

R. DAVID STEWART
Vice President - Development

November 2, 2018

Jeff Roberts, Zoning and Development Director
Community Development Department
City of Cambridge
344 Broadway
Cambridge, MA 02139

Boston

Los Angeles

New York

San Francisco

Washington, DC

**Re: MXD Infill Development Concept Plan (Special Permit PB #315)
Blue Garage Roof Study**

Dear Mr. Roberts:

This letter is to document our investigation of the Blue Garage Roof, which is in response to Condition 13(a) from PB # 315. This Planning Board condition states as follows:

"The Permittee shall provide to the Planning Board a study of options for public use of the parking garage rooftop and/or modifications to the location, design and programming of Binney Street Park and the north residential building. The purpose of such study shall include assessing whether publicly accessible and beneficial space either at the roof level or within the building, possibly programmed for public recreational use, would be preferable to the proposed open space on the north side of the north residential building, which may have limited public benefit. The Planning Board may approve an alternative plan resulting from such study as a Minor Amendment to the IDCP, after entertaining comments from the public and determining that the alternative plan would result in a greater public benefit. It is acknowledged that an alternative plan may require amending existing public open space covenants, which may be beyond the purview of the Planning Board or the Permittee, and that an alternative plan might not be feasible for that reason."

In order to determine the feasibility of delivering a publicly accessible space on top of the Blue Garage we hired Magnusson Klemencic Associates to assess the structural implications and Jensen Hughes to assess the code-related implications. Memorandums from each design professional are attached for reference.

The location under consideration for a publicly accessible amenity space is the central section of the Blue Garage, located between column lines G8 and G15, as shown on Plan A001 attached. The north and south sections of the Blue Garage will be encumbered by the North and South Residential Buildings respectively. Each residential building will deliver a certain amount of private outdoor amenity space. Given the security, access and marketing implications associated with these spaces, they need to remain private and not accessible to the public. This study therefore considers the central portion of the Blue Garage, located between column lines G8 and G15, for potential publicly accessible space.

In order to create publicly accessible space on the top of the Blue Garage, that is designed to accommodate human occupancy, the following structural and code modifications and upgrades to the Blue Garage would be necessary:

1. The entire central and northern sections of the Blue Garage would need to be seismically upgraded. This means that existing lateral supports would have to be strengthened and new lateral elements added. The layout impacts of this lateral support requirement are shown on the attached plans, A001 and A003. The modifications would result in a loss of parking of up to 25 spaces per garage level, totaling 150 spaces in a 955 space garage. This represents a 16% loss of parking capacity.
2. The garage's foundation system will have to be strengthened through the addition of micropiles and enlarged pile caps.
3. The existing expansion joints between the three sections of the garage are too narrow and would have to be increased in size to accommodate current Code requirements.
4. A new core would be required for vertical access to the roof level to meet applicable accessibility and building codes due to the anticipated occupant load for a public space. This would include a new stairwell and two (2) elevators, as shown on attached plans A001, A002 and A003.
5. Existing stair cores serving the garage would require: extension up to the new amenity level, addition of a 2-hour enclosure around the stair tower,

addition of 90-minute rated doors, replacement of handrails and guard rails, addition of luminous egress path markings, and potential upgrade to fire protection standpipes.

6. The garage life safety systems would have to be upgraded to a fully sprinklered system with a new alarm system and Fire Command Center.
7. Two (2) public bathrooms would have to be added at the level of the new amenity space, as shown on attached plan A002.

Based on the impacts, we do not recommend creating publicly accessible space on the rooftop of the Blue Garage for the following reasons:

1. The loss of up to 150 parking spaces within the Blue Garage would create a large deficit both during construction and permanently. The permanent loss would render one of the residential buildings unmarketable and therefore unbuildable based on anticipated parking demands.
2. The modifications required to the Blue Garage are so extensive that it would likely be more efficient to demolish and re-build a new structure in its place. The garage was built as a post-tensioned structure, which makes modifications additionally challenging. It simply wasn't designed to be modified in the way it would be required to add an accessible rooftop area. As a frame of reference, the current design of the South Residential Building contemplates demolishing and building back entire sections of the southern portion of the garage structure for the very reasons outlined above.
3. The public benefit associated with open space is maximized at grade. We have committed to substantially improving the open space throughout the entire Parcel 2 (North), which will include two urban parks; Binney Street Park to the north and Broadway Park to the south as well as both E/W connectors that will reinforce the connection to the 6th Street Connector and the future Volpe site beyond. These improvements will positively impact more people within the community through their prominent at-grade location, better accessibility, greater visibility, and as an enhancement to the pedestrian connectivity and urban experience.



