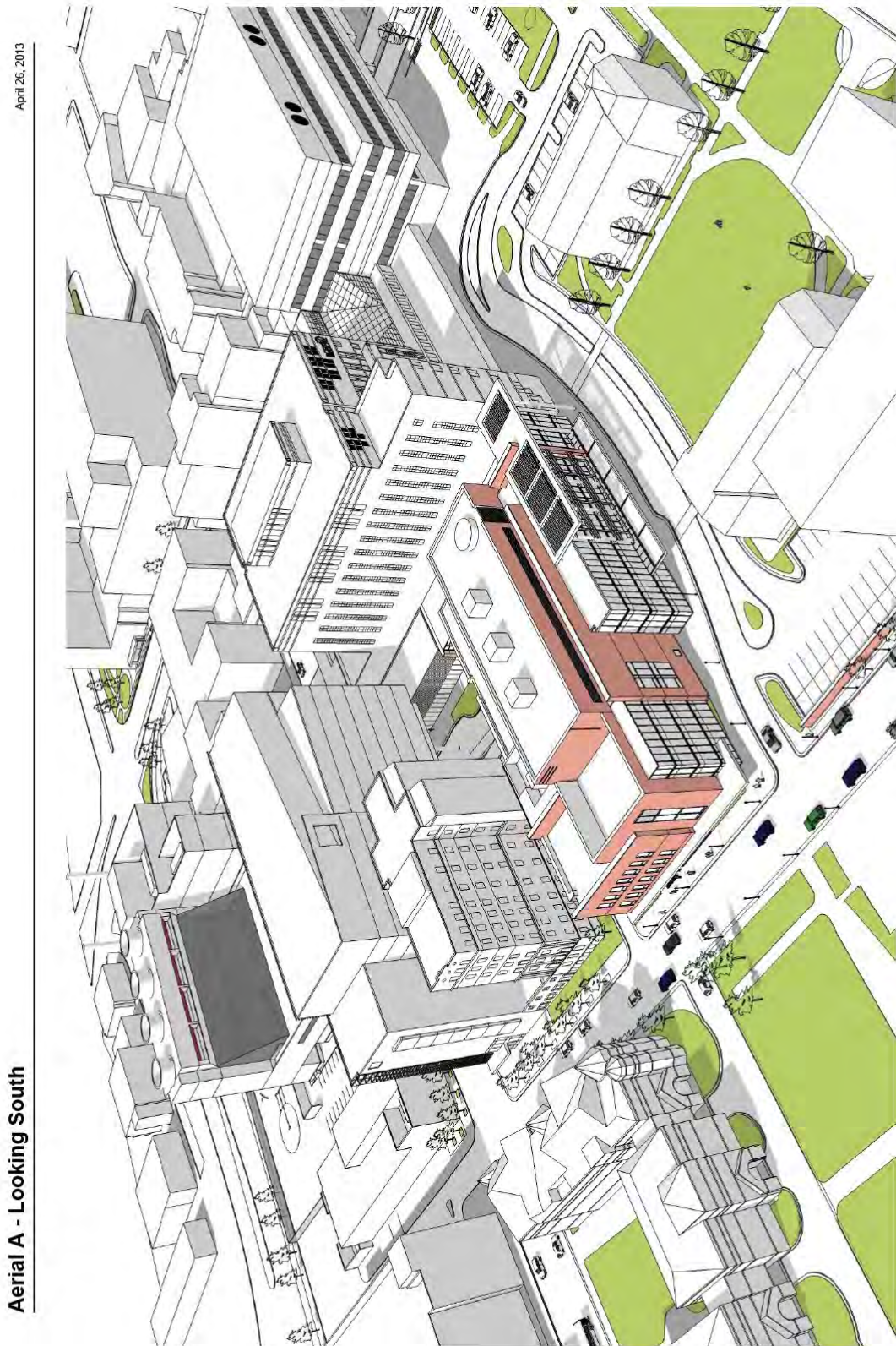
Construction of the Moakley Cancer Center Addition will necessitate a slight reconfiguration of the existing Shapiro Drive where it intersects with East Concord Street. The portion of Shapiro Drive located between the Moakley Cancer Center Addition and 85 East Concord will be relocated approximately 20 feet south of its existing location. This creates a more optimal intersection configuration and provides appropriate visual clarity for vehicular traffic turning right onto East Concord Street. Sidewalk and landscape improvements along this reconfigured portion of Shapiro Drive will be consistent with the existing conditions and materials.

Moakley Cancer Center Addition - Site Improvements

The existing MBTA bus stop along East Concord Street will be relocated from the street edge closer to the building footprint to provide users with added protection from the elements. Sidewalk and landscaping improvements will take place along the perimeter of the building defining the new MBTA bus stop location and enhancing the pedestrian experience.

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Figure 3-1 Moakley Cancer Center Addition Aerial View Looking South



Aerial A - Looking South

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Figure 3-2 Moakley Cancer Center Addition Aerial View Looking West



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Figure 3-3 Moakley Cancer Center Addition Context Photos

Context Photos

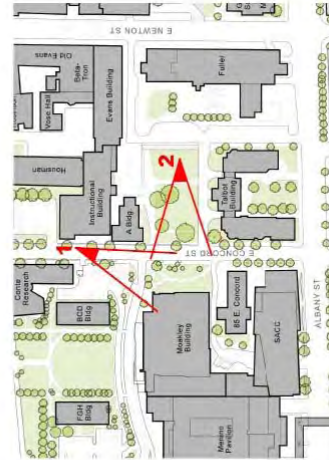
March 23, 2013



Photo 1: View from East Concord St. looking south.
Northeast corner of Moakley Cancer Center with rebuilt historic brick wall in foreground.



Photo 2: View from green space behind Talbot Building
East facade of Moakley Cancer Center with MBTA bus stop in front of.



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Figure 3-4 Moakley Cancer Center Addition Context Photos (continued)

Context Photos

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Photo 3: View from East Concord St. looking west. Southeast corner of Moakley Cancer Center.



Photo 4: View from East Concord St. looking southwest Shapiro Drive exit with East facade of Moakley Cancer Center on right and 85 E. Concord on the left.



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MOAKLEY CANCER CENTER ADDITION

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3.1.3 Urban Design – New Inpatient Building Phase 1

New Inpatient Building Phase 1 - Existing Context and Project Location

The proposed New Inpatient Building Phase 1 will be located on the West Campus along Albany Street..

The New Inpatient Building Phase 1 site is located on the north side of Albany Street and is proposed to replace the 3-story section of the existing Dowling Building and the current Emergency Department drop-off adjacent to the Menino Pavilion. Phase 1 of the New Inpatient Building is a 4-story infill project bordered directly on the north, east, and west sides by the Yawkey Ambulatory Care Center, Menino Pavilion, and remaining Dowling building respectfully. The 2-story connector wing will be located on the south edge of the Menino Pavilion over the existing Emergency Department entrance, ambulance parking, and loading area. The southern edge of the project site will engage the pedestrian streetscape and better define the building edge.

