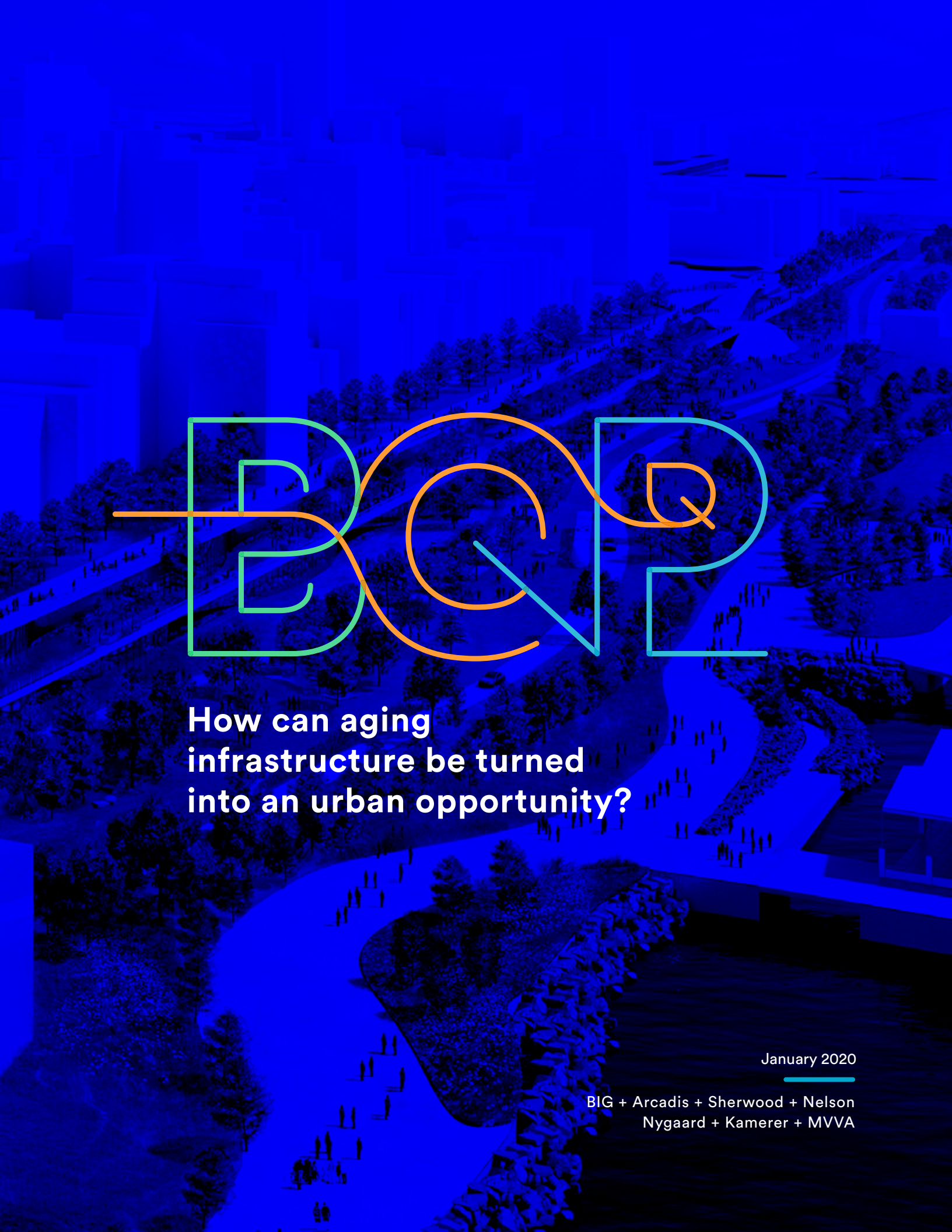

How can aging infrastructure be turned into an urban opportunity?

January 2020

BIG + Arcadis + Sherwood + Nelson
Nygaard + Kamerer + MVVA

Drawings for this study have been prepared using publicly available GIS and survey data. Detailed survey and further technical study will be required to confirm design assumptions.

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Information on the proposal can also be found at:
www.bqpark.nyc

Version: January 19TH, 2019

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Introduction to Study

This independent study has been undertaken by BIG / Bjarke Ingels Group and its partners between Winter and Fall of 2019.

The BQP design team is composed of NYC-based professionals across planning, engineering, design, and landscape, many of whom are based in the area and have been working in and around Brooklyn Bridge Park and the region extensively.

The study is meant to illustrate the high-level feasibility and benefits of an alternative approach to BQE replacement and repair, as elaborated in the following pages.

Work has been undertaken without client or compensation, and is intended as a contribution to the public discussion around the future of the BQE.

Study Highlights

BQP Feasibility

- Simple structural approach.
- De-conflicts construction from community and active traffic.
- Minimizes or eliminates temporary roadway elements.
- Avoids sensitive historical areas completely.
- Minimizes parkland alienation.

BQP Cost

- Reduced roadway construction costs – build it once, not twice.
- Reduced cost of structural system – at-grade, simple deck.
- Opportunities for diversified funding.

BQP Community Benefits

- Reduced construction impacts – preserves historical Promenade.
- Vastly improved waterfront condition.
- Creation of new parkland - 8-12+ acres.
- Improved N-S and E-W connectivity.
- Improved sound and air quality – capping, carbon re-capture.
- Improved stormwater management.
- Opportunities for new community amenities.
- Potential for BQX/light-rail.
- Potential for a continuous linear park running from DUMBO to Red Hook.

BQP Coordination Needs

- Cross-agency coordination.
- Cross-jurisdictional coordination - City/State.
- Permitting, schedule, design-build, approvals.

Contents

Executive Summary

How can aging infrastructure be turned into an urban opportunity?

The Brooklyn-Queens Expressway, or BQE, built by Robert Moses in the 1950s, is an iconic piece of New York City infrastructure that has accommodated car and truck traffic for more than 60 years. As the triple-cantilever structure along Brooklyn Heights shows signs of corrosion and aging, New York City has taken on the challenge of repairing the roadway, spanning from Sands Street in DUMBO to Atlantic Avenue in Cobble Hill. The initial replacement strategy put forth by NYC DOT for the cantilever has been constrained by limitations to work within DOT Right-of-Way - resulting in the replacement of this aging structure but a continuation of the placement of this vehicular barrier separating the Brooklyn community from its waterfront.

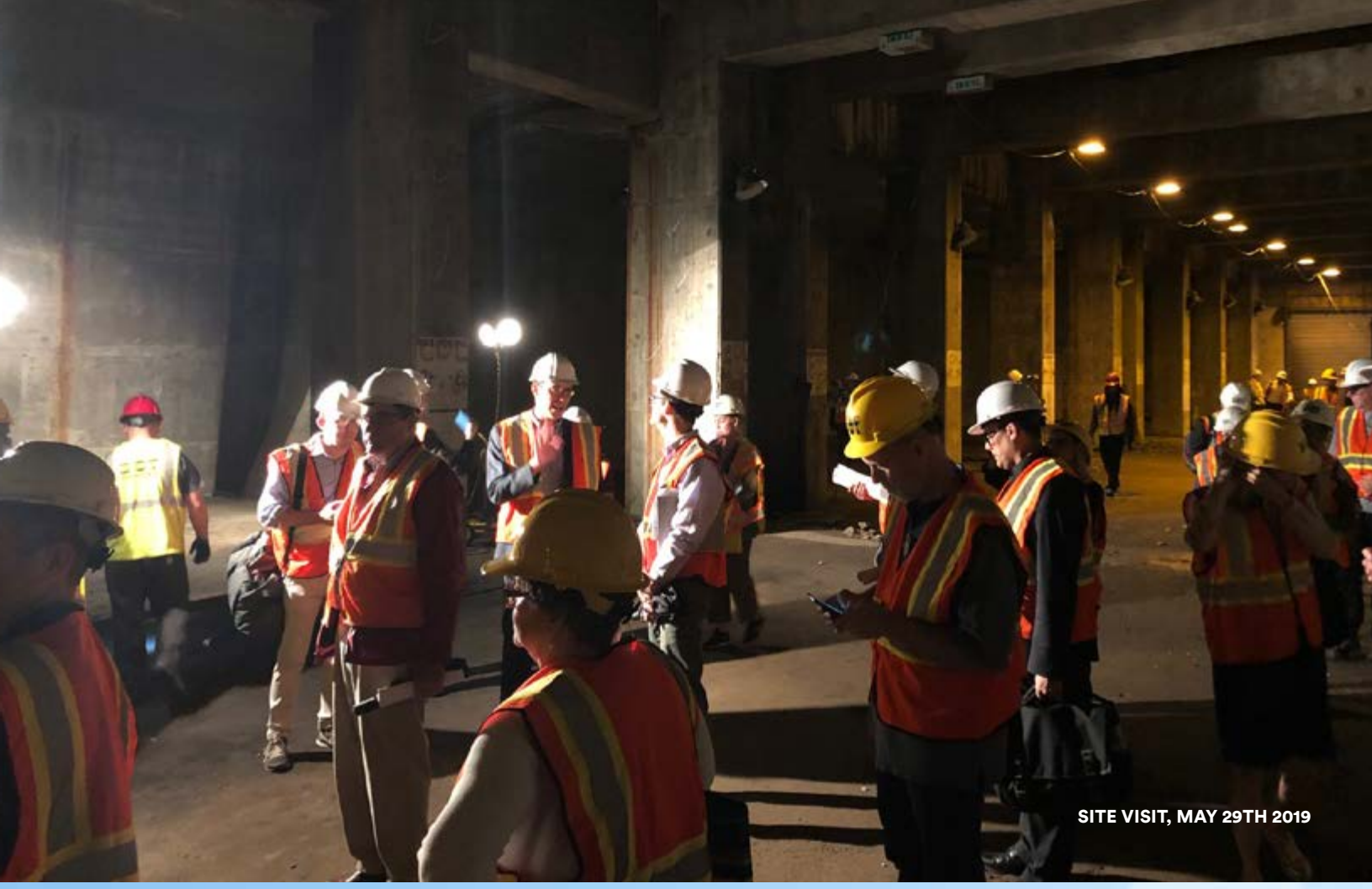
Our team believes in *Social Infrastructure* – multi-purpose investments in our cities that provide multiple benefits and bring joy to citizens day-to-day. As a contribution to the public conversation, we have developed the BQP – turning the BQ-Expressway into a BQ-Park, while still accommodating significant vehicle flows along the route. Construction of an at-grade roadway (of 4 or 6 lanes) along Furman Street and Brooklyn Bridge Park, covered with a deck structure, would result in a waterfront transformation. This deck provides a platform for adding significant new parkland along an underused corridor, while connecting Brooklyn Heights to Brooklyn Bridge Park with a preserved or re-constructed cliffside – criss-crossed by rampways, greenery, and park amenities. Local park access is accommodated on a meandering parkway, while space is created for a potential spur of a BQX (Light-Rail) or BRT (Bus Rapid Transit) line. The deck structure extends south to Atlantic Avenue – where it creates a new crossing and urban nexus, and the beginnings of a linear park which could eventually connect DUMBO to Red Hook. The simple structural approach, and one-time construction of the new roadway, create a less costly solution for reconstruction of the BQE, while delivering far more benefits to the community.

Significant outreach with community groups, elected officials, city, and state agencies has been undertaken to inform the BQP concept. This has included over 50 public meetings, briefings, and workshops between February and August of 2019. Outreach reveals that there is a broad base of support for the BQP concept, which can help facilitate the heightened level of inter-jurisdictional coordination required for an integrated approach.

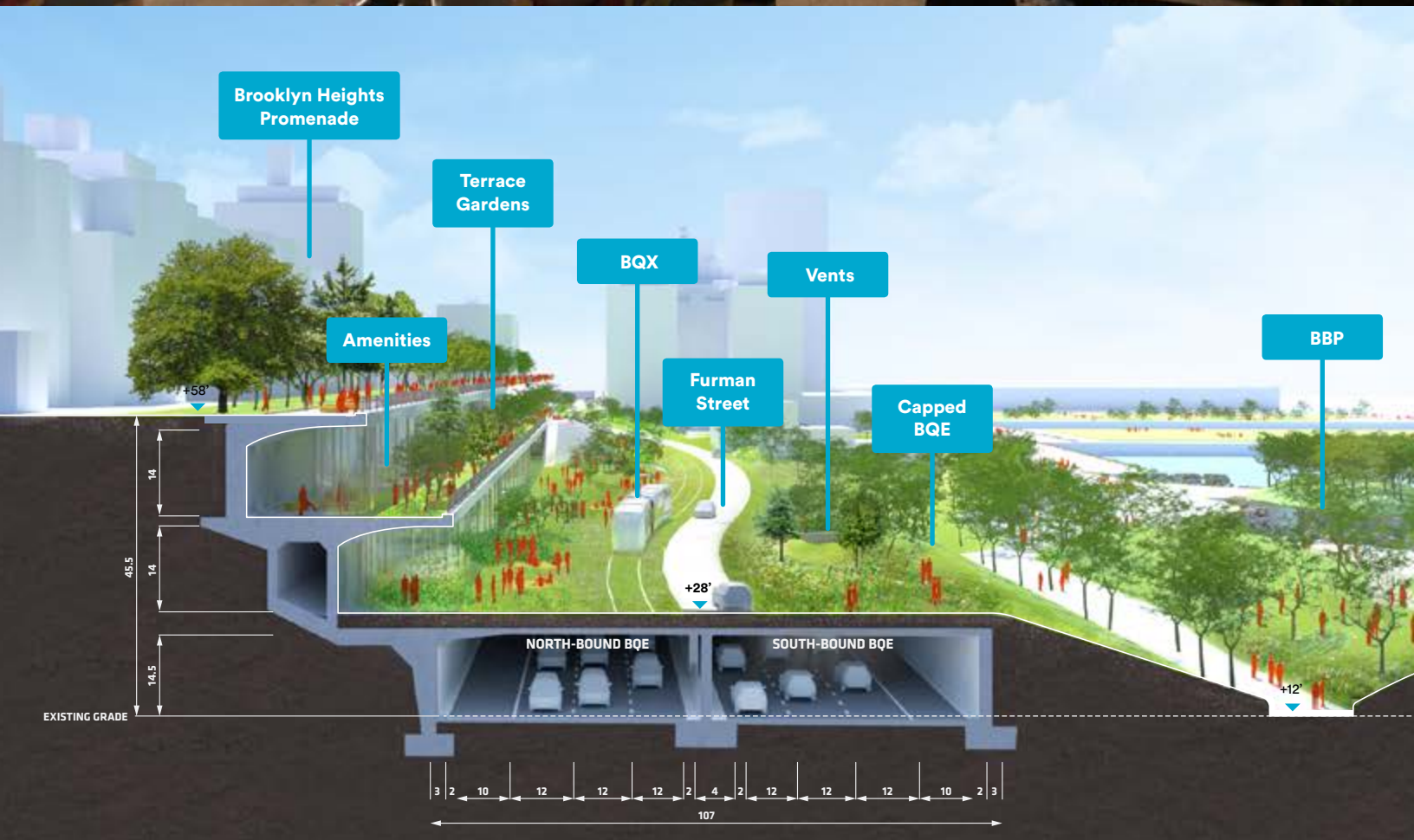
Technical study has been undertaken to determine the nature of any conflicts with existing infrastructure and landowners. While there are costs and challenges to any replacement plan for the BQE, the team's findings are that no conflicts or costs triggered by the concept are unreasonable given the scope, necessity for, and benefits of the project. A full list of technical considerations and ways in which they can be addressed are outlined on the following page.

Rough-order-of-magnitude (ROM) cost and constructability assessments have been prepared and are detailed on pages 162 and 164. Findings support the assumption that a Furman St. alignment can be built at a lower cost and shorter timeline as compared with the baseline DOT "Tempway" proposal.

Finally - rehabilitation concepts have recently entered the public conversation as a possibility. If these prove feasible, the BQP approach can easily be applied to any number of these lower-impact approaches. Two such alternatives are illustrated on page 166 of this document and warrant further study if rehabilitation is pursued by DOT.