4. Planning Board Condition 13(a) references the possibility of modifying Binney Street Park and its associated open space covenant, presumably to shift the North Residential Building into the open space. We do not recommend this move. As part of the IDCP process, we have committed to delivering retail with the North Residential Building fronting Binney Street. This is a challenged retail location since it is isolated from other street retail on Binney Street. An improved Binney Street Park, in conjunction with the other district open spaces in this area, is necessary to support the viability of the retail in this location.

We trust you will find our Blue Garage Roof Study useful. Should you have any questions, please call me on 617-236-3407.

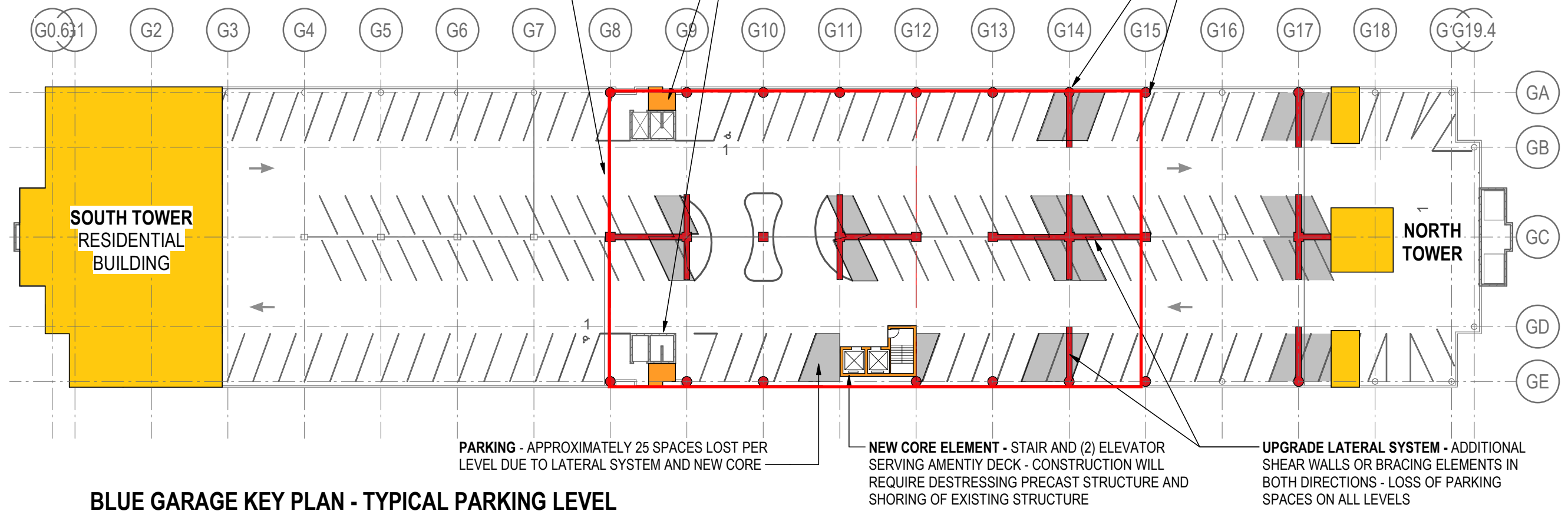
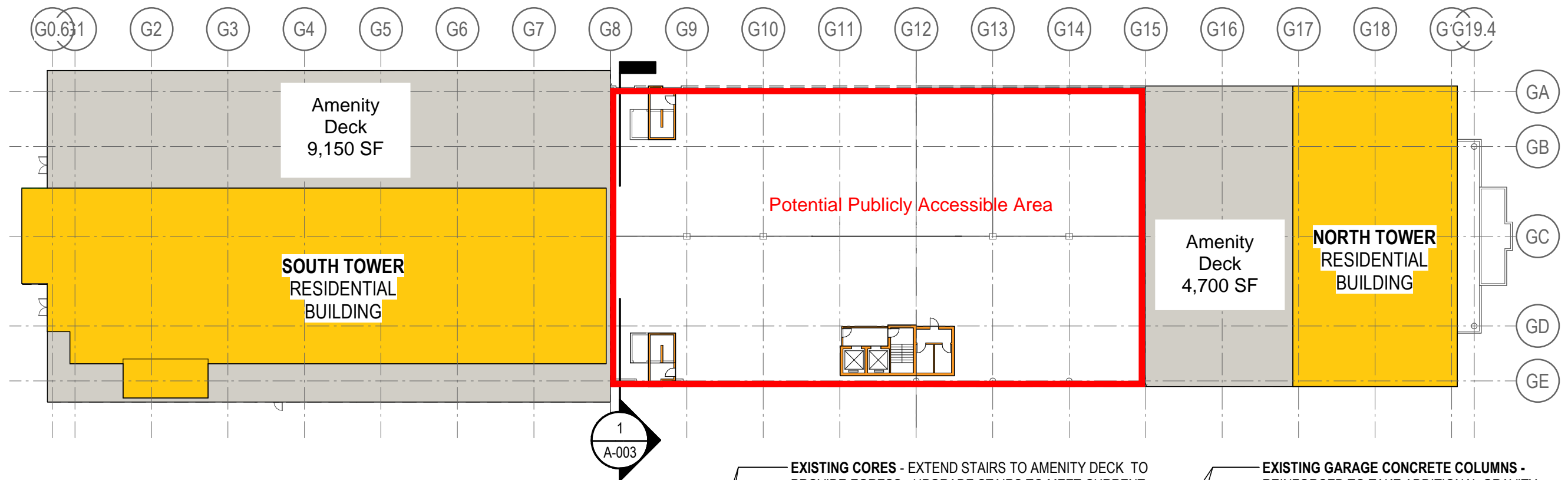
Sincerely,