The current Albany Street edge is composed of varying building setbacks, scales and styles. As a major arrival point on the BUMC Campus the streetscape lacks a vital sense of clarity and organization. The New Inpatient Building Phase 1 project will begin to better define the north edge of Albany Street and align with Boston University Medical Center's strategic urban design goals stated previously to enhance the Albany Street image.

New Inpatient Building Phase 1 - Massing and Height

The project height and massing are primarily dictated by the available site area and necessary space requirements of the program and will have a simple rectilinear form. The New Inpatient Building Phase 1 will be approximately 74 feet in height from grade including the small penthouse and will align with the Level 4 roof of the Menino Pavilion. The small penthouse will be located to the south in order to minimize visual obstruction of existing bedrooms within Menino. The connector wing will span over the existing ambulance parking area with physical links will to Menino Pavilion Levels 2 and 3. The mass of the connector wing will be a simple rectangular form along the southern face of the Menino Pavilion.

The north, east, and west facades of the New Inpatient Building Phase 1 will abut the existing Yawkey Ambulatory Care Center, Dowling Building, and Menino Pavilion. The project height and massing are consistent with the smaller scale context along Albany Street, such as the Finland and Mallory Buildings; and will provide a physical transition to the larger scale Phase 2 of the New Inpatient Building in the future.

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New Inpatient Building Phase 1 - Material Image

The exterior design of the New Inpatient Building Phase 1 along with the new Bridge will reflect Boston University Medical Center's desire to transform the Albany Street Campus image by visually strengthening connections to existing campus context and providing continuity along the street edge. The exterior treatment of the New Inpatient Building Phase 1 will be predominantly composed of a glass curtain wall system and a proposed phenolic resin panel system conveying a contemporary aesthetic consistent with the modern design direction of the campus. The south façade along the street edge will sponsor a large "picture" window, providing needed light to functions within and visual connections back to the Albany streetscape. The connector wing will continue the curtainwall system with fritted glass intended to obscure the primarily utilitarian functions within.

New Inpatient Building Phase 1 - Vehicle Access and Circulation

Normal staff and non-emergency patient access for the New Inpatient Building Phase 1 will be via the existing Menino Pavilion entrances located along the drop-off to the north of the building. Service access will be provided thru the connector wing via the new Bridge.

Construction of the New Inpatient Building Phase 1 will necessitate the relocation of the Emergency Department entrance and drop-off to the rear of the Moakley Cancer Center, where emergency patient and vehicular access will be provided via Shapiro Drive. The current loading truck dock will be relocated to the south side of Albany Street along the north face of the existing Power Plant.

New Inpatient Building Phase 1 - Site Improvements

A considerable setback from Albany Street has been maintained to provide adequate space for continued urban landscaping and sidewalk improvements to enhance the pedestrian experience along the Albany Street Corridor. A simplified ambulance parking area will be created with reduction in existing curb cuts along the north side of Albany Street. Three existing curb cuts will be closed and removal of the existing curb between the existing loading dock and existing ambulance parking areas. Urban landscape improvements will include new planters, trees, and pavers, consistent with the recent enhancements as part of the Shapiro Ambulatory Care Center to further integrate and enhance the Albany Street experience.

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Figure 3-5 New Inpatient Building Phase 1 Aerial View Looking Northwest

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Aerial A - Looking Northwest



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Figure 3-6 New Inpatient Building Phase 1 Aerial View Looking Southwest

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Aerial B - Looking Southwest



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Figure 3-7 New Inpatient Building Phase 1 Context Photos

Context Photos

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Photo 1: View from Albany St. looking east.
Dowling Building on the corner of Massachusetts Ave. and Albany St. with Yellow utilities tube and Shapiro ACC in background.

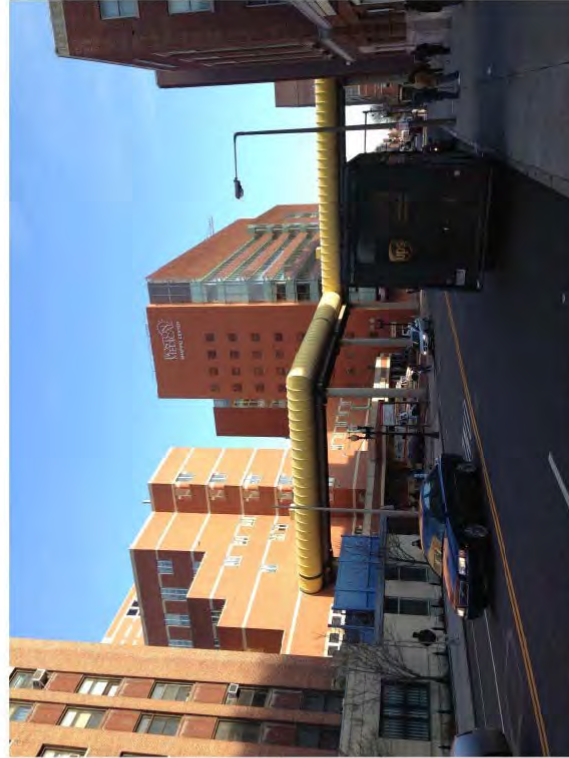


Photo 2: View from Albany St. looking east.
Yellow utilities tube over Albany St. connecting to Menino Pavilion. Shapiro ACC in background.



PHASE 1 INPATIENT BUILDING

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Figure 3-8 New Inpatient Building Phase 1 Context Photos (continued)

Context Photos

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Photo 3: View from Power Plant parking lot looking west. South face of Menino Pavilion with yellow utilities tube in the foreground. Dowling Tower in the background.



Photo 4: View from Albany St. looking west. South and east facades of Dowling Tower with 3-story section (to be demolished) of Dowling on the right.



PHASE 1 INPATIENT BUILDING

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Figure 3-9 New Inpatient Building Phase 1 Context Photos (continued)

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Photo 5: View from Albany St. looking east. Emergency Department drop-off and entrance at south face of Menino Pavilion.



Photo 6: View from Albany St. looking east. Truck Loading Dock at south face of Menino Pavilion with Shapiro ACC to the right.



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3.1.4 Urban Design – BMC Energy Facility

Energy Facility – Existing Context and Project Location

The proposed location of the Energy Facility to the west of the existing Power Plant and behind the Finland Building will help meet the urban design objectives as outlined in the IMP Amendment. It will allow for a less encumbered building site along Albany Street so the future development can continue to bring order to that urban corridor. As future phases of the IMP are developed, the desired balance of density and open space enhancements, and further definition of Albany Street will be realized.

The Energy Facility will also reinforce the contemporary architectural vocabulary that is shaping the NewMarket Square area as experienced from the Massachusetts Avenue Connector. The site to the west of the existing Power Plant will make the Energy Facility more prominent from that connector allowing it to be visually linked to the Hampton Suites and the Boston University Medical Center buildings that are contributing to the character of NewMarket.

The Energy Facility will connect to the new 1-story corridor (constructed in conjunction with the new patient transport Bridge) to the west of the existing Power Plant. The new building site will be set back further from Albany Street allowing the north side of the site to be developed as open space in conjunction with the construction of the future Administration / Clinical Building. This configuration of buildings will continue to capitalize on the unique open space characteristics of the BUMC Campus and will provide relief for pedestrians and staff. The south side of the site fronts the Massachusetts Avenue Connector, a major vehicular approach.