SITE VISIT, MAY 29TH 2019



PROPOSED SECTION, SCENARIO 1

DEP Infrastructure and Utilities (Page 80)

- 10’ sewer interceptor may remain in place along majority of length, or be downsized and reconstructed to facilitate access at estimated cost of +/- $100 Million.
- DEP likely to consider reconstruction of interceptor for any scheme, including DOT Innovative Plan.
- Water, gas, and electrical utilities along Furman St. may remain in place or relocate to new accessible utility corridor.
- NYC Franchise Area: utilities must accommodate any request for relocation if required for public improvements.

MTA Infrastructure (Page 96)

- No MTA fan plants (A/C, 2/3, R, 4/5) to be re-located.
- 2/3 Vent and Emergency Egress to remain in place, with simple stair and chimney accommodated in deck structure.
- MTA Electrical Substation at 304 Furman St. to be relocated vertically at cost of roughly $100 Million. 1970s facility is currently in the floodplain and relocation provides modernization and resiliency benefits.
- R Train Fan Plant may remain in place. Impacted manhole access to east of building may be preserved through utility hatches in new roadway surfacing.

Brooklyn Bridge Park (Page 62)

- Construction of proposal would require 1 acre of existing 60 acre park (1.6%) to undergo regrading and reconstruction.
- BBP M+O Facility, HQ building, and Pier 2 Utility structure to be reconstructed.
- Governance of new parkland would optimally be absorbed by BBP (Amendment to General Plan)
- Extensive positive opportunities for programming and access improvement unlocked by concept.

360 Furman Street (Page 114)

- BQE to be reconstructed below grade, along Furman Street.
- Lobby and ground floor retail to remain in place in final condition (Lobby temporarily accessed from corridor entry at northern end of building during certain periods of construction).
- Final condition to remove two-level highway structure adjacent to building and replace with below-grade highway covered with park deck and replaced Furman Street.
- Access from Joralemon St. can be preserved in final condition.

Atlantic Avenue (Page 128)

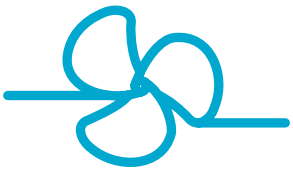
- New roadway to continue below grade from 360 Furman St., matching into Cobble Hill trench.
- Dangerous on/off ramp conditions can be addressed and reconfigured.
- Vastly improved urban conditions along Atlantic Ave. and creation of additional parkland for area.

Columbia Heights (Page 140)

- Roadway to transition from at-grade to double stacked before Columbia Heights bridge, at 5% slope and 1060' minimum radius (Federal Standards).
- Park deck to climb with roadway, creating new connection from BBP to Columbia Heights Bridge.

Roadway Design (Page 158)

- Roadway design assumes current DOT assumptions for 6 lanes with breakdown shoulders for each direction.
- -5% Maximum Slope with 1060' Minimum Radius (Federal Standards).
- Reducing lanes from 6 to 4 if possible, as recommended by RPA, would reduce cost and physical impacts of scheme further.



Tunnel Parameters (Page 160)

- Vents to be provided every 500', at roughly 200 SF each (6-8 Total).
- Condition exists in other NYC parks e.g. the Battery.
- Opportunities for carbon/particulate re-capture should be explored.
- Heavy trucks will be able to continue through system. Hazardous materials will likely require surface routing from Atlantic Ave. to terminus of covered roadway. Current volume of Haz-Mat traffic should be determined, and is likely a small % of trips.

Cost (Page 164)

- Order-of-magnitude cost has been prepared by VJ Associates and Arcadis. Details of the estimate are available on page 164 of this report.
- The estimate supports the assumption that an at-grade scheme could be built at similar or less cost than the current baseline alternative.
- If desired, the BQP scheme provides opportunities for revenue generation that may help buy down costs further.

Problem

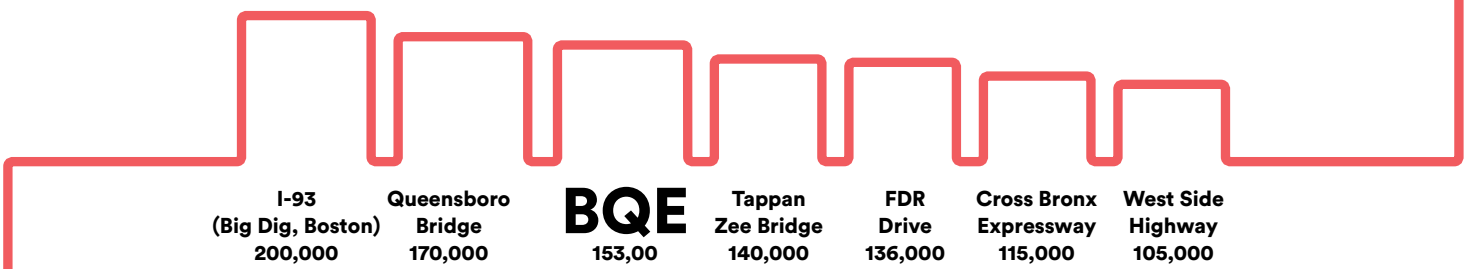
Construction of the BQE by Robert Moses began in 1944. Like other urban highways, construction was controversial because it cut through city neighborhoods and displaced residents. In the 1940s and 1950s, the Brooklyn Heights community fought Robert Moses and the government's intended six-lane highway design. A concession to appease opponents was a highway with a smaller width and in an unusual triple-cantilever structure that skirted Brooklyn Heights. The design allowed for a park on top, designed by landscape architects Rapuano and Clark, which became the iconic Brooklyn Heights Promenade. The BQE has since become one of the most heavily used urban highways in the nation, and serves as a vital transportation corridor. As Brooklyn's only interstate highway, the BQE is subject to federal as well as state regulations.

The triple cantilever has not had a major rehabilitation since it was constructed decades ago, and concerns about its safety have been growing. From 2006-2011, New York State Deparment of Transportation initiated a process to evaluate alternatives to fix the roadway. The process was terminated in 2011 due to budget constraints.

NYS DOT did not move forward with the project, and in 2014, worried about the condition of the road, NYC DOT began its own process to study reconstruction or rehabilitation solutions for the highway. NYC DOT now estimates that if not addressed, trucks may need to be diverted to surface streets by 2026, and by 2036, that the structure may not be safe for any vehicular travel.

First proposals by NYC DOT, released in Fall of 2018, responded to this urgent timeline, and as such assumed as a constraint that all reconsruction should take place within NYC DOT right-of-way, in order to avoid drawn-out coordination with adjacent public landowners. Introduction of this requirement however severely constrained potential alignments, and in the proposed option required that a temporary roadway be constructed through Brooklyn Heights Promenade for a period of 8 or more years - replaced by a similar final configuration with exposed roadway as exists today.

Community reaction to the proposal reflected a desire for a less dentrimental and more forward-thinking solution for the issue, looking towards the next 100 years. Questions of eventual roadway capacity (2, 4, or 6 lanes), roadway location, and integration with the waterfront were raised by community members and elected officials. In July of 2019, the Mayor's Expert Panel announced that the "Tempway" plan was not considered a viable way forward.



AVERAGE NUMBER OF VEHICLES PER WEEKDAY (SOURCE: RPA, REIMAGINING THE BQE)

TRIPLE CANTILEVER STRUCTURE FROM PIER 1

RALLY FOR A BETTER BQE, JANUARY 2019

Top Construction, 1950
Bottom Completion, 1954

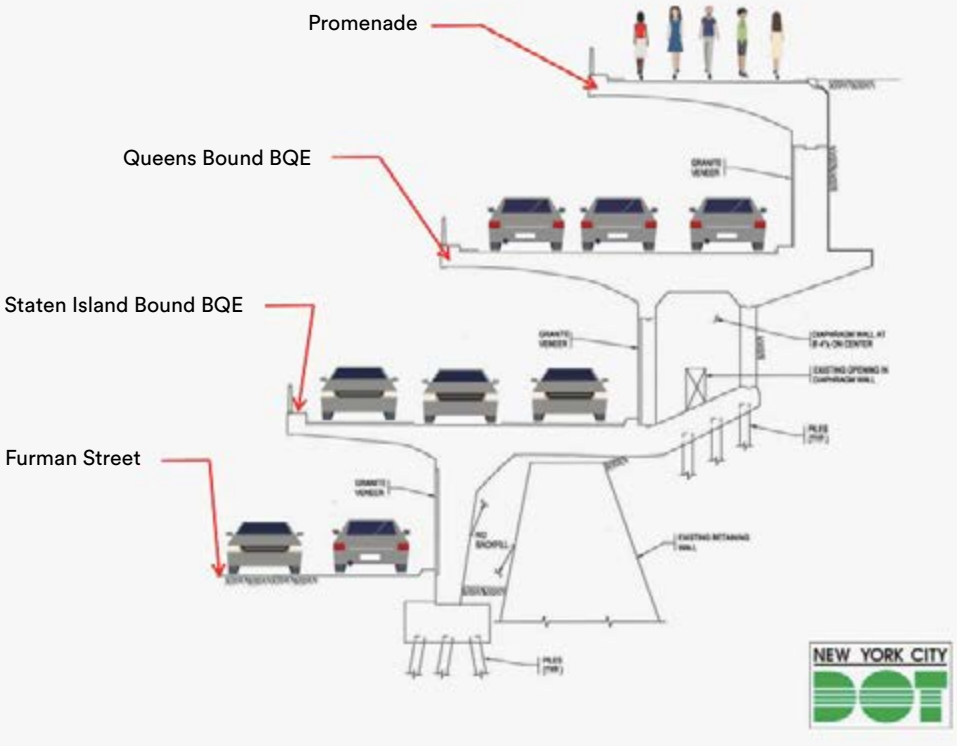
Triple Cantilever Construction

A marvel of engineering, the triple cantilever BQE structure and esplanade was built by Robert Moses in the 1950s - accommodating vehicles but cutting off the neighborhood from its waterfront.

Top Damaged Concrete at Joralemon Street Bridge
Bottom DOT BQE Triple Cantilever Typical Section

Triple Cantilever Construction

Today, steel reinforcement is rapidly corroding - if not repaired by 2026, traffic will begin to be forced onto neighborhood streets.



Approach

The BQP concept takes as its starting point that investments in our cities should go beyond 20th century models for infrastructure, built to serve a single function. Increasingly dense cities, overlaid with the impacts of aging infrastructure, climate change, and other challenges, demand a multi-issue approach to large infrastructure projects, which should accomplish multiple goals and accommodate multiple uses wherever possible. By doubling, tripling, and quadrupling benefits, investments in *social infrastructure* can work overtime - diversifying their funding pools, and building stronger constituencies for their construction.

20th-century roadway infrastructure has had a particularly destructive effect on coastal neighborhoods throughout New York, as it has in many cities around the world. Originally thought to be progressive uses of declining waterfronts, coastal highways such as those built by Robert Moses have prioritized those moving through cities over those living in them - severing communities in half, and contributing to poor access and health outcomes for adjacent residents.

Cities around the world have begun to re-think their coastal roadways, through road dieting, capping, or full deconstruction. New York City itself has already done this - when a portion of the elevated Westside Highway collapsed in 1973, a full overhaul brought the roadway to grade as a stoplit boulevard, and created the 4.5 miles of Hudson River Park that we have today.

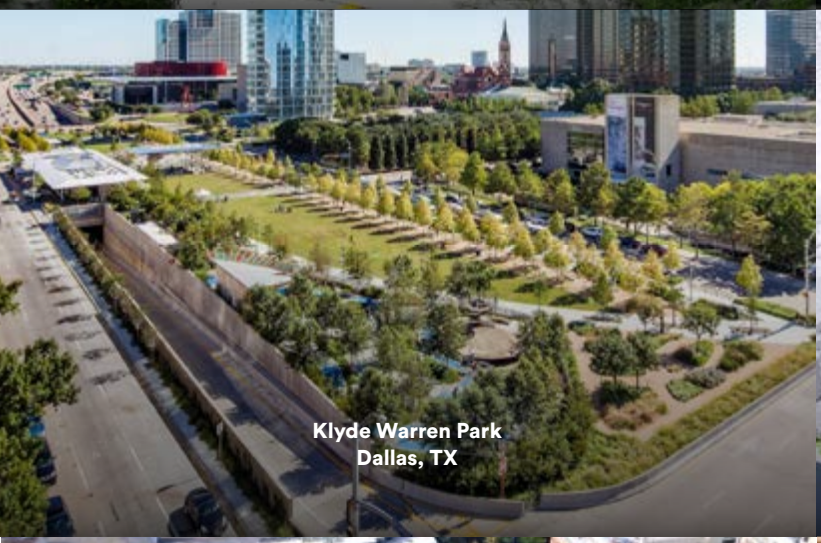
The crisis of the BQE provides a generational opportunity to re-think this waterfront for the next 100 years. It should serve as a model for a way government can approach aging highways around the city, and demonstrate how the needs of infrastructure can be balanced with those of city residents.

In order to accomplish this, the traditional silos of city and state agencies, which tend to optimize for single functions, need to be re-imagined. Construction of an integrated project will likely need to be led by a consortium of relevant agencies, across transportation, open space, planning, and economic development specializations. Coordination across city, state, and other stakeholders should be a baseline assumption.

The concept outlined in the following pages assumes cross-jurisdictional collaboration as a necessity, not as an option, and takes advantage of land adjacent to the DOT right-of-way to accomplish a project that is more constructable, less costly, and more beneficial as a result.

Cheonggyecheon Stream Restoration Project
Seoul, South Korea

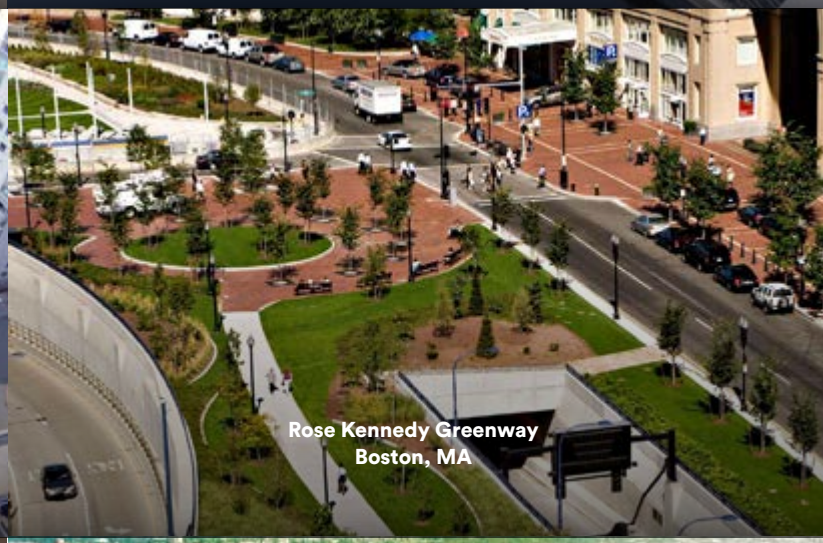
Olympic Sculpture Park
Seattle, WA



Klyde Warren Park
Dallas, TX

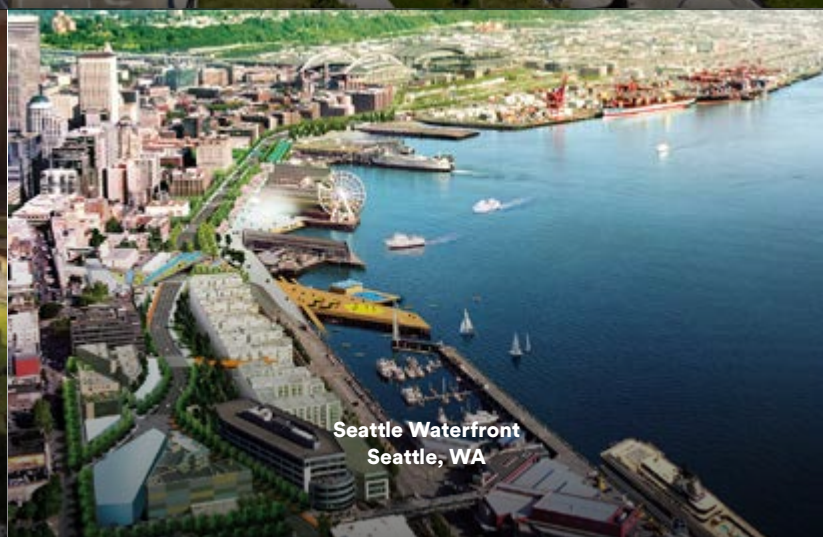
East Side Coastal Resiliency Project (Big U)
New York, NY