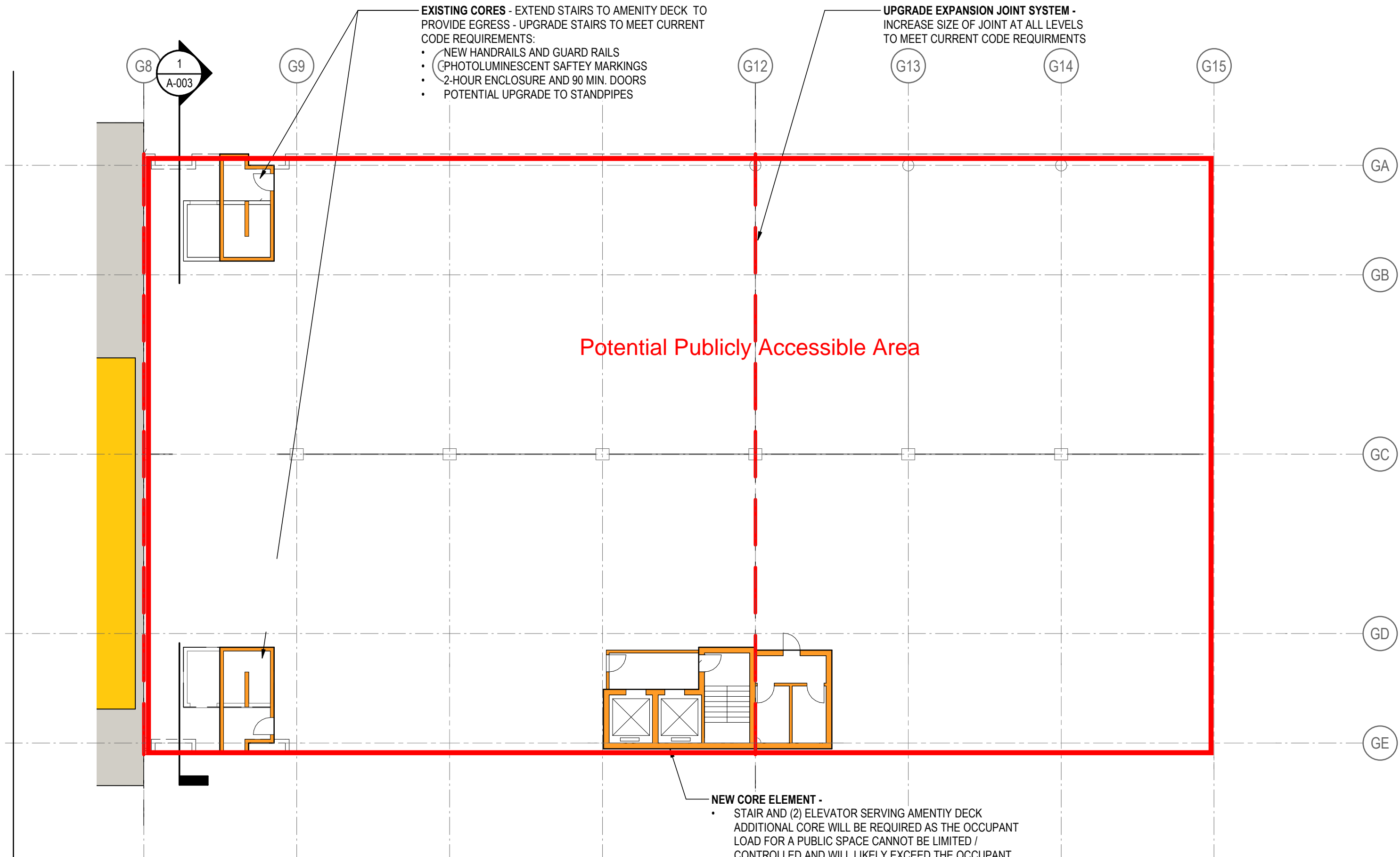
A handwritten signature in blue ink, appearing to read 'David Stewart'.