Energy Facility - Height and Massing

The height and massing are primarily dictated by dimensional clearances required for the large pieces of equipment to be housed within the building envelope. The height of the building will be approximately 100 feet from grade to the top of the roof screen and will be shorter than the existing Power Plant in overall height. The north face will be set back approximately 60 feet in front of the north face of the existing Power Plant. The existing staff parking along Albany Street will be maintained until the proposed Administration / Clinical Building and open space is developed. The south side is bound by setbacks associated with the Roxbury Canal.

Two 6'-0" diameter exhaust stacks will be approximately 160 feet above grade. They will be located adjacent to the taller portion of the existing Power Plant to reduce the perceived height. The height (to the top of the roof) of the Energy Facility will be approximately 30'-0" shorter than the height (to the top of the roof) of the existing Power Plant.

The project's height and massing are consistent and compatible with the institutional scale and density of the existing BioSquare development to the east and Crosstown/NewMarket development to the west. The massing of the Energy Facility also establishes a relationship with the scale and massing of the existing Power Plant, the Shapiro Ambulatory Care Center

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across Albany Street and the proposed New Inpatient Building that will bring continuity to the North side of Albany.

Energy Facility - Material and Image

Simple massing and a minimal material palette are proposed for the Energy Facility. The building will be almost exclusively mechanical equipment with minimal occupied space. As a result, the building façade will utilize dark grey solid and louvered metal panels. This exterior cladding system will be complemented by metal screening around the rooftop mechanical equipment that will complement the “industrial” architecture of the existing Power Plant. The building’s simple form celebrates its utilitarian function while softening the visual impact to the BUMC and BioSquare campuses. The contemporary façade will also complement the evolving architectural style of structures in the NewMarket area.

The Energy Facility’s presence will be predominantly visible from the Massachusetts Avenue Connector. Visual glazed portals will be viewed from the South, East and West elevations.

Energy Facility - Vehicular Access and Circulation

Normal staff access and small material deliveries for the Energy Facility will be via existing Power Plant entrances and loading docks located along the Albany Street. Limited service access will occur on the north and south side of the Energy Facility for routine maintenance and to accommodate deliveries of equipment and materials to support ongoing operations.

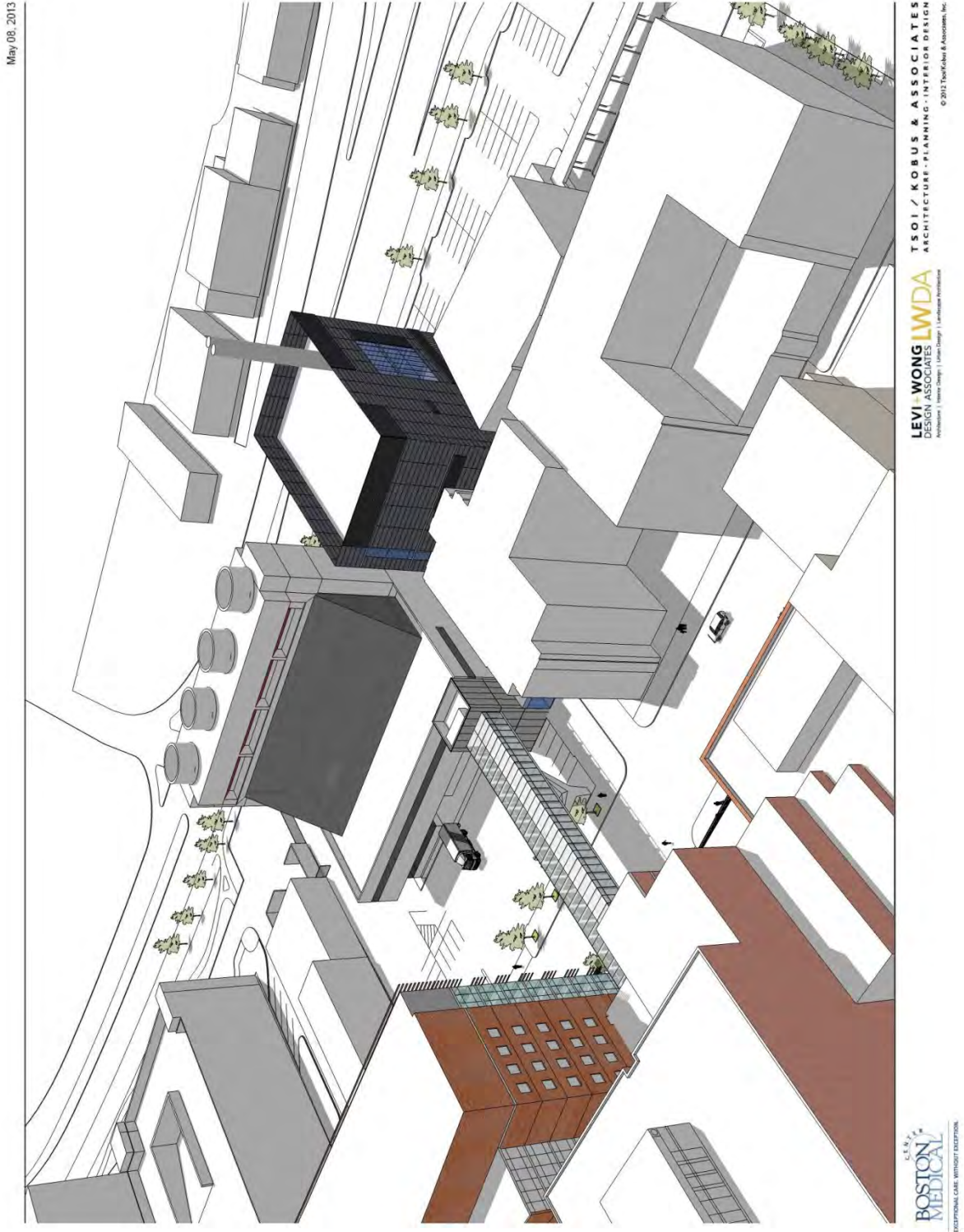
Energy Facility - Site Improvements

Sidewalk and urban landscaping improvements along the project frontage at Albany Street will occur as part of the proposed new Bridge. Urban landscape improvements will include new planters, trees, and pavers, consistent with the recent enhancements as part of the Shapiro Ambulatory Care Center to further integrate and enhance the Albany Street experience. It is anticipated that this zone will remain oriented to service vehicles in the near term with pedestrian improvements focusing on the sidewalks along Albany Street.

One of the existing two lanes underneath the existing yellow utility tube will be closed (with the construction of the new Bridge) minimizing and reducing the width of this curb cut in half. The vehicle ramp to the existing staff parking lot of the Power Plant will be relocated to better align with the loading docks for the proposed interim loading relocation. The building setback will allow for the extension of an open space system with the development of the future Administration / Clinical Building. Access to the existing staff parking lot next to the Woods-Mullen Shelter will be re-located to Massachusetts Avenue.