Freeway Park
Seattle, WA



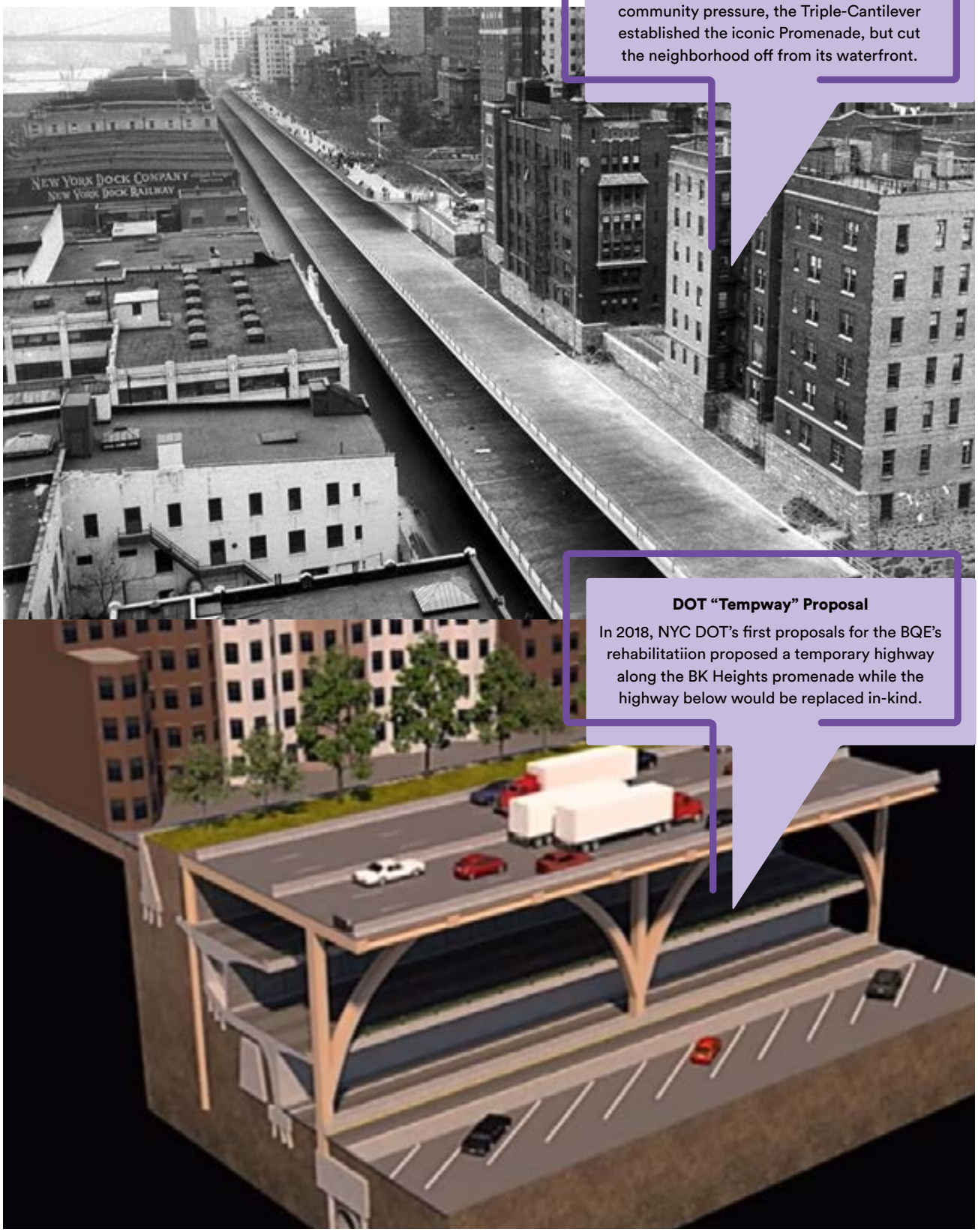
Rose Kennedy Greenway
Boston, MA

Margaret T. Hance Park
Phoenix, AZ



Seattle Waterfront
Seattle, WA

Top BQE Construction, 1950s
Bottom DOT "Tempway" Proposal



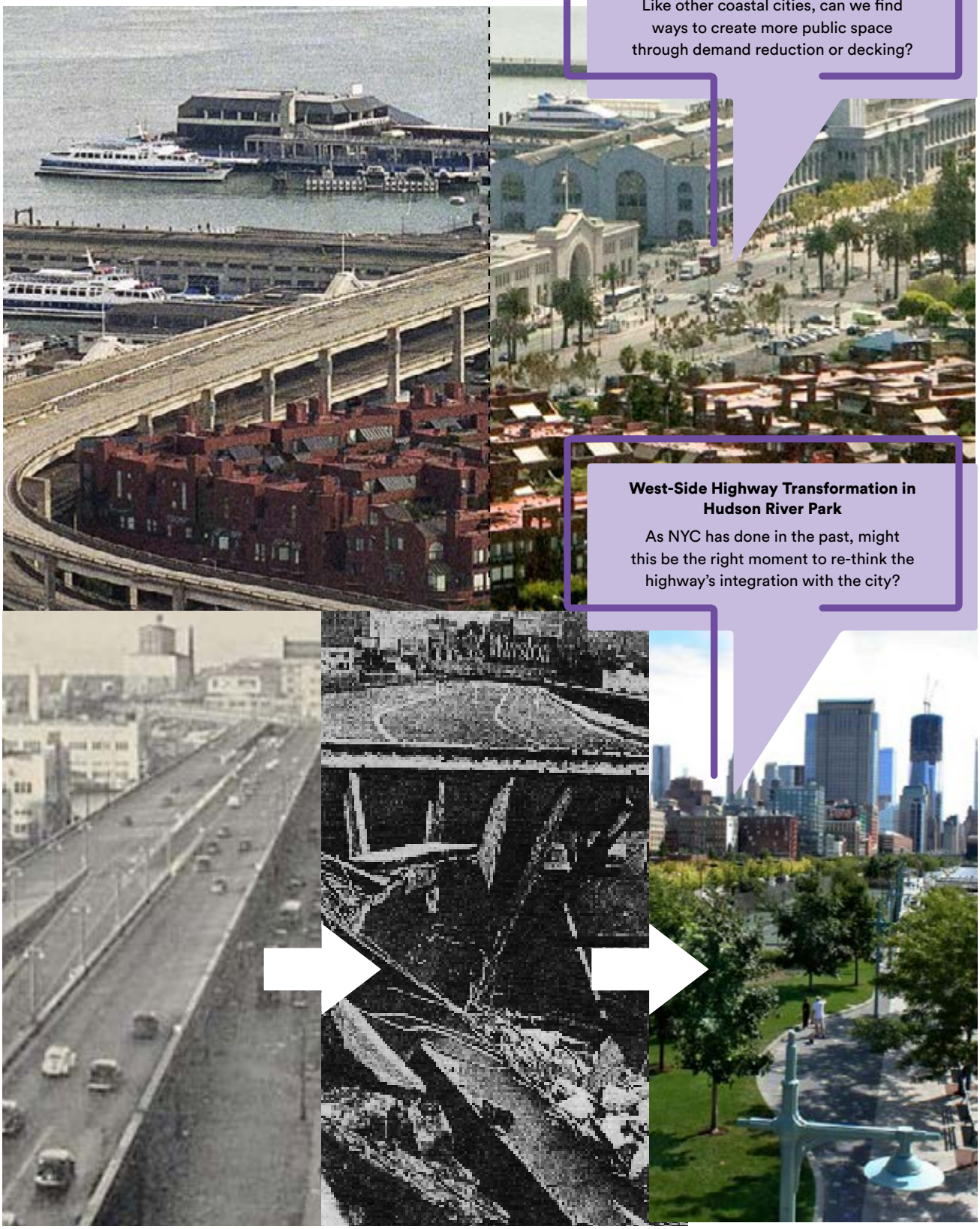
Construction of Triple-Cantilever

Pushed to the waterfront due to community pressure, the Triple-Cantilever established the iconic Promenade, but cut the neighborhood off from its waterfront.

DOT "Tempway" Proposal

In 2018, NYC DOT's first proposals for the BQE's rehabilitatiion proposed a temporary highway along the BK Heights promenade while the highway below would be replaced in-kind.

Top Embarcardero Highway, Before and After, 1980s-90s
Bottom Westside Highway, 1950s, 1973, Today



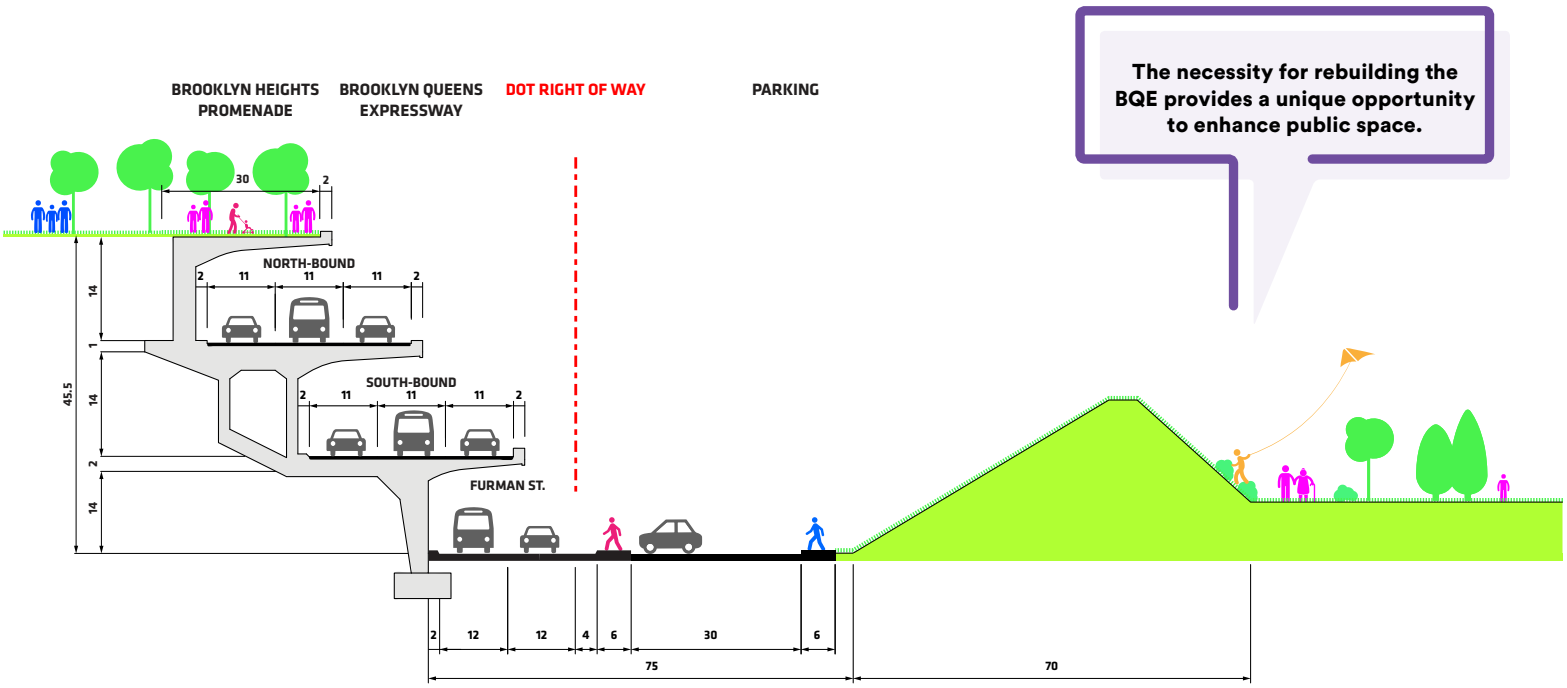
Embarcadero Transformation
San Francisco, California

Like other coastal cities, can we find ways to create more public space through demand reduction or decking?

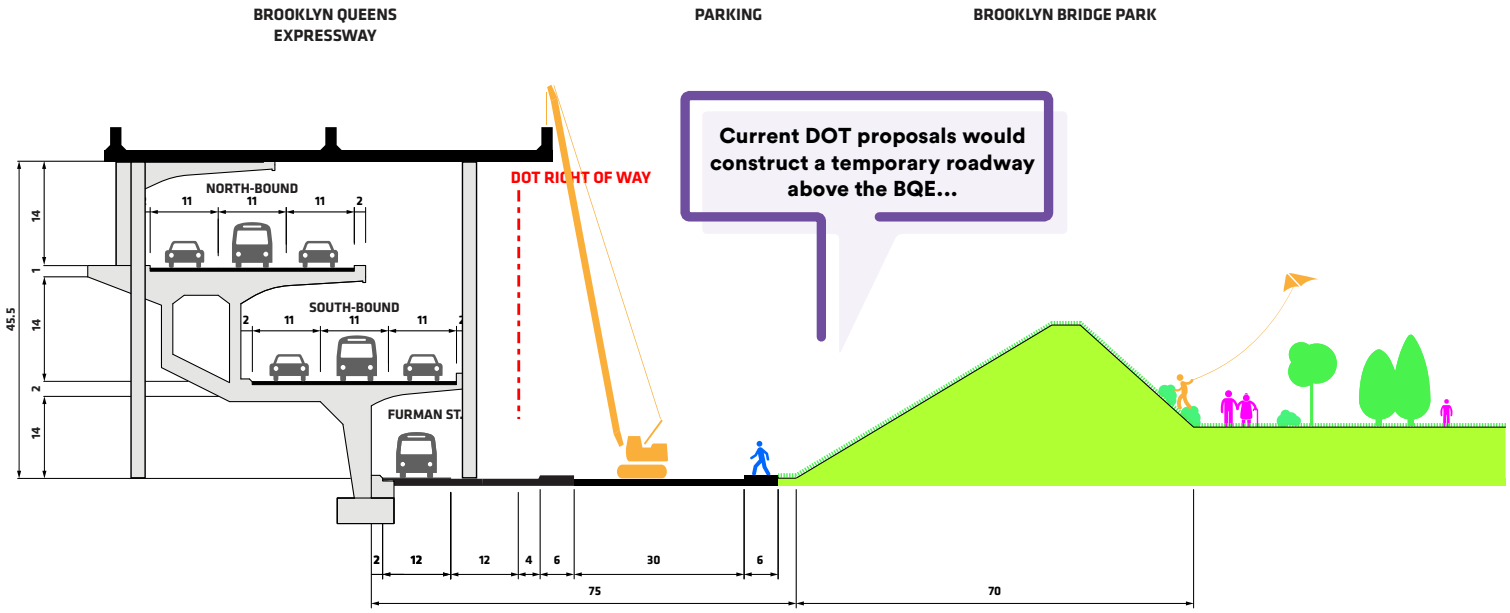
West-Side Highway Transformation in Hudson River Park

As NYC has done in the past, might this be the right moment to re-think the highway's integration with the city?