R. David Stewart

Encl.

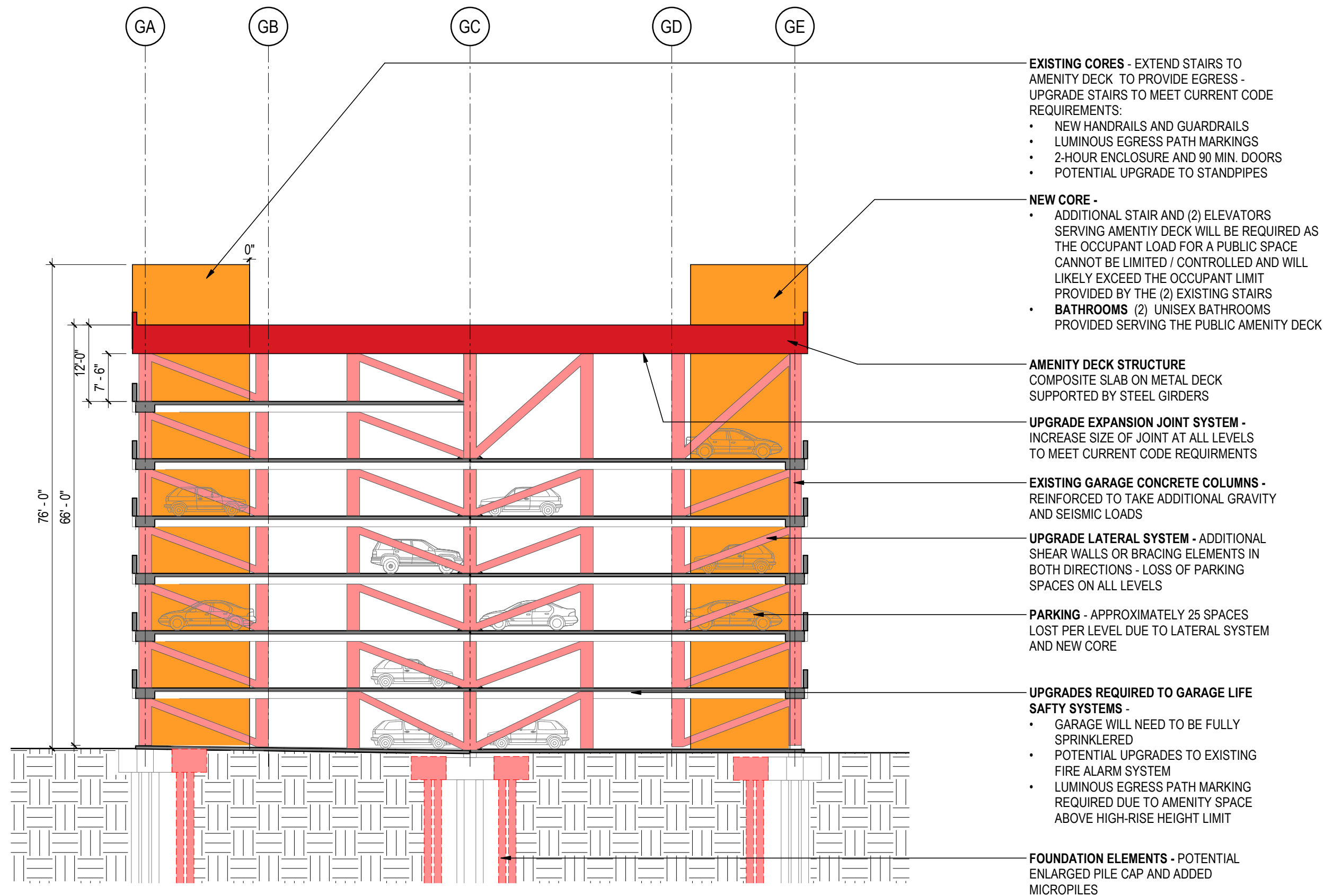
cc: Suzannah Bigolin, City of Cambridge
Liza Paden, City of Cambridge
Tom Evans, Cambridge Redevelopment Authority
IDCP Team, Boston Properties