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Figure 3-10 Energy Facility Aerial View Looking East



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Figure 3-11 Energy Facility Aerial View Looking West



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Figure 3-12 Energy Facility Context Photos

Context Photos

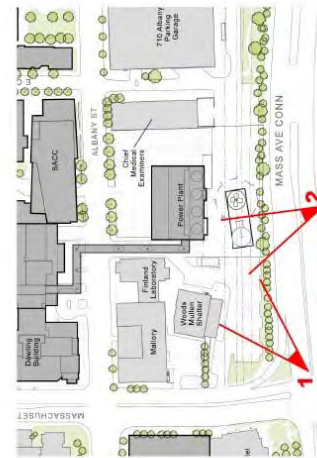
May 06, 2013



Photo 1: View from Mass. Ave. Connector looking north. South faces of the Woods Mullen Shelter and the Power Plant.



Photo 2: View from Mass. Ave. Connector looking west. East and south faces of the Woods Mullen Shelter and the Finland Building. South facade of the Power Plant located to the right.



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Figure 3-13 Energy Facility Context Photos (continued)

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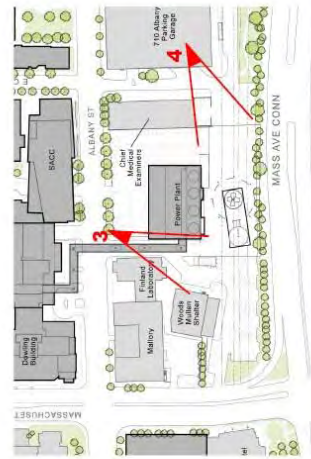
May 06, 2013



Photo 3: View from Power Plant parking looking southeast.
The existing Power Plant on the right with the yellow utilities tube overhead. Proposed Energy Facility site beyond.



Photo 4: View from top of 710 Albany St. Parking Garage
East face of Power Plant and Helipad. Energy Facility site beyond.



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New Patient Transport Bridge - Existing Context and Project Location

The proposed new Bridge will be located within the Boston University Medical Center West Campus spanning over Albany Street.

Currently Albany Street is composed of varying building setbacks, scales and styles. As a major arrival point on the BUMC Campus the streetscape lacks a vital sense of clarity and organization. This project in conjunction with the proposed New Inpatient Building Phase 1 will begin to better define the north edge of Albany Street and align with Boston University Medical Center's strategic urban design goals stated previously.

The project site is located both on the south and north sides of Albany Street. The project is proposed to cross south to north over Albany Street in the approximate location of the existing yellow utility tube connecting to the New Inpatient Building Phase 1 over the existing Emergency Department Entrance, Ambulance parking, and loading area.

New Patient Transport Bridge - Massing and Height

The project is consistent with the surrounding contextual scale and desired contemporary aesthetic of the institution. A simplified form and a minimal material palette provide the visual clarity and consistency currently absent from the Albany Street Corridor.

The new Bridge is a simple rectilinear mass spanning from the existing Power Plant on the south of Albany Street to New Inpatient Building Phase 1. It rests on two structural supports located on either side of the street edge and has a clear height of approximately 27 feet above Albany Street. The new Bridge is approximately 16 feet tall (approximately 43 feet in height from grade) and has a roofline consistent with the connector wing of the New Inpatient Building Phase 1 and the Menino Pavilion. The new elevator and stair tower in the new Bridge will rise above the roof of the new Bridge to accommodate the elevator overrun. The overall building height including the elevator overrun will be approximately 50 feet in height from grade. A 1-story corridor approximately 16 feet in height will be located at grade to the west of the existing Power Plant providing access from the helipad for Med Flight patients to the new Bridge and to the Emergency Department.

New Patient Transport Bridge - Material Image

Simple massing and a minimal material palette are proposed for the project in order to reduce its visual impact on the Albany Street Corridor. Glass curtainwall and metal panel wall will be featured on the Bridge conveying a clean, light, modern image. The bridge structure is supported at two points on either side of Albany Street and will be clad in metal panel. The position and simple form of the supports help to define a new gateway along the Albany Street Corridor. The 1 story corridor at grade will feature a consistent material palette of metal panel and glazing. At night, the Bridge is proposed to be strategically lit creating a luminous beacon providing a new way-finding device in the center of the Albany Street Corridor.

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New Patient Transport Bridge - Vehicle Access and Circulation

The Bridge will facilitate new Med Flight patient transport by providing access from the existing helipad located on the south side of Albany Street to the Emergency Department within the Menino Pavilion. This new transport will provide more efficient patient care while reducing operational costs associated with current ambulance patient movement.

Construction of the Bridge will also necessitate the relocation of the Emergency Department entrance and drop-off to the rear of the Moakley Cancer Center, where emergency patient and vehicular access will be provided via Shapiro Drive.

The existing loading truck dock along the south face of the Menino Pavilion will be relocated to the south side of Albany Street along the north face of the existing Power Plant. Materials will be provided to the hospital functions north of Albany Street via the new Bridge, where they will be transported to the Menino Pavilion and then distributed accordingly.

New Patient Transport Bridge - Site Improvements

Streetscape alterations will occur with the new Bridge and New Inpatient Building Phase 1 along Albany Street in order to create a simplified ambulance parking area and reduce the number of curb cuts along the north side of Albany Street. Alterations include the closing of three existing curb cuts and the removal of the curb between the existing loading dock and existing ambulance parking areas. One of the two lanes underneath the existing yellow utility tube will be closed minimizing and reducing the width of the curb cut in half. New Sidewalk and urban landscaping improvements are proposed along the street edge to further integrate and enhance the Albany Street experience.