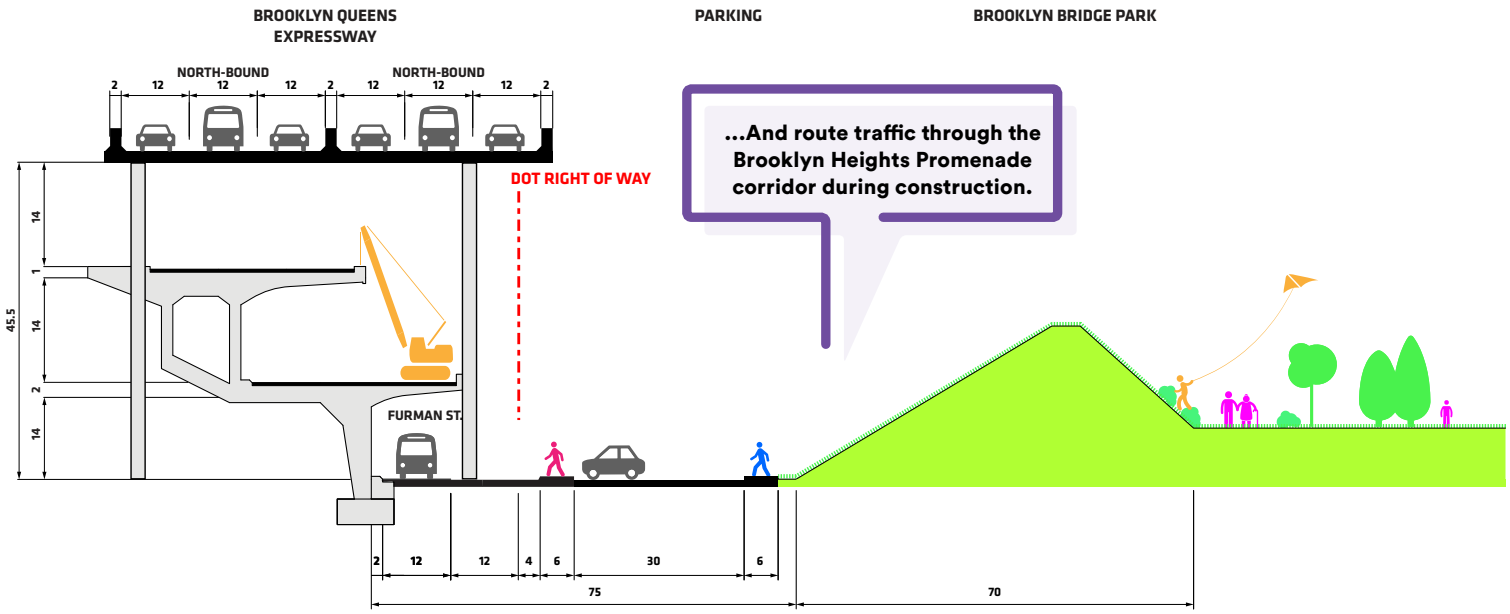
Current Conditions



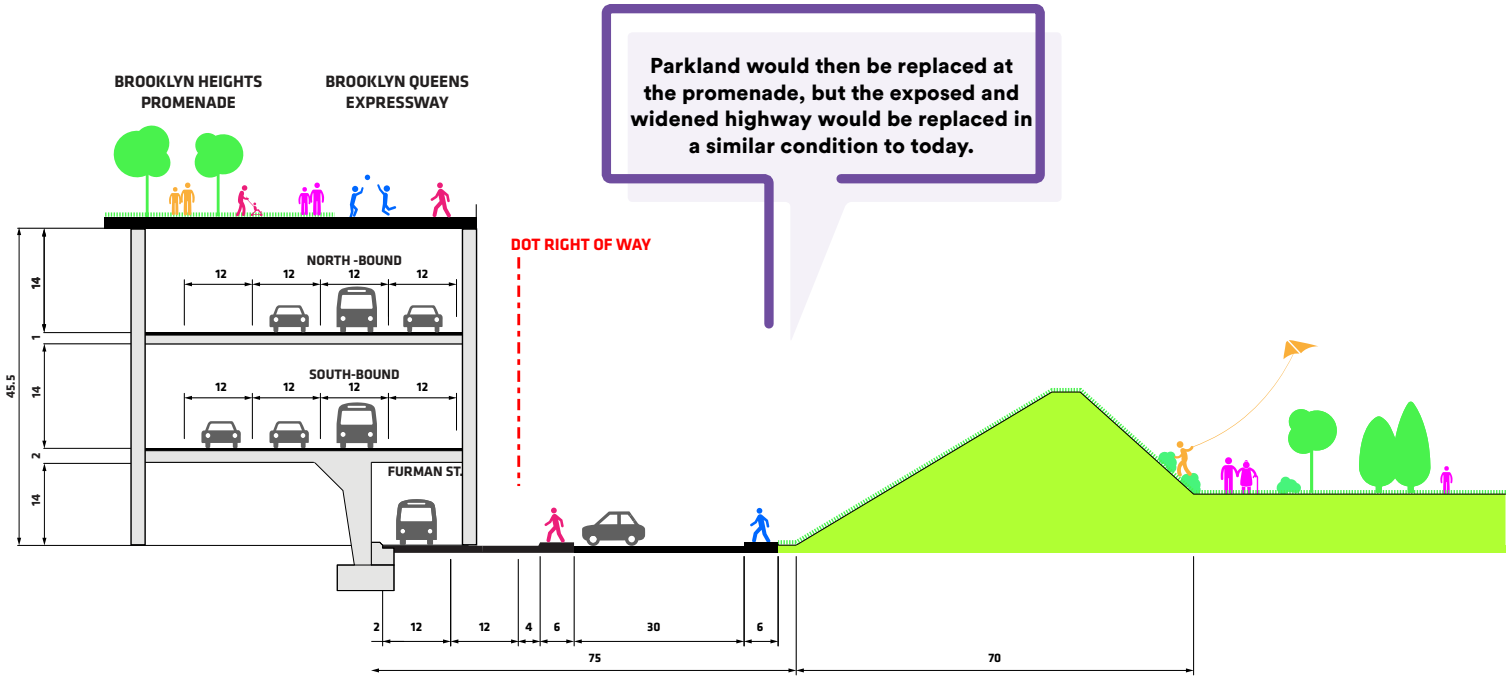
DOT “Tempway” Proposal - Phase 1



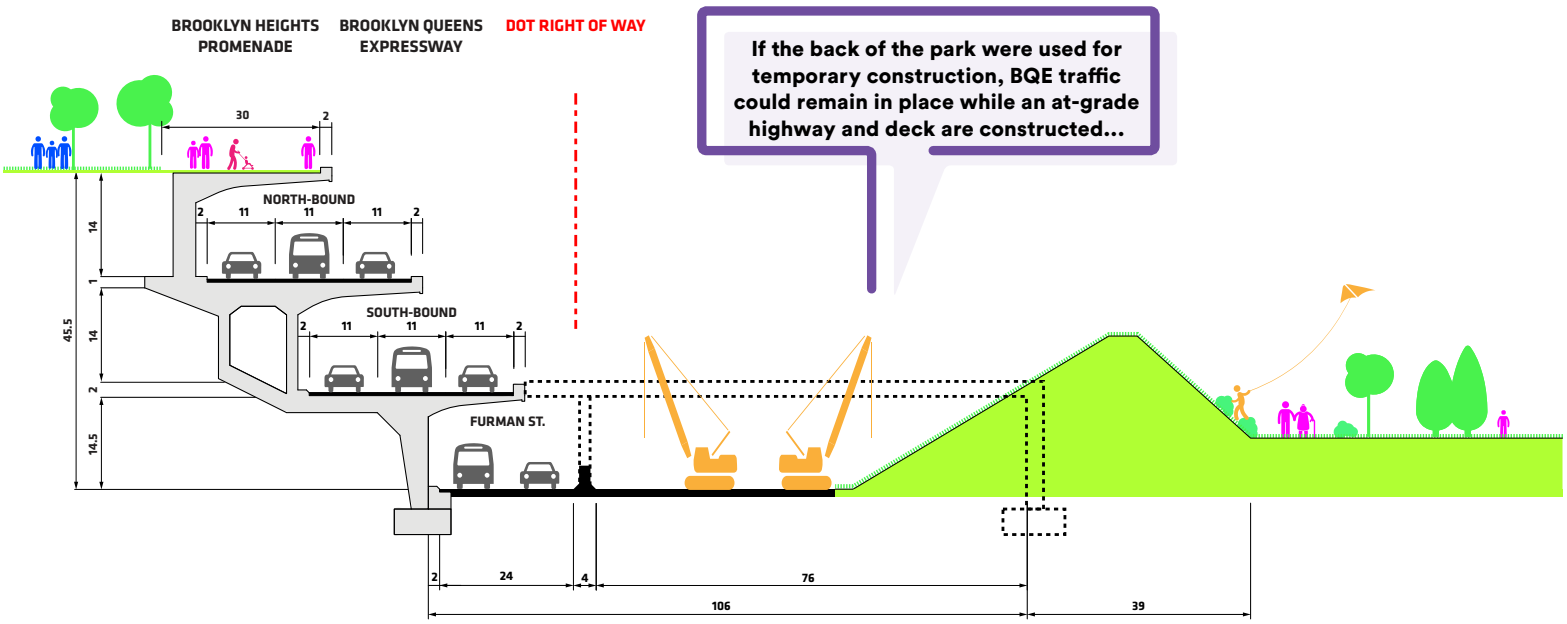
DOT “Tempway” Proposal - Phase 2



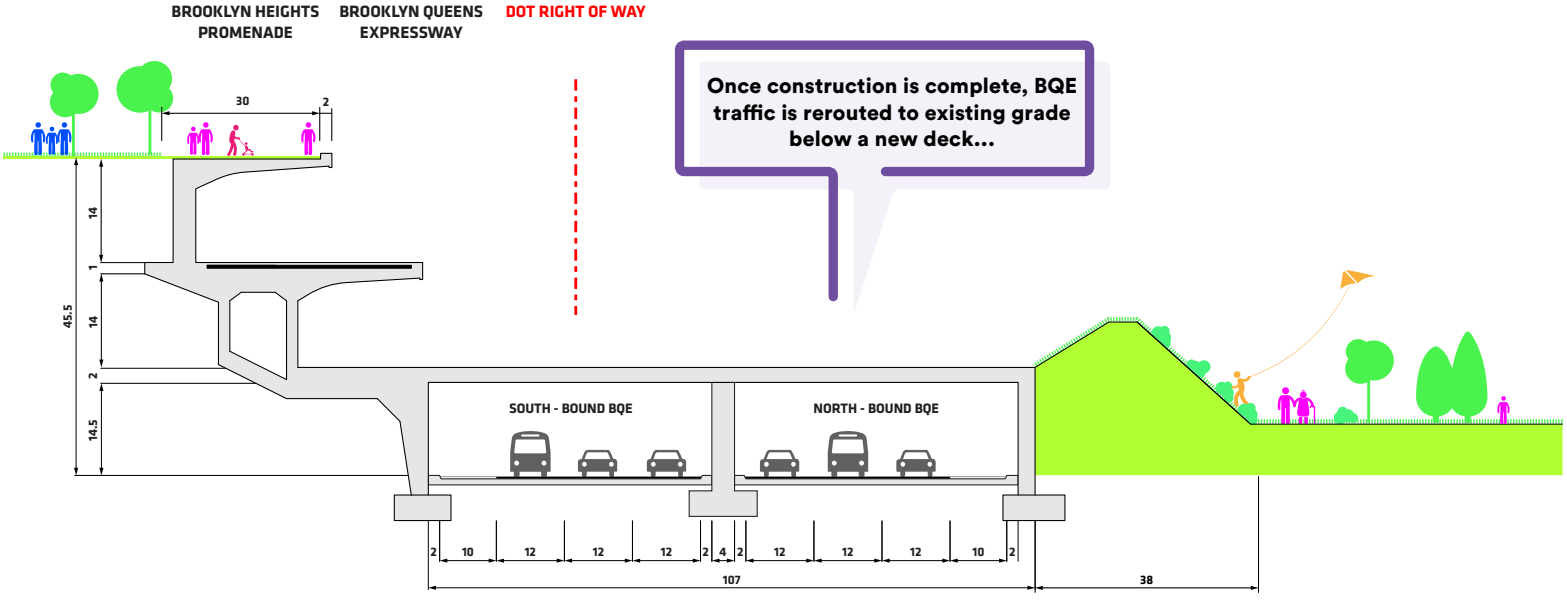
DOT “Tempway” Proposal - Phase 3



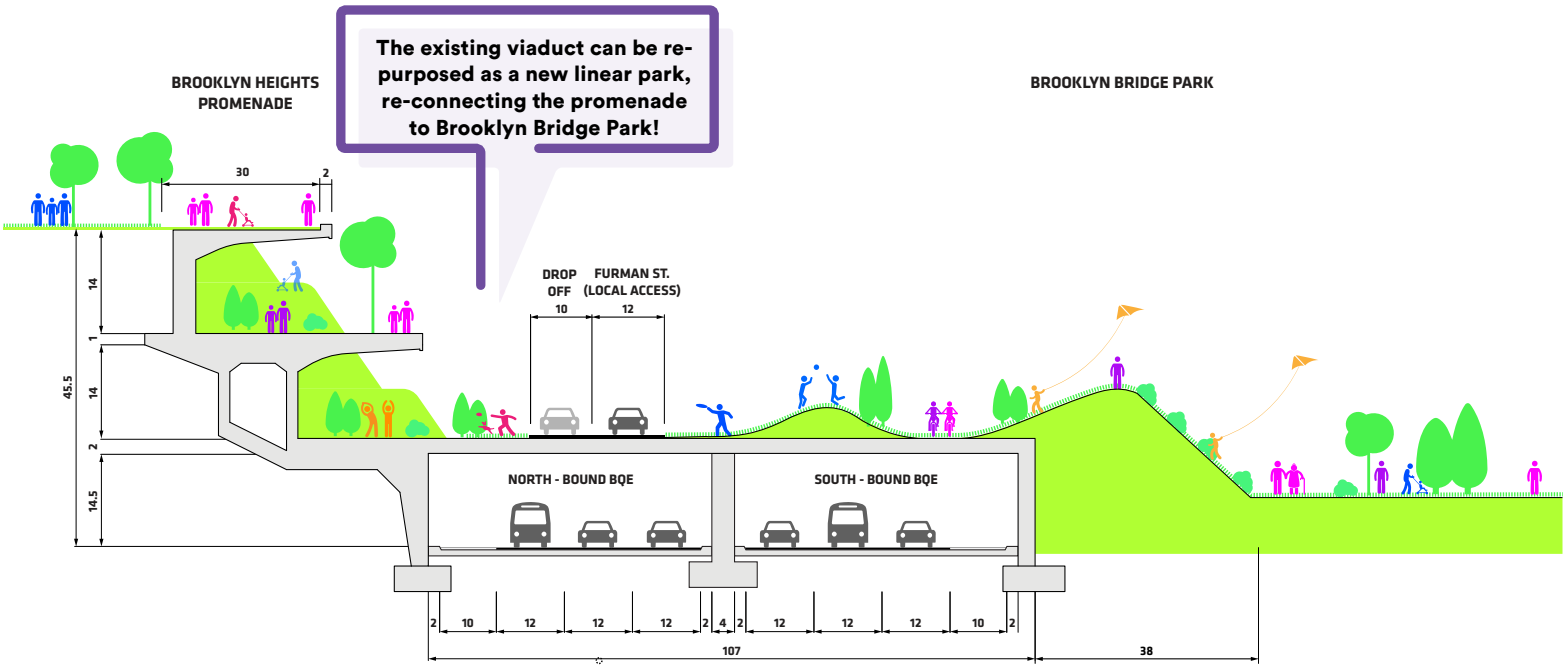
BQP - Phase 1



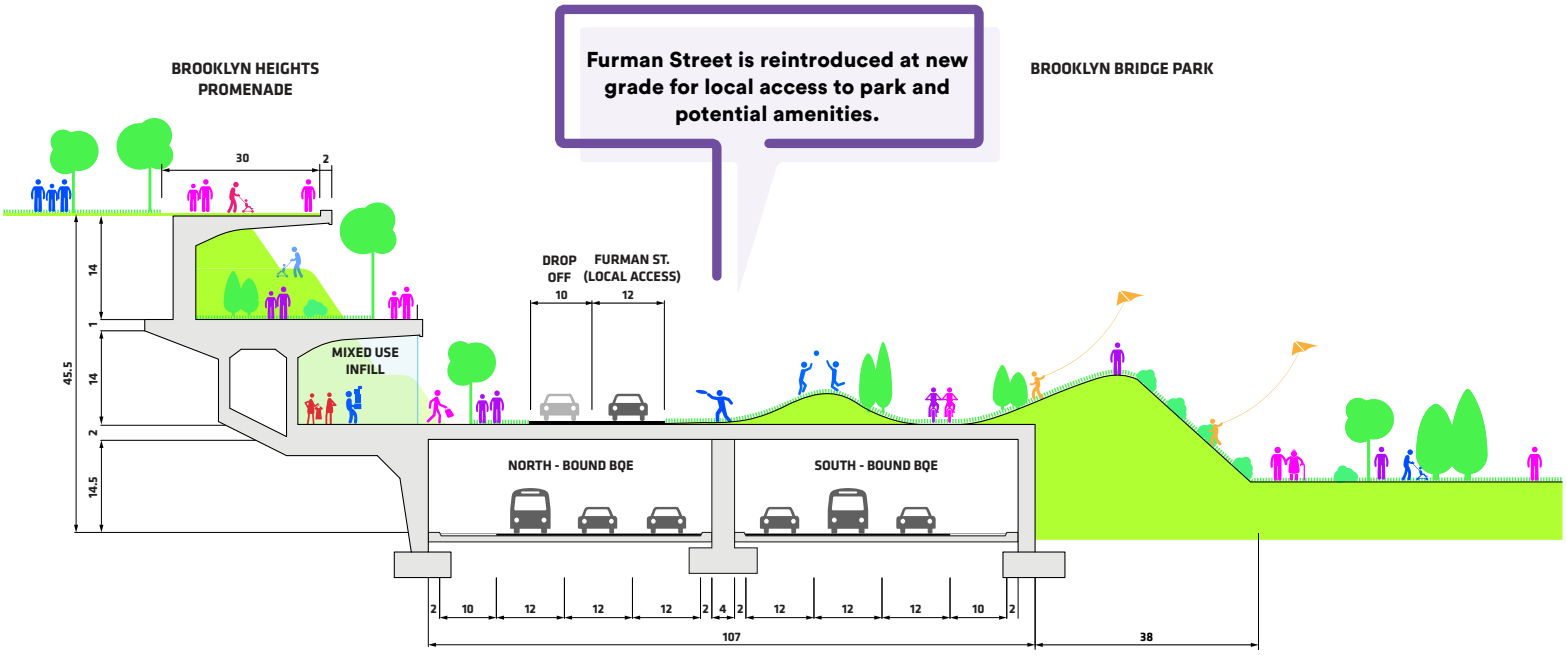
BQP - Phase 2



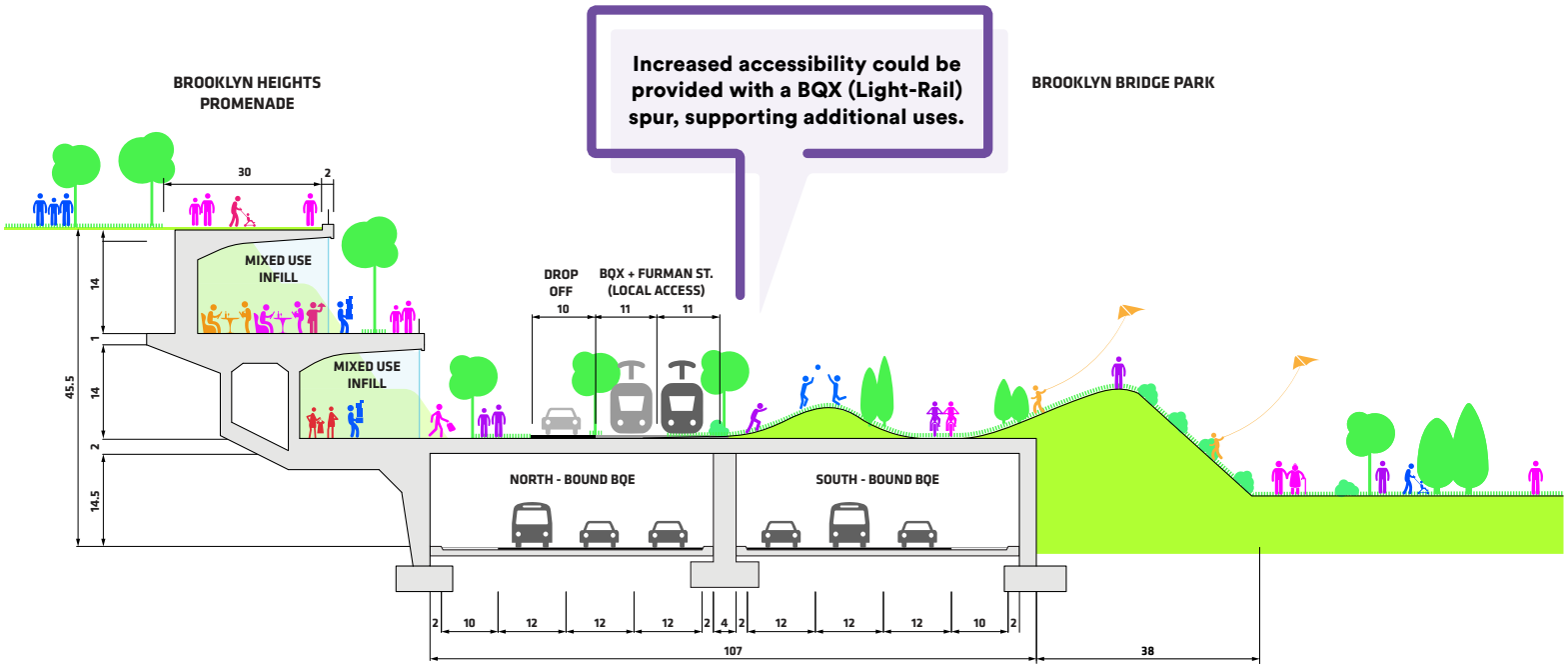
BQP - Phase 3 - Preserved Triple Cantilever