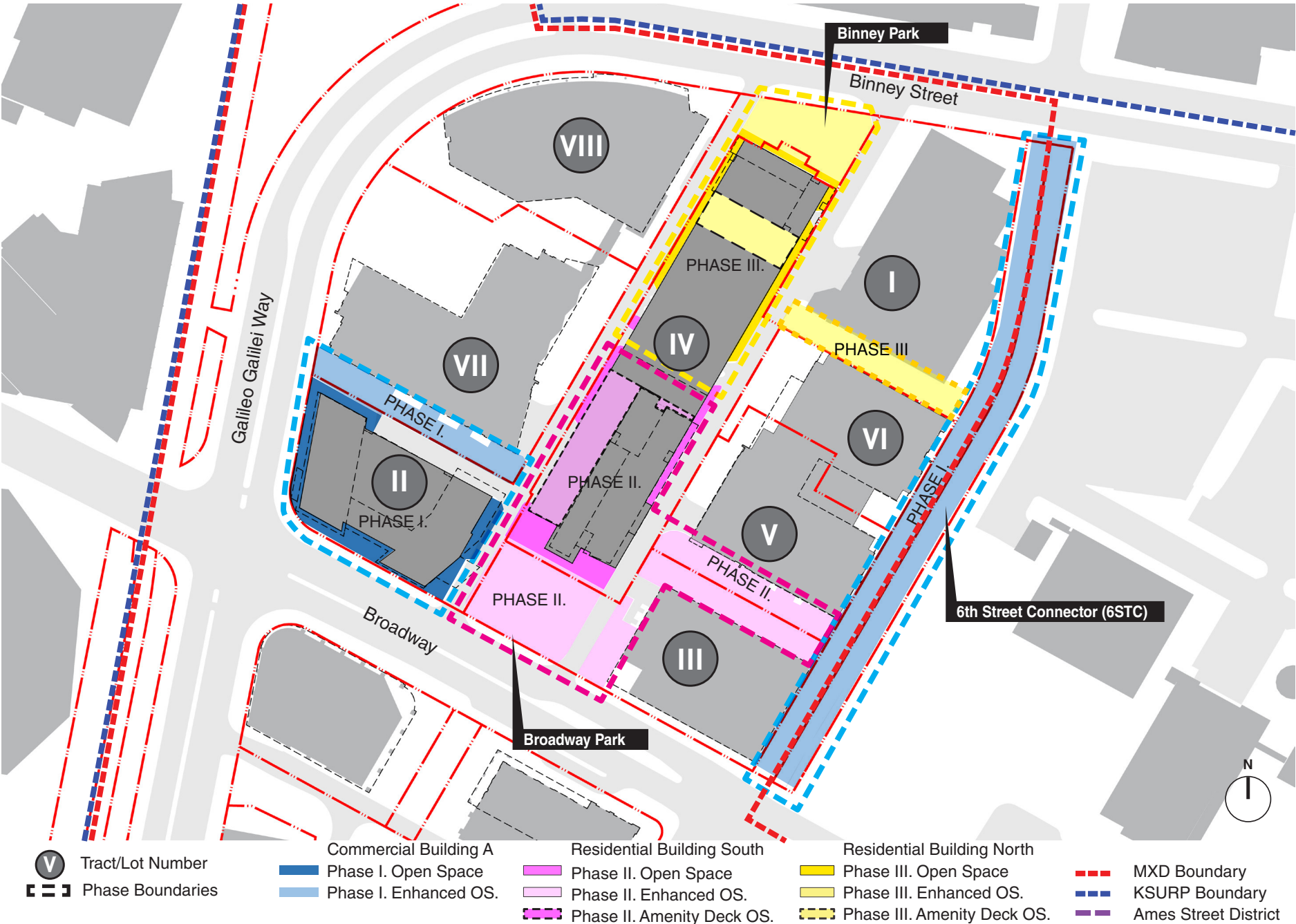
Potential Publicly Accessible Area

AMENITY DECK PLAN



BLUE GARAGE SECTION - PUBLIC AMENITY DECK





Memo



Structural + Civil Engineers

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TO	George Needs, Boston Properties	DATE	7/25/2018
FROM	Eleanor Reynolds	PAGE	1 OF 2
PROJECT	135 Broadway, Cambridge MA	PROJECT #	A5921.00
SUBJECT	Assembly Green Roof over Existing Parking Structure		

Magnusson Klemencic Associates has been directed to evaluate a vertical expansion of the existing garage for the 135 Broadway residential project in Cambridge, MA. The vertical expansion will incorporate an amenities deck/ occupied green roof over the existing 7-story parking structure.

Existing Structure

The existing Cambridge North garage is a post-tensioned concrete parking structure. The structure is split into three sections by means of expansion joints located on each side of a 4-bay central section. The structural system consists of a 6-inch one-way post-tensioned slab supported by transverse post tensioned beams spaced at 27 feet on center. The beams are supported by three rows of reinforced concrete columns founded on pile caps with three to five precast concrete driven piles per column. The wind and seismic bracing system of the garage is a concrete moment frame with the columns, transverse beams in the east-west direction, and longitudinal perimeter beams in the north-south direction.

Structural Code Requirements

The requirements for existing structures undergoing structural modifications are contained in Chapter 34 of the *Massachusetts State Building Code* (780 CMR), Ninth Edition. This code references and amends the 2015 *International Existing Building Code*.

Additions to a structure involve increasing a building's floor area, either by adding stories or by adding horizontal area to existing stories. For additions to an existing structure, the following code requirements apply:

- Any element whose gravity load demand is increased by more than 5 percent or whose gravity load-carrying capacity is reduced by more than 5 percent must satisfy the building code requirements for new construction.