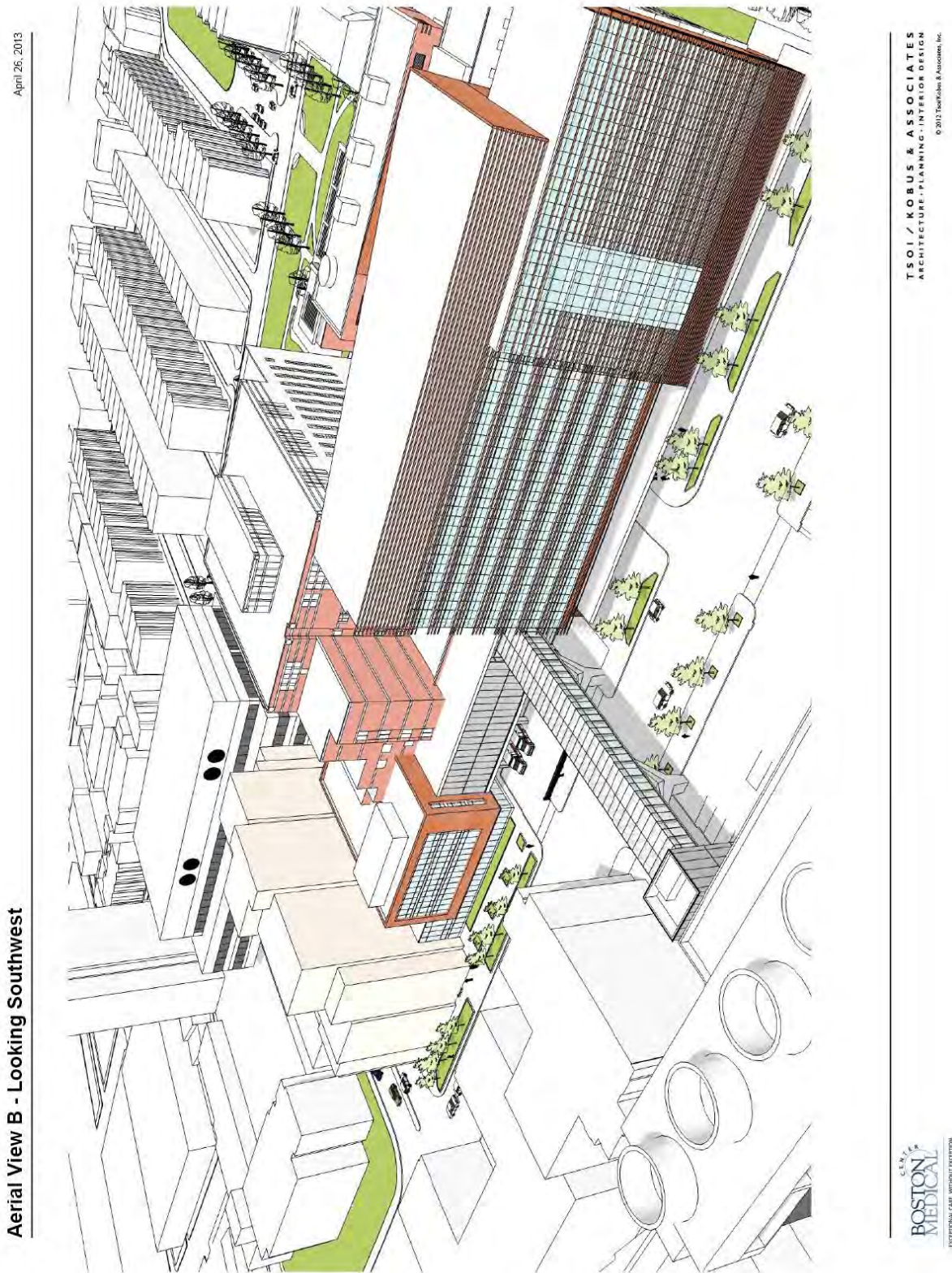
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Figure 3-15 New Patient Transport Bridge Aerial View Looking Northwest



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Figure 3 -16 New Patient Transport Bridge Aerial View Looking Southwest



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Figure 3 -17 New Patient Transport Bridge Context Photos

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Photo 1: View from Albany St. looking east.
Yellow utilities tube over Albany St. connecting to Menino Pavilion.
Dowling Tower to the left and Shapiro ACC in background.



Photo 2: View from Albany St. looking east.
Emergency Department drop-off and entrance at south face of Menino Pavilion.



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Figure 3-18 New Patient Transport Bridge Context Photos (continued)

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Photo 3: View from Power Plant looking west.
Yellow utilities tube over Albany St. connecting to Menino Pavilion.
South facade of Shapiro ACC to right and Power Plant in foreground.



Photo 4: View from Albany St. looking southwest.
Emergency Department drop-off and entrance at south face of Menino Pavilion with yellow utilities tube overhead.



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3.2 Sustainable Design

The Proposed Projects include a number of environmentally protective technologies and practices incorporated into the planning, design and operations.

All of the proposed IMP projects will meet the requirements of Article 37 of the Code. The Proponent has evaluated the projects under the U.S. Green Council's Leadership in Energy and Environmental Design (LEED) system and the projects are anticipated to receive ratings of up to "Silver" LEED-NC [New Construction]. See Appendix F for LEED Checklists for each of the proposed projects demonstrating anticipated compliance with these standards.

3.3 Environmental Protection

3.3.1 Wind

The Moakley Cancer Center Addition will be a similar height to the Moakley Building. Given the Addition's location, it is anticipated that it will be shielded from the predominant winds by other buildings in the surrounding area, and therefore is anticipated to have minimal impact on pedestrian level winds.

The New Inpatient Building Phase 1 is located in an area where a building currently exists and a driveway, and will be significantly shorter than the buildings immediately adjacent to it. The buildings will also be set back from the sidewalk and trees will buffer the edge of the building from the sidewalk. It is anticipated that the New Inpatient Building Phase 1 will have minimal impact on pedestrian level winds.

The Energy Facility is designed to be of similar height and massing to buildings in the vicinity of the project Site. Based on the height of the project and its similar massing to surrounding buildings, the Project is not expected to cause significant material impacts to upper level or pedestrian level winds.

3.3.2 Daylight

The project sites are located within a dense urban environment surrounded by building of similar height and massing as the proposed projects. Due to the existing configuration of the project sites, minimal impacts to daylight obstruction are anticipated.

3.3.3 Shadow

The proposed project sites are located in a dense urban area on the BUMC Campus. The new Moakley Cancer Center Addition will be surrounded by and adjacent to structures of similar height and massing, any shadow impact will not create significant new shadow coverage on public ways or open space in the area when compared to existing conditions during the time periods studied.

The proposed New Inpatient Building Phase 1 location is along the north side of Albany Street. Based upon the shadow study, the New Inpatient Building Phase 1 will not create

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any new shadows on public ways or green spaces. Net new shadows created will be primarily cast back on the roof of the new Phase 1 Inpatient Building.

The proposed Energy Facility will be surrounded by and adjacent to structures of similar height and massing, any shadow impact will be comparable to the neighboring buildings. It is anticipated that the Energy Facility will not create significant new shadow coverage on public ways or open spaces in the area when compared to existing conditions during the time periods studied.

The scale and location of the new Bridge creates a small net new shadow impact that falls primarily on itself. As the Bridge will be replacing the existing "Yellow Tube" that currently spans Albany Street, there will be a minimal shadow impact on the adjacent streetscape compared to the existing condition.

See Appendix B for Shadow Study diagrams – Moakley Cancer Center Addition

See Appendix C for Shadow Study diagrams – New Inpatient Building Phase 1

See Appendix D for Shadow Study diagrams – BMC Energy Facility

See Appendix E for Shadow Study diagrams – New Patient Transport Bridge

3.3.4 Solar Glare

The exterior materials for the proposed projects have not been determined. Building exteriors are expected to be constructed of a mixture of modern and traditional building materials. At this time, reflective glass is not anticipated for any of the projects. The proposed projects will be designed so as not to present an adverse safety impact on project area traffic as a result of solar glare.

3.3.5 Air Quality

Transportation Impacts: Impacts on air quality from transportation typically occur at intersections with long delays. It is anticipated that the increases in traffic due to the proposed Projects (mostly the New Inpatient Building Phase 1 and Moakley Cancer Center Addition) will not lead to an exceedance of the National Ambient Air Quality Standards (NAAQS).

Boston University Medical Center currently implements an aggressive vehicle trip reduction program which will be implemented for its proposed Projects as applicable.

Stationary Sources: It is anticipated that the air quality impacts from the new mechanical equipment necessary for the New Inpatient Building Phase 1 will not significantly impact air quality in the surrounding area. New equipment subject to Massachusetts Department of Environmental Protection (MassDEP) regulations will comply with such regulations.

It is anticipated that the air quality impacts from the minimal new mechanical equipment necessary for the Moakley Cancer Center addition will not significantly impact air quality in the surrounding area.