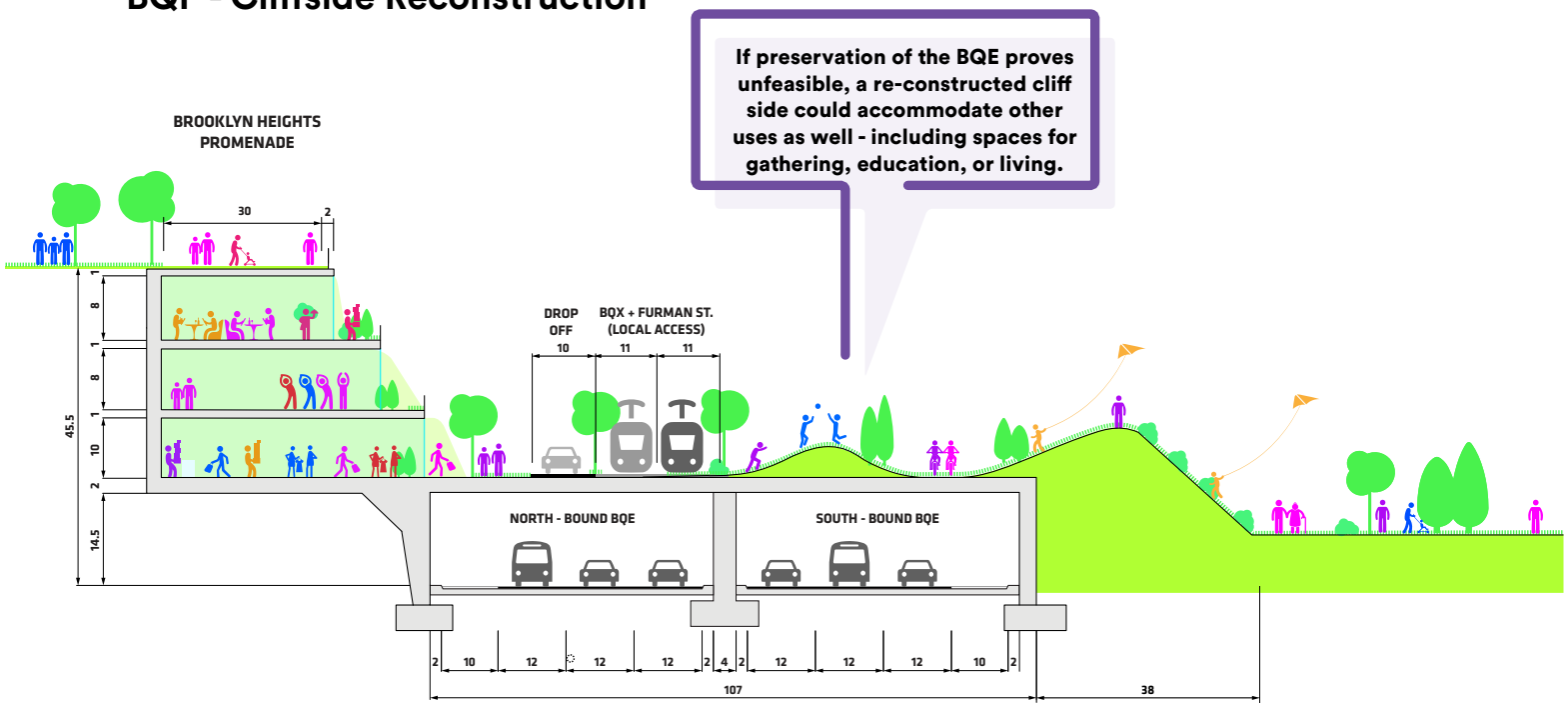
BQP - Preserved Triple Cantilever



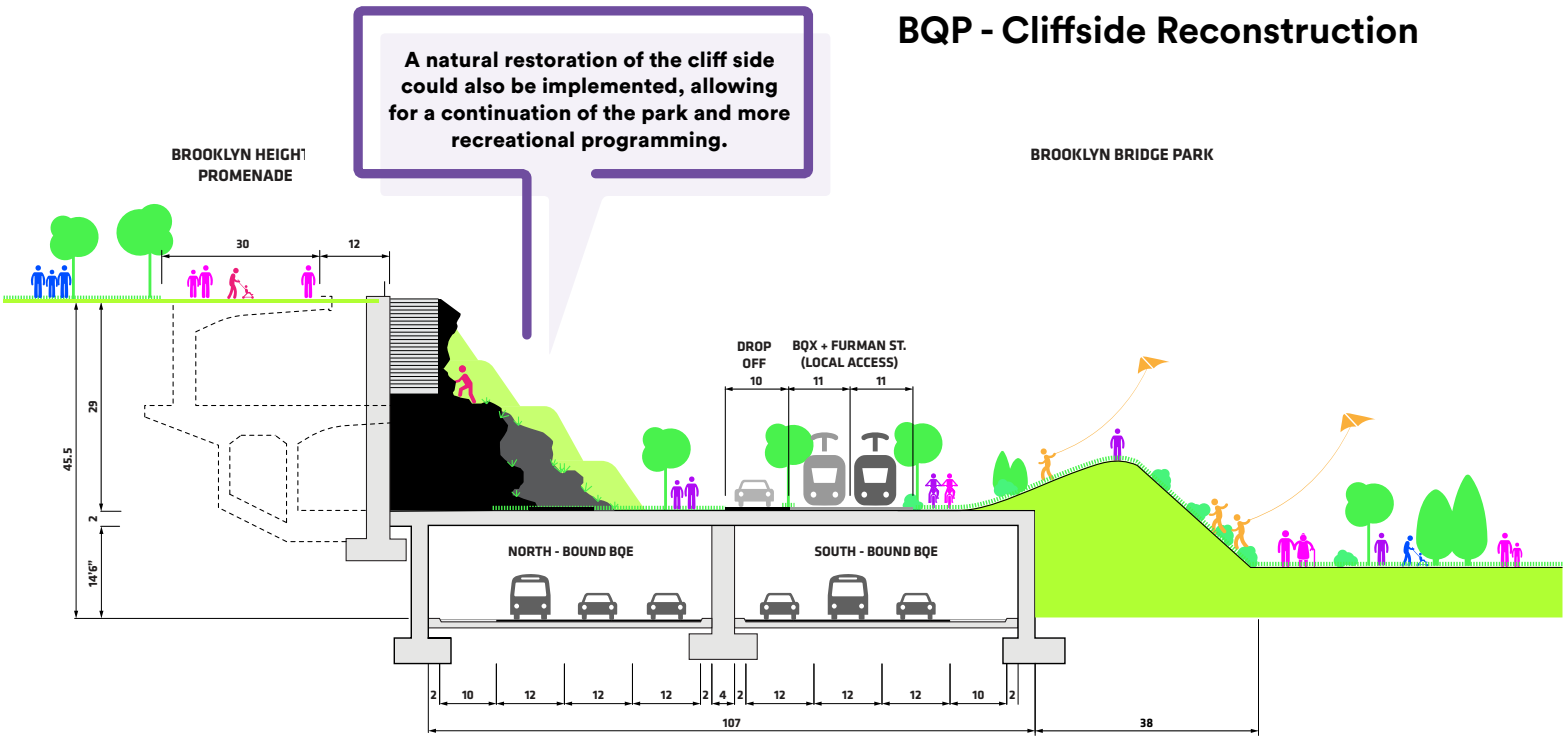
BQP - Preserved Triple Cantilever



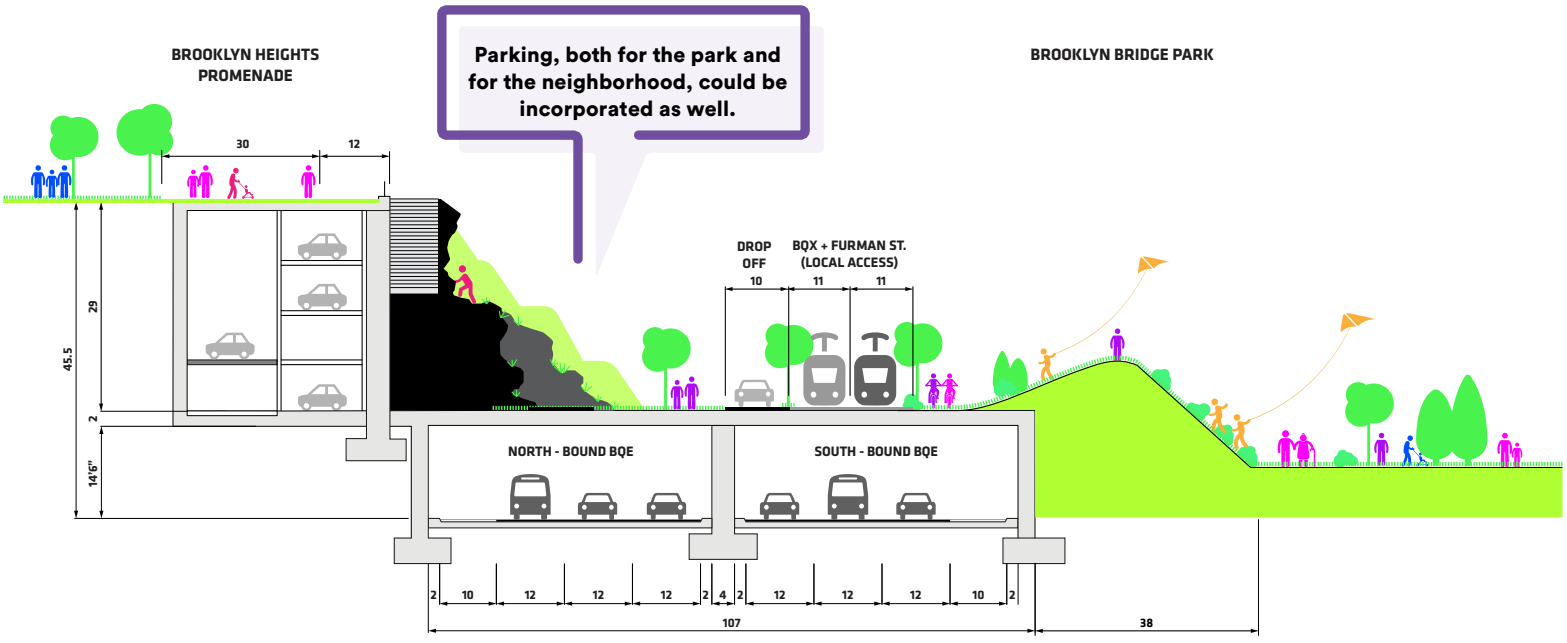
BQP - Cliffside Reconstruction



BQP - Cliffside Reconstruction



BQP - Cliffside Reconstruction



Toolkit

Rethinking the existing condition of the BQE cantilever presents a number of opportunities to add and enhance public space, add park and public amenities, improve access and connections, and add significant vegetation.