- Any element whose lateral load demand is increased by more than 10 percent must satisfy the building code requirements for 100 percent of the seismic and wind forces prescribed for new construction.

The added level of amenity/ occupied green roof space will trigger a gravity and lateral evaluation of the existing structural elements.

Gravity Load Assessment

The assessment of the existing structure is based on the sizes in the drawings (with limited field verification), the concrete strength noted in the drawings, and code minimums for reinforcing steel. Based on these properties, the existing columns have sufficient capacity for one additional amenity or green roof level. Note that, since the garage has a bracing system



consisting of concrete moment frames, the columns also serve to resist lateral forces. Therefore, the gravity load check must be combined with a lateral load check as described in the following section.

The design capacity of the existing foundations is specified in the drawings. Based on input from the project geotechnical engineer, a 10 percent allowable capacity increase is utilized in the verification. There is some reserve capacity in the foundations, but the interior pile foundations lack adequate capacity for the added level. Thus, these foundations will need to be strengthened by means of added micropiles and an enlarged pile cap.

Lateral Load Assessment

Given the date of construction and the structural system, we expect that the existing parking garage does not conform to the current seismic design requirements for new structures; therefore, a 10 percent increase in lateral forces will trigger a seismic upgrade based on the 780 CMR requirements for additions. To assess the impact of the added level, MKA performed a preliminary comparative analysis of the existing structure with and without the addition. The assessment is based on seismic loading, as wind loads do not govern the lateral analysis.