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The Energy Facility will allow BMC to generate approximately 75% of its own electricity and nearly 100% of its own steam. Cogeneration is a highly efficient method to produce steam and power, resulting in one of the lowest fossil fuel emissions and greenhouse gases. The cogeneration facility will consist of one Taurus 70 gas turbine, one duct burner to provide supplemental steam to the BMC distribution system, and three gas fired boilers for cogeneration duct burner backup. The gas turbine and duct burners will be fueled by natural gas under normal operating conditions. In the event of an emergency, the gas turbines and duct burners will be fueled by the existing fuel oil storage tank in order to support continuous operation.

The Energy Facility will be a minor source of air emissions and will need to file an Environmental Results Program form for a Non-Emergency Turbine and a Non Major Comprehensive Air Plans Approval application for its equipment. The turbine and duct burner will be designed with Selective Catalytic Reduction (Oxides of Nitrogen (NOx) controls) and Oxidation Catalysts (Carbon Monoxide (CO) and Volatile Organic Compounds (VOC) controls) to meet Massachusetts Department of Environmental Protection's (MassDEP) requirements for Best Available Control Technology. The cogeneration facility will also demonstrate compliance with the National Ambient Air Quality Standards. Therefore, the Project will have minimal impacts to air quality.

Construction Impacts: Short-term air quality impacts from fugitive dust may be expected during the demolition and early phases of construction and from site preparation activities. Plans for controlling dust during construction will include wetting during periods of high wind and careful removal of debris by covered trucks. The construction contracts will provide for a number of strictly enforced measures to be utilized by contractors to reduce emissions and minimize impacts. These are expected to include:

- ◆ Using wetting agents where needed on a scheduled basis;
- ◆ Using covered trucks;
- ◆ Minimizing exposed storage debris on-site;
- ◆ Monitoring actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- ◆ Locating aggregate storage piles away from areas having the greatest pedestrian activity where and when possible; and
- ◆ Periodic cleaning of streets and sidewalks to minimize dust accumulations.

3.3.6 Noise

The primary operational noise caused by the proposed projects will be the result of mechanical equipment. The project sites are located proximate to I-93 and the Massachusetts Avenue Connector which are the sources for much of the ambient noise in the area. In addition, the ambient noise levels around the project sites are elevated due to

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the urban nature of the area. Design of the projects will consider operational noise and will include noise attenuation mitigation as needed to ensure compliance with City of Boston Noise Ordinance and MassDEP noise regulations.

Intermittent increases in noise levels will occur in the short-term during construction. Construction work will comply with the requirements of the City of Boston noise ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures are expected to include:

- ◆ Using appropriate mufflers on all equipment and providing ongoing maintenance of intake and exhaust mufflers;
- ◆ Muffling enclosures on continuously operating equipment, such as air compressors and welding generators with outdoor exposure;
- ◆ Replacing specific construction operations and techniques by less noisy ones where feasible;
- ◆ Selecting the quietest of alternate items of equipment;
- ◆ Scheduling equipment operations to keep average levels low, to synchronize noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
- ◆ Turning off idling equipment; and
- ◆ Locating noise equipment at locations that protect sensitive locations by shielding or distance.

3.3.7 Water Quality/Wetlands

The proposed projects are located on existing developed sites. The projects are not expected to result in the introduction of any pollutants, including sediments, into the surface waters or local groundwater.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) indicates the FEMA Flood Zone Designations for the Projects' sites (City of Boston, Community Panel Number 25025C 0079G). The map shows that the Projects' sites are located outside of the 500-year flood plain. The project sites do not contain any wetlands.

3.3.8 Geotechnical / Groundwater

The proposed Moakley Cancer Center Addition and New Inpatient Building Phase 1 will involve some subsurface excavation for a below grade basement. The Draft Project Impact Report (DPIR) will include information on anticipated subsurface conditions across the proposed sites. The sites are located in the Groundwater Conservation Overlay District.

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Measures will be implemented in order to minimize the potential for impact to the groundwater conditions.

3.3.9 Construction Waste and Disposal

Solid waste generated by construction will consist of excavated material and debris. Excavated material will be composed of miscellaneous fill and underlying natural deposits. Excavation and off-site disposition will be conducted in accordance with a Soil Management Plan developed for the projects and included in the Construction Documents. The Soil Management Plan will describe procedures for identification, management and off-site transport of any contaminated soils. Management of soil during excavation and construction will be conducted in accordance with applicable local, state, and federal laws and regulations.

Construction dewatering will be conducted in accordance with a Groundwater Management Plan that will be included as part of the Construction Documents. The Groundwater Management Plan will describe the procedures for maintenance of groundwater levels and for treatment (if necessary) and discharge of effluent from dewatering activities.

3.3.10 Solid Waste Generation and Recycling

The projects will generate solid waste from employees such as wastepaper, cardboard, glass bottles, aluminum cans, etc. Recycling of this material will be encouraged and managed through Boston University Medical Center's active campus recycling program. Staging areas with recycling bins will accommodate the recyclable material from the projects.

3.3.11 Rodent Control

A rodent extermination certificate will be filed with the building permit application to the City. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work for the proposed Project, in compliance with the City's requirements. Rodent extermination prior to work start-up will consist of treatment of areas throughout the site. During the construction process, regular service visits will be made.

3.3.12 Wildlife Habitat

The site is within a fully developed urban area and, as such, the proposed projects will not impact wildlife habitats as shown on the National Heritage and Endangered Species Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife.

3.4 Construction Management Plan

A Construction Management Plan (CMP) will be submitted to the Boston Transportation Department (BTD) for review and approval prior to issuance of a building permit. The CMP will define truck routes which will help minimize the impact of trucks on local streets. The

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construction contractor will be required to comply with the details and conditions of the approved CMP.

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

3.4.1 Construction Schedule and Coordination

Construction of the Moakley Cancer Center Addition is estimated to last approximately 18 months. Initial site work is expected to begin during the 4th Quarter of 2013.

Construction of the New Inpatient Building Phase 1 is estimated to last approximately 18 months. Initial site work is expected to begin during the 4th Quarter of 2013.

Construction of the Energy Facility is estimated to last approximately 24 months. Initial site work is expected to begin during the 1st Quarter of 2015.

Construction of the New Patient Transport Bridge is estimated to last approximately 11 months. Initial site work is expected to begin during the 2nd Quarter of 2016.

Typical construction hours will be from 7:00 am to 6:00 pm, Monday through Friday, with most shifts ordinarily ending at 3:30 pm. No sound-generating activity will occur before 7:00 am. If longer hours, additional shifts, or Saturday work is required, the Construction Manager will place a work permit request to the Boston Air Pollution Control Commission and BTB in advance. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 pm to ensure the structural integrity of the finished product. (Certain components must be completed in a single pour and placement of concrete cannot be interrupted.)

Proper planning with the City, neighborhood and developers of other projects under construction in the area will be essential to the successful construction of the Projects. The construction contractor will be responsible for coordinating construction activities during all phases of construction with City of Boston agencies to minimize potential scheduling and construction conflicts with other ongoing construction projects in the area.