While the structure of the BQE triple-cantilever is failing, it may be sufficient to support lighter-weight programs in it's current condition or with targeted rehabilitation. The team has developed a toolkit of options that can replace the existing structure. Each option can be inserted for the entire length of the BQP or combined as needed or desired.

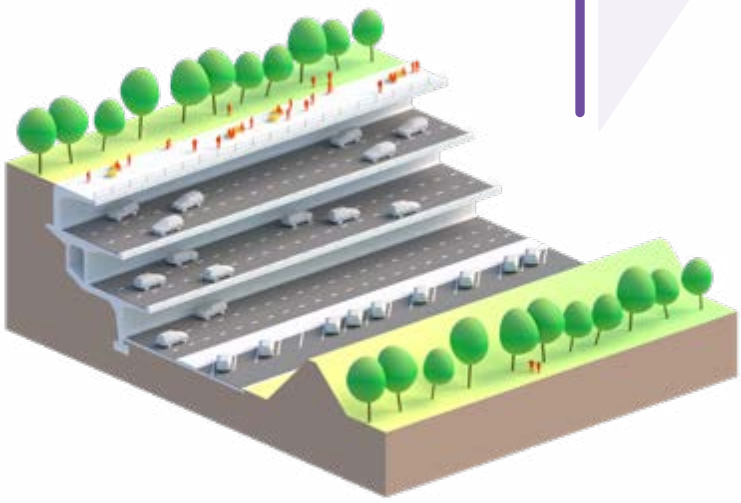
Option A reinforces the existing structure and layers park, public space, and light mixed use development onto the cantilever and roadway cap.

Option B's variations assume replacement of the cantilever structure, layering variously: mixed- use development, naturalistic park, or buried parking and naturalistic park.

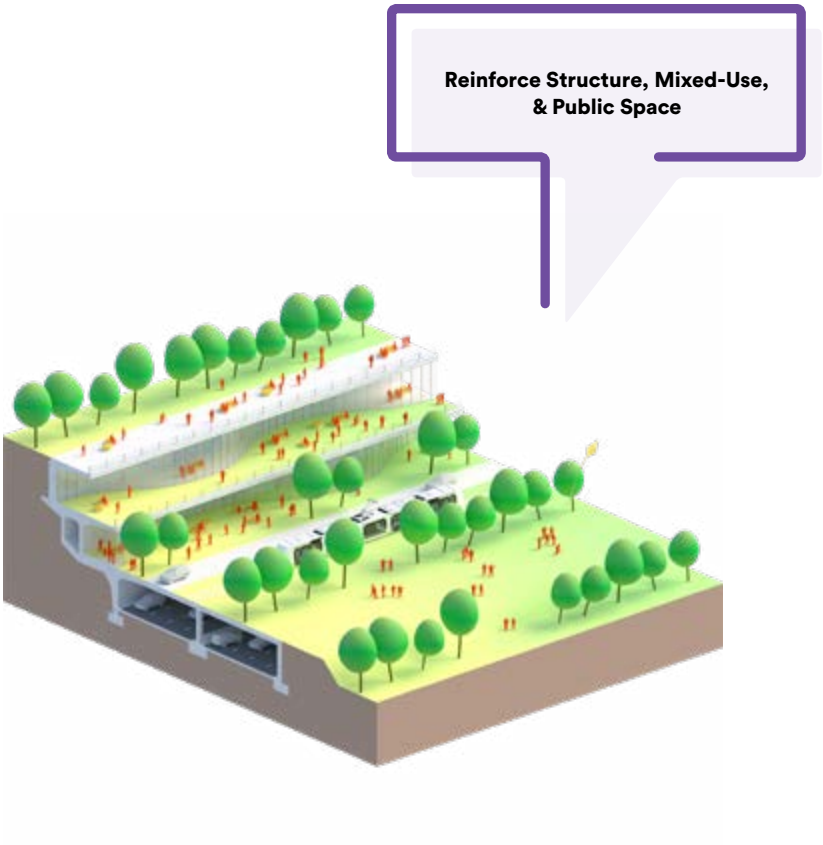
The ultimate design can mix and match these options and calibrate to meet the goals of the project.

Existing Conditions

BQE

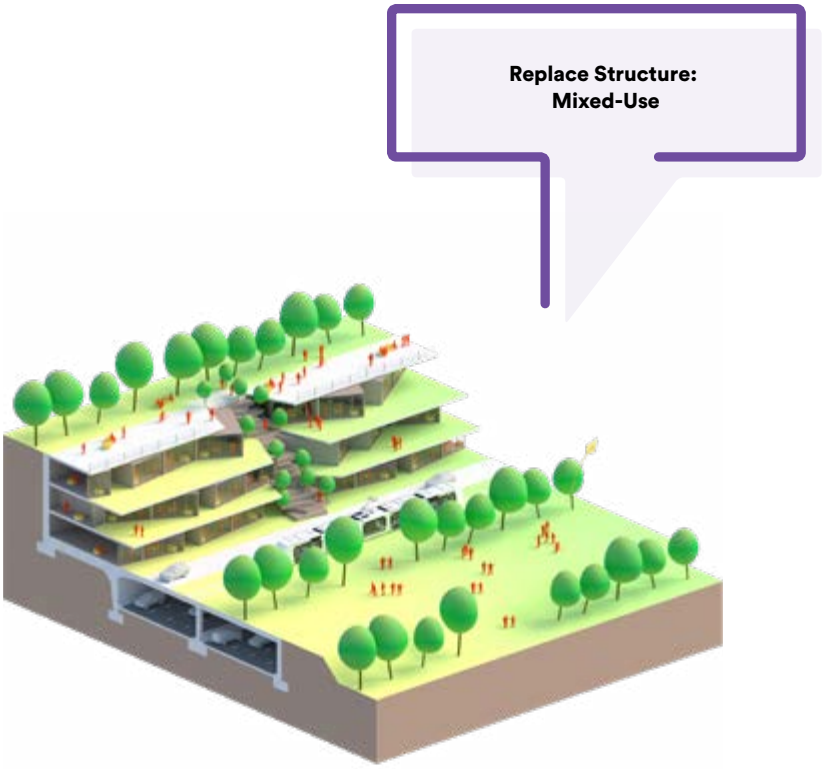


TRIPLE CANTILEVER STRUCTURE



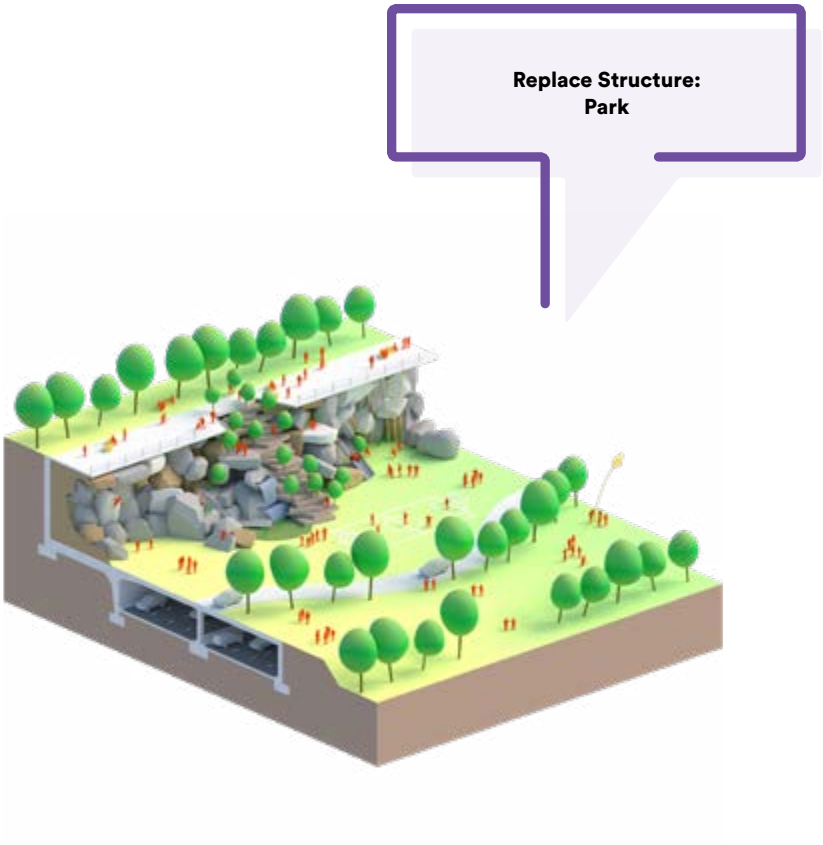
Option A

Option A reuses the existing cantilever structure (with reinforcement as necessary) to support pedestrians, vegetation, and small park amenity pavilions. The legibility of the iconic cantilever is preserved as a piece of the city's heritage. The roadway cap provides space for additional park and public space and a relocated Furman Street.



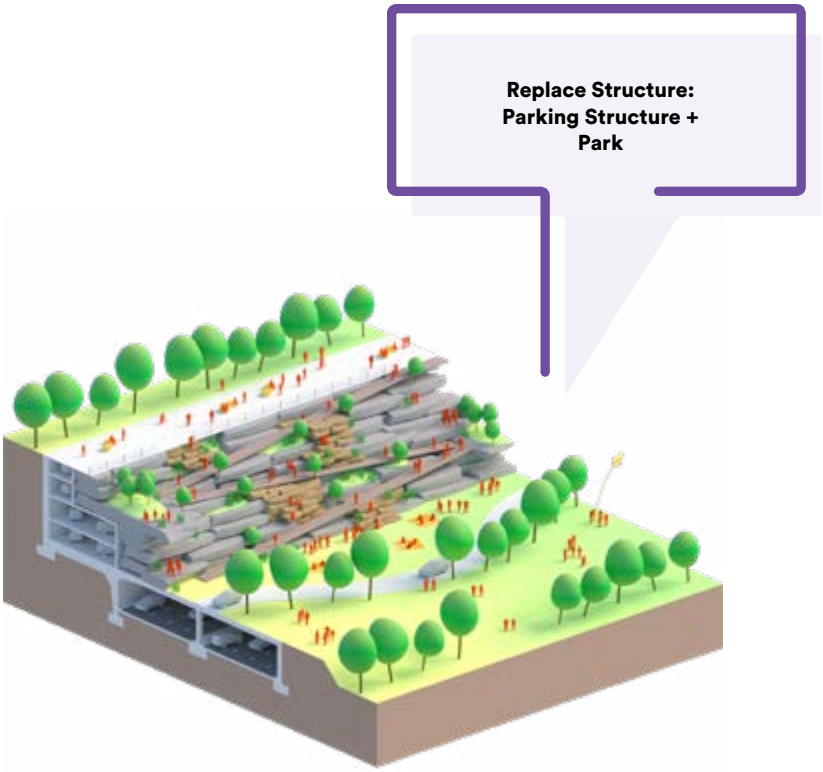
Option B1

Option B1 replaces the cantilever structure with a newly built structure that supports more intensive programming, amenities, and development that has the potential to generate revenue. The roadway cap provides space for additional park and public space and a relocated Furman Street, as well as a potential BQX (Light-Rail) or BRT (Bus Rapid Transit) corridor. Vertical connections are integrated for enhanced movement between the promenade and the park cap.



Option B2

Option B2 replaces the cantilever with a structure that maintains the Brooklyn Heights Promenade and supports a naturalistic park slope between the promenade and the roadway park cap. A naturalistic hillside provides a variety of programmatic and planting opportunities, such as rock climbing or play, as well as opportunities for a diverse planting palette. Rubble from the BQE cantilever is reused for the hillside and rocky scrambles provide connection between roadway cap and promenade.



Option B3

Recognizing that Brooklyn Heights has a deficit of parking spaces, and that some BBP parking along Furman St. will be displaced (30-40 spaces), Option B3 replaces the cantilever with a new structure that conceals an automated or traditional parking system under a naturalistic hillside. The hillside uses BQE cantilever rubble to accommodate rocky scrambles, planting, and lookouts. Gently sloping ramps connect the rebuilt promenade to the roadway park cap below.

Scenario 1 — Repair

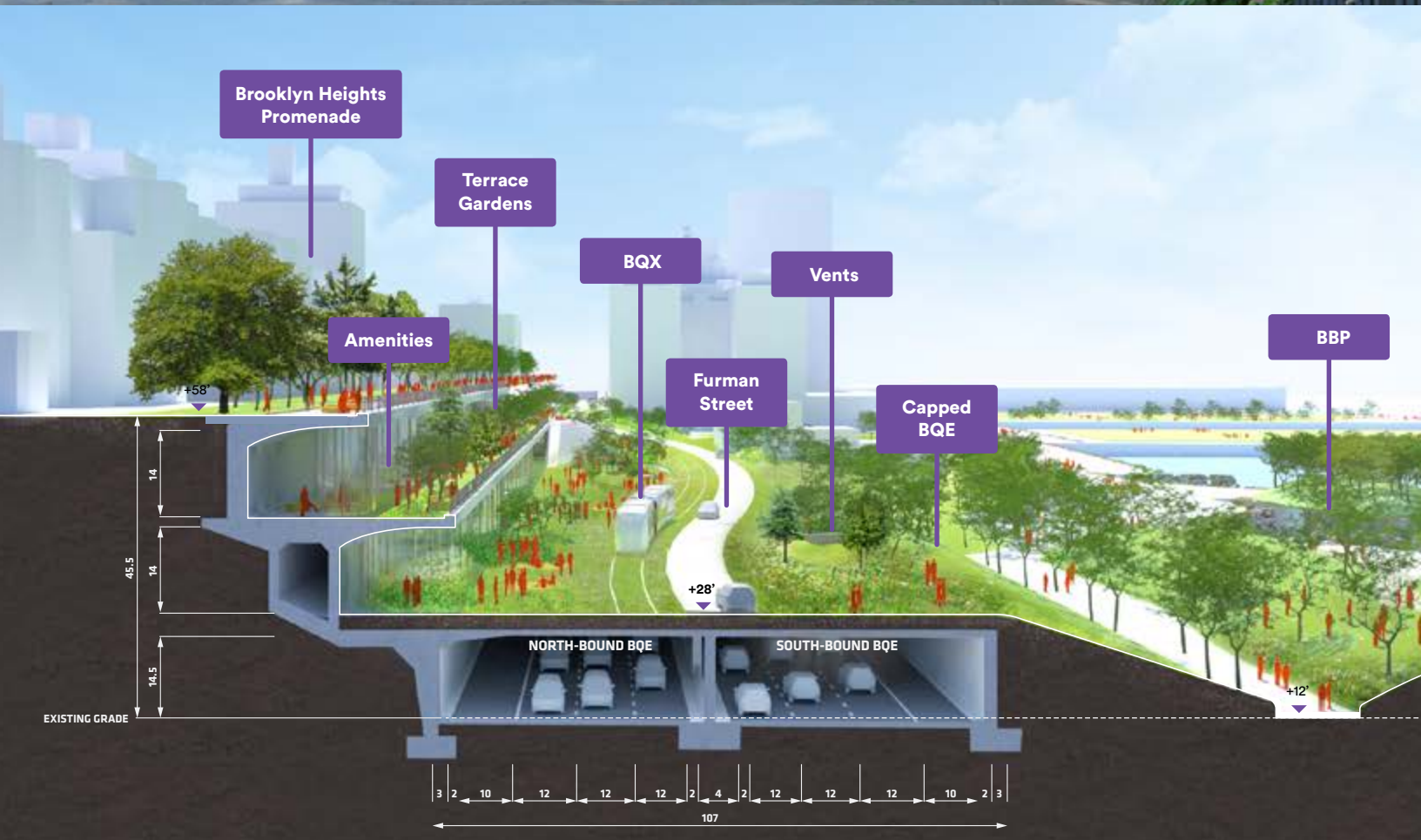
Scenario 1 preserves the iconic triple cantilever and piece of the city's heritage. As with both scenarios, it places the BQE at grade for the majority of its length - where Furman Street currently runs - and caps it with a simple prefabricated tunnel section that gets covered over by park. Brooklyn Bridge Park's current berms are partially demolished so that they slope up to the top of the BQE roadway cap, pulling public space from the waterfront all the way to the inside of what is now the south-bound BQE lane. Furman Street relocates to the top of the cap to continue to provide local access and enhance access to the park. The current north-bound BQE level is rehabilitated to become a series of terrace gardens supporting planting and small trees in a linear green park. Interlaced with the terrace gardens, new park amenities and public program fold into the cantilever structure. The roadway top presents an opportunity to integrate a transit corridor (BQX or BRT) along the waterfront. Vents every 500 feet exhaust roadway fumes and provide fresh air intake to the BQE. Vents are contained within vegetated slopes and surrounded by trees to cleanse the air they are venting.