Based on MKA's evaluation of the existing garage, the added assembly green roof increases the lateral loads on the upper floors by more than 10 percent. The structure does not have sufficient lateral load capacity to support the increased demand; therefore, a seismic upgrade will be required. The ability to add bracing elements is highly constrained by the parking, drive aisle, vertical transportation, and egress functions of the garage. It should be assumed that an upgrade involves added lateral elements that will be distributed to not significantly impact the drive aisle and egress functions. Some loss of parking stalls may occur.

Furthermore, the existing expansion joints between the three sections of the garage are too narrow to meet current code requirements. The length of the expansion-joint bearing will be increased to accommodate out-of-phase displacements between adjacent garage sections.

MKA/ecr

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**BROADWAY PARK – BLUE GARAGE ROOF
CODE COMPLIANCE CONSIDERATIONS**
October 29, 2018

The Project contemplates construction of a new, open-air, assembly occupancy roof level (Level 8) above the existing 7 level Blue Garage (open parking garage). The significant code compliance considerations associated with the Project are as follows:

(NOTE: The following code compliance considerations do not specifically contemplate the proposed South Tower and North Tower residential buildings.)

(NOTE: Refer to separate memo by Magnusson Klemencic Associates regarding structural code compliance considerations.)

- The following primary codes are applicable to the Project:
 - **Accessibility** – Massachusetts Architectural Access Board Regulations (521 CMR) and the Americans with Disabilities Act (ADA) 2010 Standards for Accessible Design
 - **Building** – Massachusetts State Building Code (780 CMR) 9th Edition (amended version of the 2015 International Building Code (IBC) and the 2015 International Existing Building Code (IEBC))
 - **Plumbing** - Massachusetts Fuel Gas and Plumbing Codes, 248 CMR
- The Project involves the following work which has been classified by type according to the Work Area Compliance Method of 780 CMR §34-IEBC:
 - Addition to (vertical expansion of) the existing building.

Where the addition to the existing building increases the height of the building to more than 70 feet, the building is classified as a high-rise; the height measured to the roof of certain spaces which are not specifically classified as a penthouse(s) (e.g., elevator lobby, toilet rooms etc.).

PENTHOUSE. An enclosed, unoccupied rooftop structure used for sheltering mechanical and electrical equipment, tanks, elevators and related machinery, and vertical *shaft* openings.

1002.1 Compliance with the Building Code. Where the character or use of an existing building or part of an existing building is changed to a special use or occupancy as found in 780 CMR 4.00, the special use or occupancy shall comply with the applicable requirements of that chapter. Areas changed to incidental uses shall comply with 780 CMR Table 509.

- Level 2 Alterations to the existing building
- Change of occupancy with a change of occupancy classification to include Group A-3 and A-5, Assembly occupancies

- Considering the type(s) of work involved, the following is required:
 - The addition is required to comply fully with the new construction requirements of the applicable accessibility and building codes.
 - The roof level park must be fully accessible including accessible vertical transportation (i.e., elevator(s)). Where the roof level assembly occupancy is located more than four stories above the level of exit discharge, standby power is required to be provided for the elevator(s).
 - The new roof level and the supporting structural members are required to be 2-hour fire resistance rated and columns are required to be 3-hour fire resistance rated.
 - The existing building (parking garage) is required to be fully sprinklered. Considering the height of the building it is expected that a fire pump will be required. If an electric motor driven fire pump is provided, connection to an emergency power source is required.
 - The existing building is required to be equipped with a voice fire alarm system.
 - Exit stairways serving the roof level park are required to be enclosed with 2-hour rated fire barriers with 90-minute rated doors.

(NOTE: *Where the occupied roof level is not located more than 75 feet above the lowest level of fire department vehicle access, pressurized exit stairways are not required.*)
 - Enclosed exit stairways are required to be provided with luminous egress path markings.
 - Where the roof level park is occupied by more than 300 people, a main entrance / exit is required to be provided. Accordingly, a new enclosed exit stairway should be provided sized to accommodate 50% of the roof level occupant load at 0.2"/person.
 - The building is required to be provided with a Fire Command Center (FCC).
 - Where the parking garage and roof level park are "open-air", required post fire smoke purge requirements are satisfied by natural ventilation.
 - Considering the nature of the roof level park and the intent of the Plumbing Code (248 CMR) it is expected that at least one (1) men's toilet room and one (1) women's toilet room (or two (2) unisex toilet rooms) will be required. Approval of a Plumbing Code variance may be required to allow this modest level of service.

**** End ****