3.4.2 Construction Staging and Public Safety

Primary staging will be on-site. For each project the proposed construction staging plan will be designed to isolate the construction while providing safe access for pedestrians and vehicles during normal day-to-day activities and emergencies. The staging areas will be secured by chain-link fencing to protect pedestrians from entering these areas.

Although specific construction and staging details have not been finalized, the Proponent and its construction management consultants will work to ensure that staging areas will be

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located to minimize impacts to pedestrian and vehicular flow. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. If required by BTM and the Boston Police Department, police details will be provided to facilitate traffic flow. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

3.4.3 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. The Proponent will make reasonable good-faith efforts to have at least 50 percent of the total employee work hours are for Boston residents, at least 25 percent of total employee work hours are for minorities and at least 10 percent of the total employee work hours are for women. The Proponent will enter into a construction jobs agreement with the City of Boston.

To reduce vehicle trips to and from the construction site, minimal construction worker parking will be available at the site and all workers will be strongly encouraged to use public transportation and ridesharing options. The Proponent and contractor will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area. Five bus routes currently service the area, and the Project site is proximate to the Silver Line. Space on-site will be made available for workers' supplies and tools so they do not have to be brought to the site each day.

3.4.4 Construction Truck Routes and Deliveries

The construction team will manage deliveries to the site during morning and afternoon peak hours in a manner that minimizes disruption to traffic flow on adjacent streets. The construction team will provide subcontractors and vendors with Construction Vehicle & Delivery Truck Route Brochures in advance of construction activity. "No Idling" signs will be included at the loading, delivery, pick-up and drop-off areas.

Truck traffic will vary throughout the construction period depending on the activity. Construction truck routes to and from the Project site for contractor personnel, supplies, materials, and removal of excavations will be coordinated by the Proponent with the BTM and established in the CMP. These routes will be mandated as a part of subcontractors' contracts for the Project. Traffic logistics and routing are planned to minimize community impacts.

3.4.5 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the project. However, increased community sound levels are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities.

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Mitigation measures are expected to include:

- ◆ Instituting a proactive program to ensure compliance with the City of Boston noise limitation policy;
- ◆ Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers;
- ◆ Muffling enclosures on continuously running equipment, such as air compressors and welding generators;
- ◆ Replacing specific construction operations and techniques with less noisy methods where feasible;
- ◆ Selecting the quietest alternative items of equipment where feasible;
- ◆ Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
- ◆ Turning off idling equipment; and
- ◆ Locating noisy equipment at locations that protect sensitive locations by shielding or distance.

3.4.6 Construction Air Quality

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

- ◆ Using wetting agents on areas of exposed soil on a scheduled basis;
- ◆ Using covered trucks;
- ◆ Minimizing spoils on the construction site;
- ◆ Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- ◆ Minimizing storage of debris on the site; and
- ◆ Periodic street and sidewalk cleaning with water to minimize dust accumulations.

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3.4.7 Construction Waste

The Proponents will reuse or recycle construction materials to the extent feasible. Construction procedures will allow for the segregation, reuse, and recycling of materials. Materials that cannot be reused or recycled will be transported in covered trucks by a contract hauler to a licensed facility, per the MassDEP regulations for Solid Waste Facilities, 310 CMR 16.00.

3.4.8 Protection of Utilities

Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with the MWRA, BWSC, Boston Public Works Department, the Dig Safe program, and the governing utility company requirements. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its Site Plan Review Process.

3.5 Historic and Archaeological Resources

Boston University Medical Center is located within the South End Harrison/Albany Protection Area (Protection Area), and encompasses the “Boston City Hospital” Area, both of which are included in the Inventory of Historic and Archaeological Assets of the Commonwealth. The Protection Area was established to protect views of the adjacent South End Landmark District, to ensure that new development or major alterations adjacent to the District are architecturally compatible in massing, setback, and height, and to protect light and air circulation within the District. Building demolitions, the height and setback of new construction, and changes to topography and landscaping within the Protection Area are subject to review by the South End Landmark District Commission (SELDC).

There are no known archaeological resources listed in the State and National Registers of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth within the Project site. The Project sites consist of a previously developed urban site; therefore, it is unlikely that the proposed Project will affect previously unidentified archaeological resources.

3.6 Infrastructure

This section evaluates the infrastructure systems that will support BMC’s proposed projects. Based on initial investigations, the existing infrastructure systems in the area appear to be able to accommodate the incremental increase in demand associated with the proposed projects.

The design process for the proposed projects will include the required engineering analyses and will adhere to applicable protocols and design standards, ensuring that the proposed Project is properly supported by and properly uses the City’s infrastructure.

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The systems discussed below include those owned or managed by the Boston Water and Sewer Commission (BWSC), private utility companies, and on-site infrastructure. There will be close coordination between these entities and the project team during subsequent reviews and the design process. All improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC site plan review process. This process includes a comprehensive design review of the proposed service connections, assessment of system demands and capacity and establishment of service accounts.

3.6.1 Regulatory Framework

This section, in addition to a description of existing and future infrastructure connections, discusses the regulatory framework of utility connection reviews and standards. All connections will be designed and constructed in accordance with city, state and federal standards.

- ◆ In the City of Boston, BWSC is responsible for all water, sewer and stormwater systems.
- ◆ The Boston Fire Department (BFD) will review the Proposed Project with respect to fire protection measures such as siamese connections and standpipes.
- ◆ Design of the site access, hydrant locations, and energy systems (gas, steam and electric) will also be coordinated with the respective system owners.
- ◆ New utility connections will be authorized by the Boston Public Works Department through the street opening permit process, as required.
- ◆ New steam and power conduits between campus buildings, within city streets, will require permitting with the City of Boston Public Improvements Commission (PIC).

3.6.2 Existing Wastewater

Local sewer service in the City of Boston is provided by the BWSC. Wastewater generated at the BMC campus is collected by various sewer mains within the surrounding streets and conveyed to the Massachusetts Water Resources Authority (MWRA) facility on Deer Island via a 66" x 68" combined sewer located in Albany Street.

3.6.2.1 Demand/Use

Wastewater generation from each of the projects has been calculated as described below.

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Moakley Cancer Center Addition

The Moakley Addition will provide additional and improved space for existing uses within the building. The proposed addition does not represent an expansion of the building's uses by increasing patient capacity, doctors or staff. Accordingly, no increase in wastewater generation from the existing Moakley building is anticipated as a result of this project.

New Inpatient Building Phase 1

The New Inpatient Building Phase 1 will include in-patient rooms, radiology and surgery areas as well as an amphitheater and circulation space for vital connector to campus buildings. The estimated wastewater generation from the New Inpatient Building Phase 1 has been calculated in gallons per day (gpd) as the sum of these uses based on rates established by the Massachusetts Department of Environmental Protection Title V 310 CMR 15.203 System Sewage Flow Design Criteria and summarized in the table below.

Table 3-1 Estimate Wastewater Generation

Use	Number	Units	Rate	Averaged Daily Sewage Flow (gpd)
Floor B: Amphitheater	250	seats	3 gpd/seat	750
Floor 1: Radiology	16,678	sf	75 gpd/1,000 sf	1,250
Floor 2: Surgery	16,678	sf	75 gpd/1,000 sf	1,250
Floors 3 & 4: In-patient	28	Beds	200 gpd/bed	<u>5,600</u>
			Totals	8,850

Average daily flow is calculated from the project to be approximately 8,850 gpd. Based on a peaking factor of 3.0, peak daily flows from the project are estimated to be approximately 26,550 gpd.