As the roadway begins to slope up to meet the existing roadway grades as it passes under the Columbia Heights Bridge, its cap becomes a pedestrian connection from the Columbia Heights bridge down to the park, enhancing access to Brooklyn Bridge Park.

Toward Montague Street, a monumental stair connects the Brooklyn Heights Promenade with the terrace gardens and new park land below.

As the BQP continues south by the R Train Fan Plant, it begins to dive below grade such that the roadway cap is at the current grade of Furman Street by the time it reaches Joralemon Street. Furman Street and Joralemon Street continue to serve as access roads for Brooklyn Bridge Park and 360 Furman while the BQE roadway meets the depth of the Cobble Hill Trench.

PROMENADE, CURRENT CONDITION



PROPOSED SECTION, SCENARIO 1


Brooklyn Heights Promenade
Connection to Columbia Heights

SCENARIO 1 - REPAIR
AERIAL VIEW LOOKING SOUTH

Scenario 2 — Replace

Inspired by historical conditions in which a generous green embankment connected the Brooklyn waterfront to Brooklyn Heights, Scenario 2 replaces the cantilever structure in full to create a verdant hillside between the Brooklyn Heights Promenade and Brooklyn Bridge Park.

Similar to Scenario 1, Brooklyn Bridge Park's current berms slope up to the top of the BQE roadway cap, pulling public space from the waterfront toward Brooklyn Heights. Furman Street relocates to the top of the cap to continue to provide local access and enhance access to the park.

Given demand for parking in the area, Scenario 2 provides an opportunity to bury automated bays of parking between the reconstructed structure and the park slopes. The deconstruction of the BQE provides material for compacted fill to support the sloped park between the roadway cap and Promenade.

Accessible ramps weave across the slope, enhancing access between Brooklyn Bridge Park and Brooklyn Heights. Along these routes, lookouts and pavilions nestle into the slope, taking advantage of dramatic views of the East River and Upper Hudson Bay.

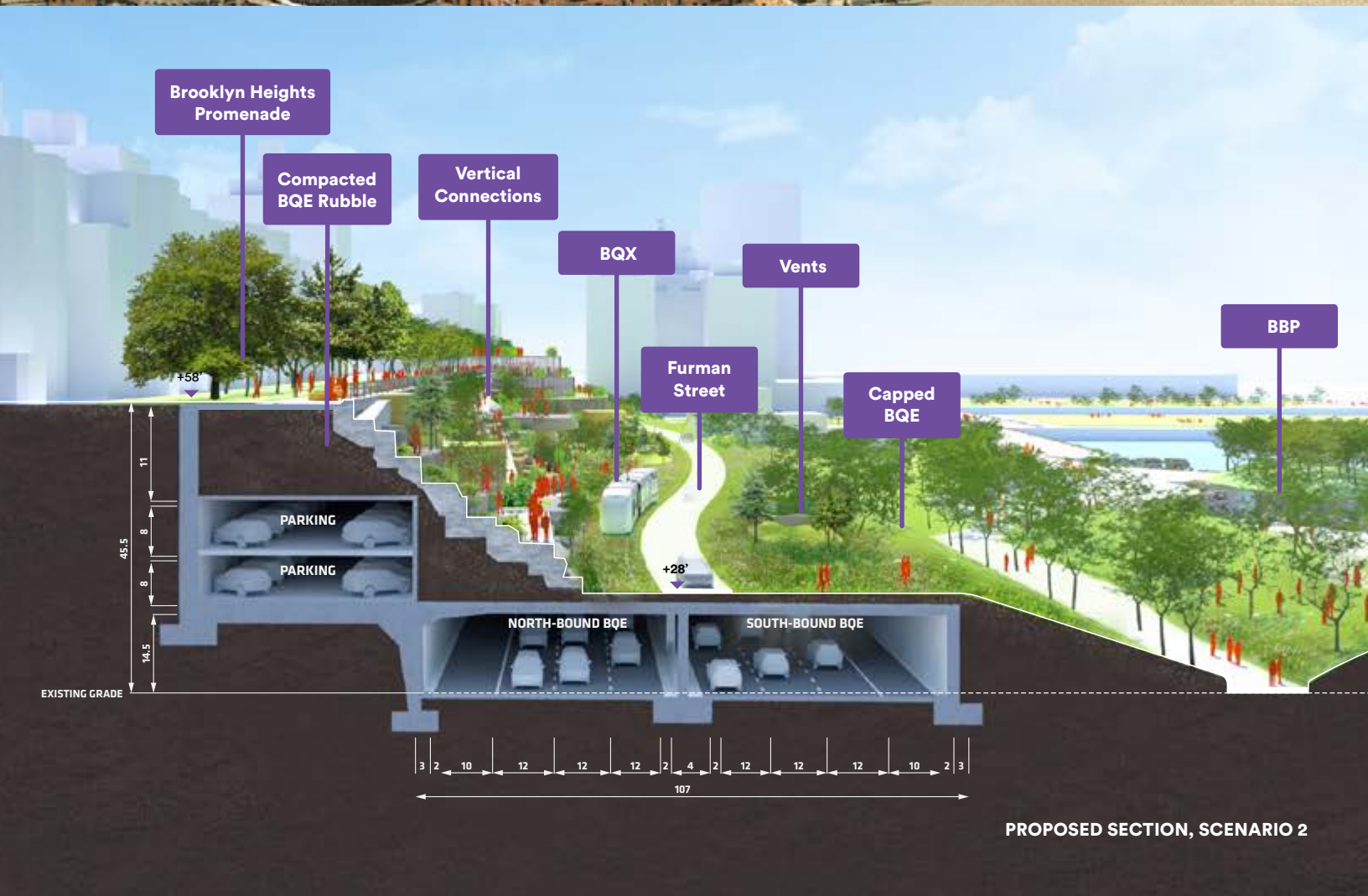
Around Clark Street and Montague Street, more intensive development provides opportunity for enhanced park amenities, community amenities, and revenue generating pavilions.

As the BQP continues south by the R Train Fan Plant, it begins to dive below grade such that the roadway cap is at the current grade of Furman Street by the time it reaches Joralemon Street. Furman Street and Joralemon Street continue to serve as access roads for Brooklyn Bridge Park and 360 Furman while the BQE roadway meets the depth of the Cobble Hill Trench.

Can we learn from the waterfront's past to shape its future?

Early Brooklyn heights was a seamless transition between nature and city - port operations demanded a strong relationship between the city and water.

BROOKLYN HEIGHTS, 1874



PROPOSED SECTION, SCENARIO 2


Brooklyn Heights Promenade
Connection to Columbia Heights

SCENARIO 2 - REPLACE
AERIAL VIEW LOOKING SOUTH

Phasing

The BQP concept assumes a similar or shortened timeline as compared to the DOT baseline proposal (a total construction length of 6-8 years).

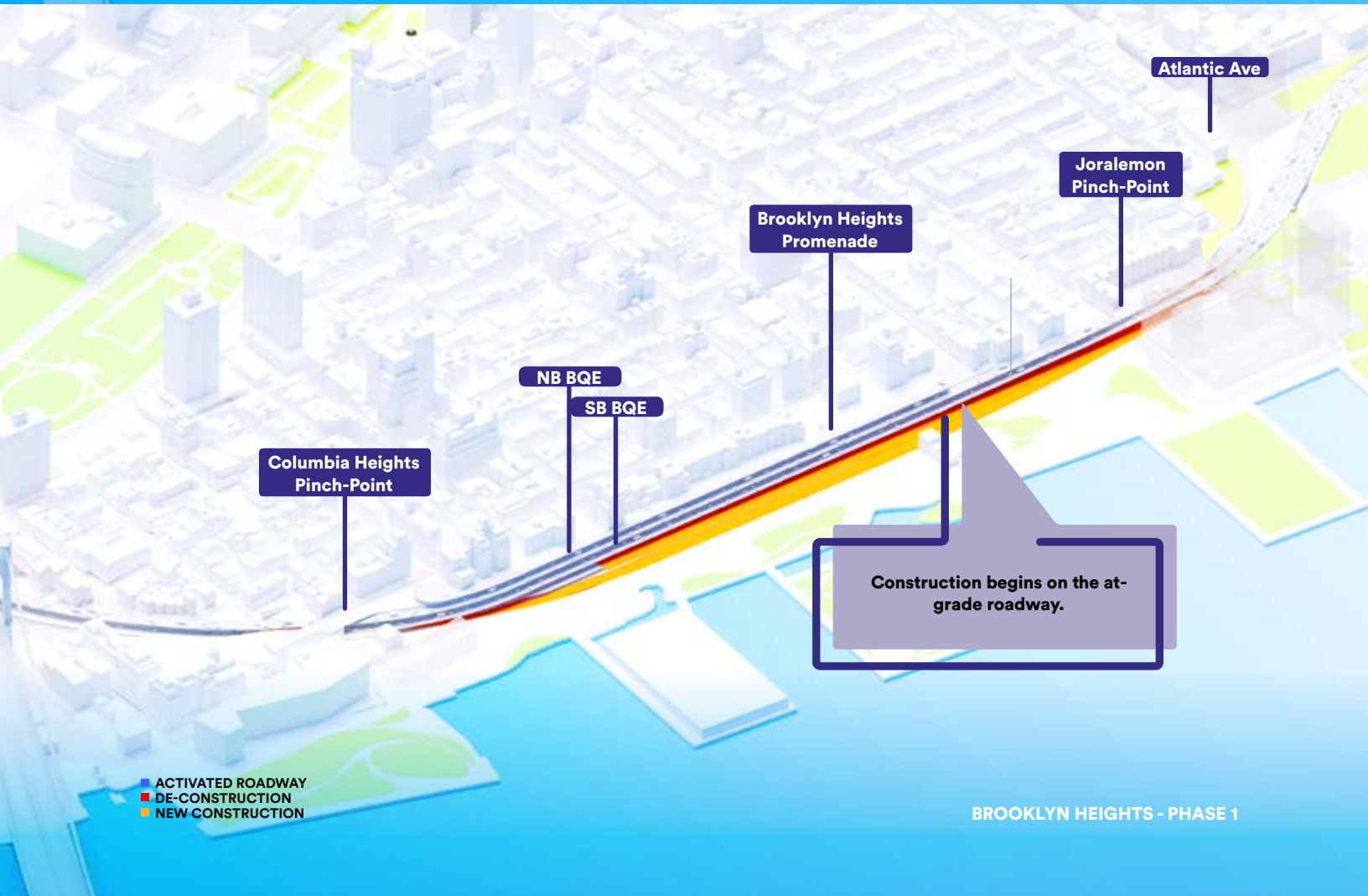
The first phase of the project constructs one-half of the future at-grade and trenched BQE while leaving the existing structure in place, so that traffic remains undisrupted for the first several years of work. Furman Street is rerouted and the at-grade roadway is constructed south of the Columbia Heights Pinch Point to Joralemon Street. Between Joralemon and Atlantic, the cut-and-cover trench is partially dug.

In the second phase, traffic is reduced to three lanes on the upper cantilever while the lower cantilever is decommissioned and deconstructed in phases. The cut-and-cover trench is expanded and partially extended to the Cobble Hill Trench. The south-bound roadway is reconstructed using the DOT lane-by-lane construction method at the Columbia Heights Pinch Point, and then connected to the at-grade roadway. At Atlantic Avenue, the south-bound roadway is trenched so that it meets the Cobble Hill Trench elevation.

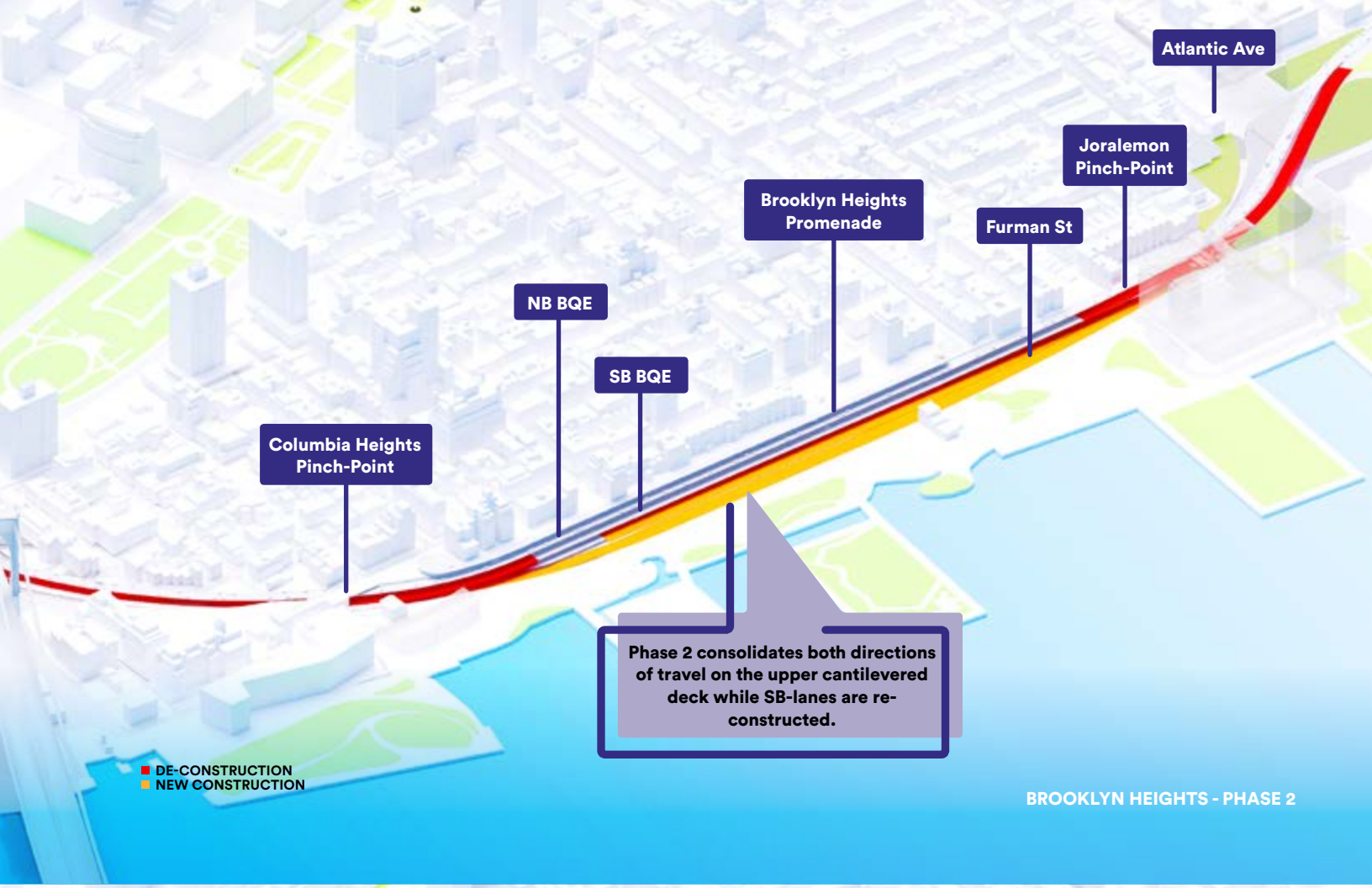
In the third phase, BQE traffic is rerouted to the newly constructed at-grade and trenched roadways while portions of the upper cantilever are deconstructed. The north-bound roadway at the Columbia Heights Pinch Point is reconstructed using the DOT lane-by-lane method and connected to the at-grade roadway. The north-bound roadway is trenched at Atlantic Avenue to meet the Cobble Hill Trench.