Energy Facility

The Energy Facility will generate wastewater from cooling tower blow down and other sanitary wastewater from within the proposed building. Other wastewater generation associated with this project includes condensate from steam distribution which does not return to the facility. A preliminary estimate of wastewater generation from the new Energy Facility is approximately 50,000 gpd.

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New Patient Transport Bridge

The new Bridge consists of patient transport and service corridors to connect hospital buildings. There is no wastewater generation associated with this use.

3.6.2.2 Proposed Connections

The sewer services for the proposed projects will tie into existing nearby existing sewer mains.

The New Inpatient Building Phase 1, and Moakley Cancer Center Addition will connect to BWSC sewer mains in Albany and East Concord Street, respectively. These addition projects may utilize existing service connections from their respective buildings or construct new connections as appropriate based on final project design. Proposed sewer service configurations and design notes are summarized in the table below.

Table 3-2 Proposed Sewer Service Configurations

Project	Sewer Connection	Design Notes
New Inpatient Building Phase 1	66"x68" Sewer in Albany Street	Connection to existing buildings or new service connection to Albany Street to be determined during design.
Moakley Cancer Center Addition	27" Sewer in East Concord Street	Project will likely combine with wastewater from existing Moakley Building since the existing service connection passes through addition area.
Energy Facility	66"x68" Sewer in Albany Street	Connection to Albany Street sewer similar to the existing Power Plant connection
New Patient Transport Bridge	None	No sewer service anticipated. Incidental wastewater will likely be routed to systems in adjacent buildings.

3.6.3 Domestic Water and Fire Protection

3.6.3.1 Existing Water Supply System

The BUMC Campus is located in the South End service area of the BWSC public water supply service areas. Albany and East Concord Streets are served by 12-inch high and low pressure lines. Hydrant test data provided by the BWSC expressed in gallons per minute (gpm) is presented in the table below.

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Table 3-3 Hydrant Test Data

Date	Location	Static Pressure (psi)	Residual Pressure (psi)	Total Flow (gpm)	Flow at 20 psi (gpm)
3/21/05	12" Low Albany Street	68	62	3,182	1,083
9/26/00	12" High Albany Street	96	88	4,388	1,479

The results of the hydrant flow tests indicate the actual amount of water (flow) available and the actual pressure (residual) flow provided. These flow metrics are analyzed to establish the quantity of water that will be delivered at 20 psi as a common evaluation point.

The data provided is the most recent test data obtained from the BWSC. Additional testing of specific hydrants in close proximity to the proposed projects will likely be performed during subsequent project phases to support design of fire protection systems.

3.6.3.2 Demand/Use

Based on the wastewater calculations provided in Section 3.6.2.1, water use for the New Inpatient Building Phase 1 is estimated to be approximately 8,850 gpd. The Moakley Cancer Center Addition provides additional and improved space for existing building uses and is not expected to result in an increase in water use above existing conditions. There is no water use associated with the New Patient Transport Bridge project.

Domestic water demand for the Energy Facility will be variable based on the rate of steam production and outdoor air conditions. It is estimated that the proposed project will require an average of approximately 220,000 gpd with a peak demand of 750 gallons per minute.

3.6.3.3 Proposed Connections

Proposed domestic and fire service connections for each of the projects are summarized in the table below.

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Table 3-4 Proposed Domestic and Fire Service Connections

Project	Water/Fire Connection	Design Notes
New Inpatient Building Phase 1	12" High and Low Services in Albany Street	Connection to existing buildings or new service connection to Albany Street to be determined during design.
Moakley Cancer Center Addition	12" High and Low Services in East Concord Street	Connection to existing building water systems and/or new tap into existing Moakley service connection from East Concord Street to be determined during design.
Energy Facility	12" High and Low Services in Albany Street and 18" Low Service in Mass Avenue	Redundant service required with fire and domestic connections in both Albany Street and Mass Avenue.
New Patient Transport Bridge	None	No water service anticipated.

3.6.4 Stormwater Management

3.6.4.1 Existing Conditions

The BUMC Campus is serviced by several BWSC drain lines. The proposed project sites are currently occupied by buildings, paved surfaces or landscaped areas. Runoff from these areas flows to nearby BWSC storm drain systems which discharge to the Roxbury Canal Conduit.

3.6.4.2 Proposed Conditions

Stormwater from the project sites will be routed to follow existing drainage patterns to the nearby BWSC drain lines and the Roxbury Canal Conduit. Since the BUMC Campus is located in the Groundwater Conservation Overlay District (GCOD), each of the projects will be required to infiltrate one inch of runoff per square foot of new building footprint.

The proposed projects will be designed mitigate potential increases in peak flows, pollutants, or sediments to existing drainage infrastructure. In conjunction with the BWSC site plan review and the General Service Application, the proponent will submit a stormwater management plan. Compliance with the standards for the final site design will be reviewed as part of the BWSC site plan review process.

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A summary of stormwater management controls for each project site is provided in the table below.

Table 3-5 Stormwater Management Controls

Project	Approximate Footprint (sf)	Infiltration Requirement (ft ³)	Design Notes
New Inpatient Building Phase 1	16,800	1,400	Project site occupied primarily by existing building. Project may result in a minimal increase in impervious surfaces.
Moakley Cancer Center Addition	6,200	516	Project site occupied by grass area. Increase in impervious surface will require stormwater management to mitigate potential increases in peak runoff.
Energy Facility	12,500	1,042	Project site is currently occupied by paved surfaces.
New Patient Bridge	7,000	583	Project will be located above Albany Street and adjacent sidewalks. No resulting change in surface runoff patterns is anticipated.

3.6.5 Anticipated Energy Needs

3.6.5.1 Natural Gas Service

Natural gas for the Proposed Project will be provided by National Grid from their existing gas mains within Albany Street. The specific gas service needs for each project will be determined and coordinated with the utility company during final design.

3.6.5.2 Electrical Service

Boston University Medical Center purchases electricity from NSTAR Electric in bulk and redistributes from the existing Power Plant Building to other BUMC Campus buildings. This practice will be continued for the New Inpatient Building Phase 1 or other projects until the new Energy Facility is constructed. The new Energy Facility will be equipped with a nominal 7.5 MW gas-fired turbine module and serve as the primary electric service power source for the BUMC Campus.

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3.6.5.3 Steam

Steam is currently provided by Veolia Energy and distributed to the BUMC Campus from the existing Power Plant building.

The new Energy Facility will be a Combined Heat and Power (CHP) generating facility. The project is anticipated to generate approximately 300,000 lbs/hour of high pressure steam which will be distributed throughout the BUMC Campus through existing and new infrastructure. The proposed steam generation will be sufficient to supply Boston University Medical Center's needs and will negate the need for importing steam from off-site sources.

3.6.5.4 Telecommunications

Verizon will provide telephone and telecommunication services to the proposed projects. There are existing fiber optic services located in Albany and East Newton Streets with sufficient capacity to service the proposed project.