In the final phase, traffic resumes at full capacity in both directions as the roadway is deck system, and cap are all completed.

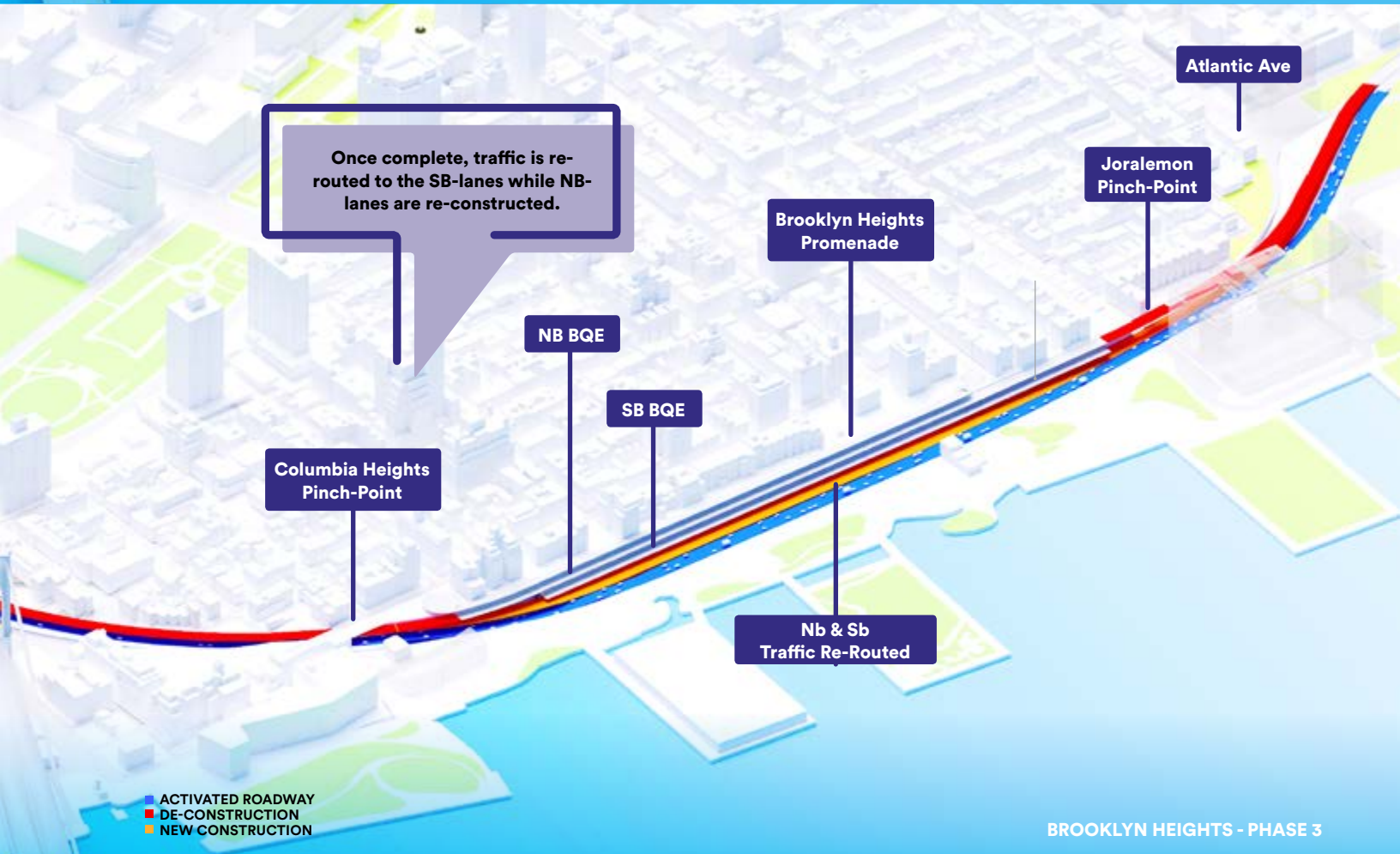
EXISTING CONDITIONS



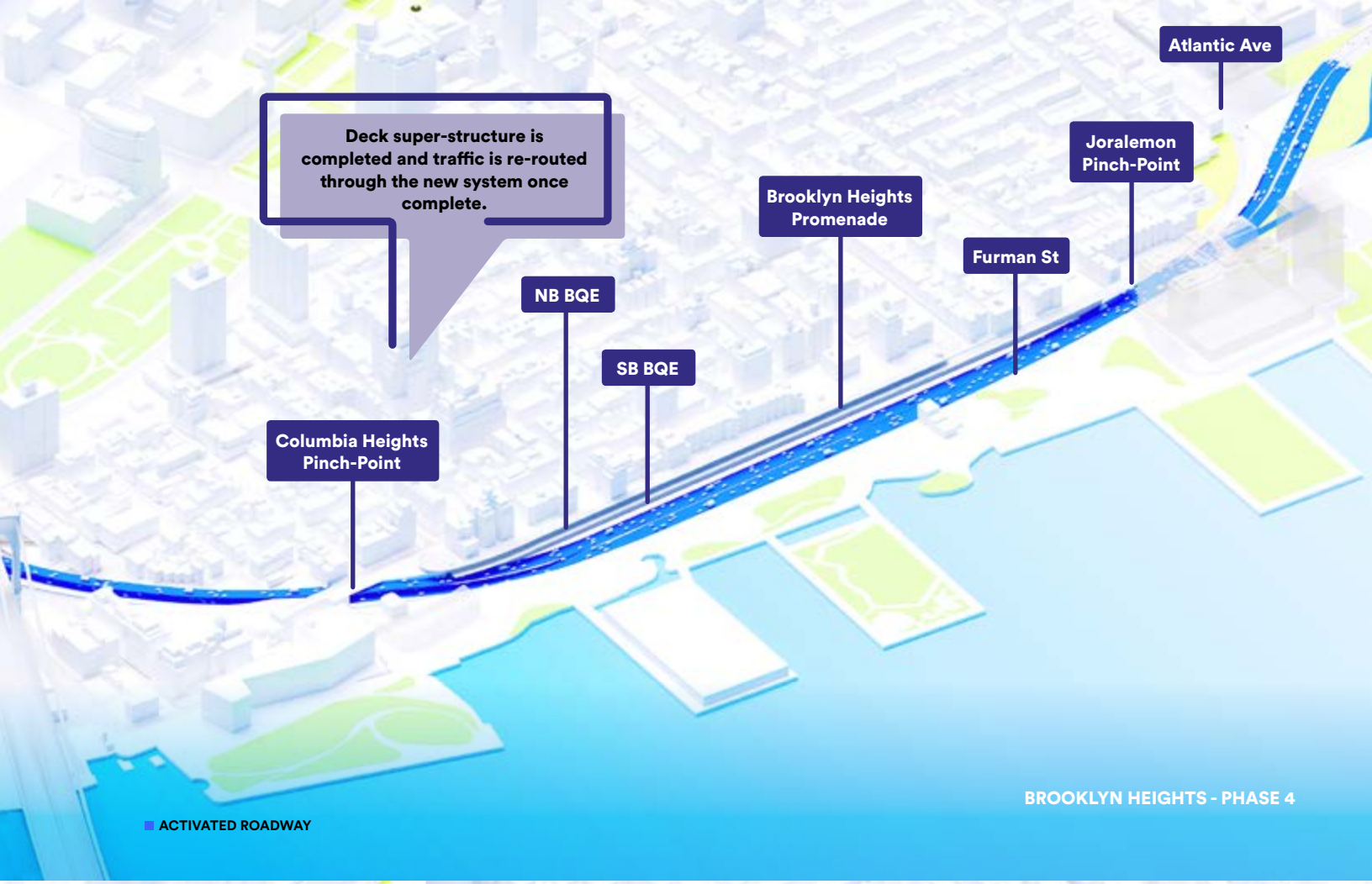
BROOKLYN HEIGHTS - PHASE 1



BROOKLYN HEIGHTS - PHASE 2



BROOKLYN HEIGHTS - PHASE 3



BROOKLYN HEIGHTS - PHASE 4

BROOKLYN HEIGHTS - BQE CAPPED WITH PARK

Outreach

The conception of any social infrastructure project should involve extensive outreach, both to inform and be informed by the wide range of parties who hold stake in the final result. After conceiving of the basic technical approach for the BQP concept, the team undertook 6 months of outreach to gauge consensus for the concept and incorporate improvements to the idea. 50+ meetings, briefings, and public presentations have been held as of December 2019. Outreach suggests that there is broad consensus around the BQP concept, due to its urban benefits, minimization of disruption to the neighborhood, and promising constructability and cost implications. Questions and concerns have revolved primarily around impacts to existing properties and facilities, solutions to which are addressed in the Planning Constraints chapter of this report and summary on page 6-7. In particular, concerns around impacts to 360 Furman St. were extensive, and led to an update of the proposal to introduce a cut-and-cover trench, rather than elevated deck, from Joralemon St. to Atlantic Avenue. In the future, continued outreach should be undertaken to determine programming and other details of the scheme.

To date, the proposal has been informed by outreach to:

City
NYC Department of Transportation
NYC Dept. of Environmental Protection

State
Metropolitan Transit Authority NYCT

Elected Officials
Brooklyn Borough President Eric L. Adams
City Councilmember Stephen T. Levin
Office of City Council Speaker Corey Johnson
Office of City Comptroller Scott M. Stringer
Office of US Congresswoman Nydia Velazquez
Office of State Senator Brian Kavanaugh
Office of State Assemblywoman Jo Anne Simon

Community
A Better Way
Brooklyn Heights Association
Cobble Hill Association
Montague Street BID
Downtown Brooklyn Partnership
DUMBO Improvement District
360 Furman St. Board
360 Furman St. Residents
Cadman Towers

Brooklyn Bridge Park
Brooklyn Bridge Park Corporation
Brooklyn Bridge Park Conservancy Board
Brooklyn Bridge Park Development Corporation

Non-Profit
Regional Plan Association
American Institute of Architects
Real Estate Board of New York
NY Landmarks Conservancy
Historic Districts Council
Brooklyn Community Foundation
Municipal Arts Society


BQE → BQP


BROOKLYN

Equity

The Brooklyn Bridge Park waterfront is a borough and city-wide resource. What happens here will impact millions of annual visitors and residents across all incomes, backgrounds, and age groups. These visitors partake in the views to New York harbor, in passive and active recreation, and the rich programming and events of the park. The park welcomes 330,000+ summer visitors every week, and between 200,000 and 300,000 participate in the extensive programs throughout the year.

Our team believes that rebuilding the BQE in a better way will not function as a luxury for one community. Rather, it will improve and add parkland for it's considerable city-wide usershed, improve health outcomes for all those around it, and serve as a model for future aging infrastructure aross New York City's five boroughs.

By helping to link the waterfront along it's north-south vector, it will additionally strengthen the emerging live-work corridor along the East River, providing better access to residents across a variety of neighborhoods, and help to support a growing Brooklyn economy.

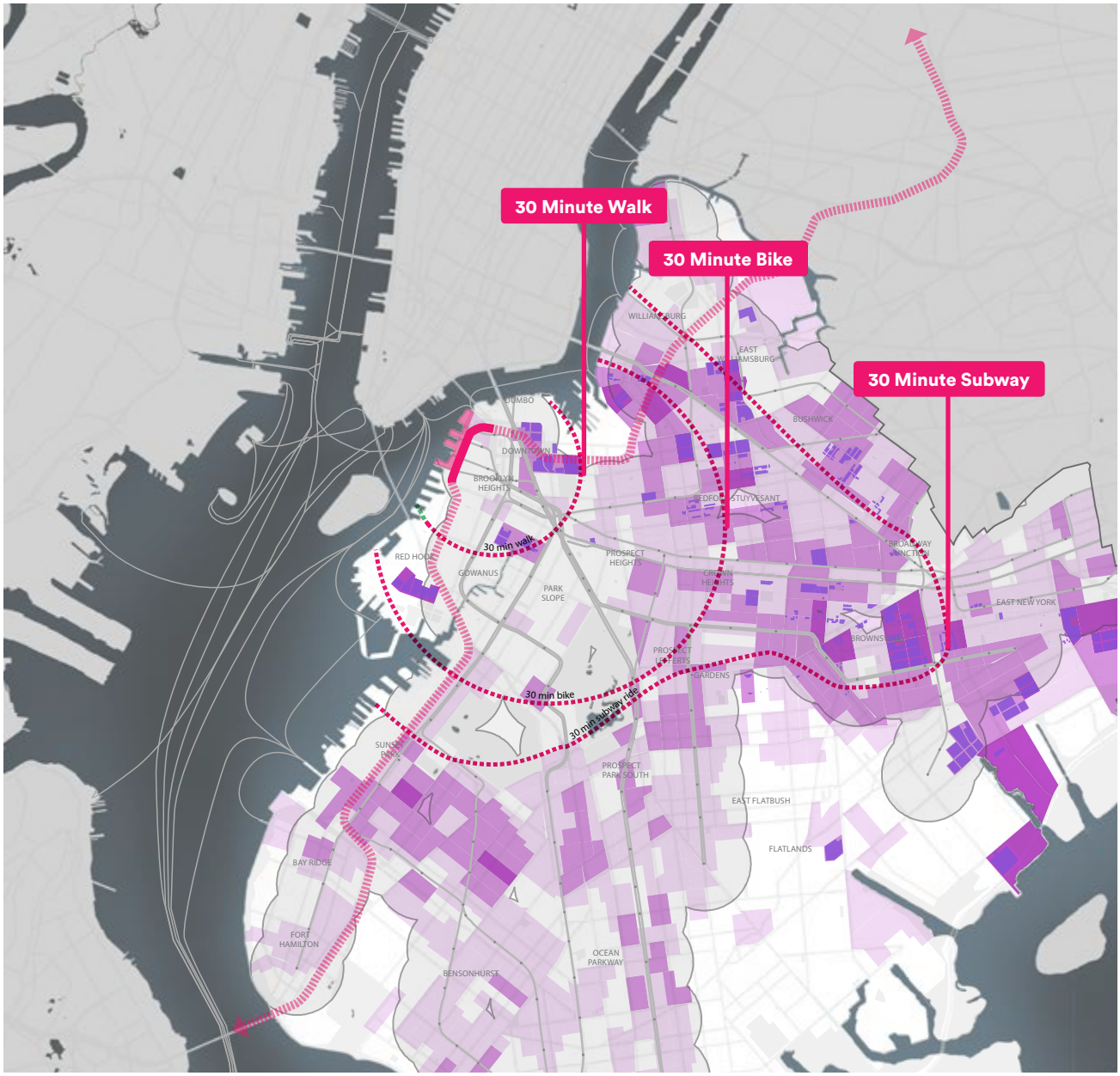
Over time, a corridor-wide study should determine future needs for rehabilitation or replacement along the BQE, and identify continued opportunities for equitable urban improvments along the BK waterfront.








PARK



NYCHA HOUSING

HOUSEHOLDS BELOW THE POVERTY LEVEL

- 150-350
- 350-700
- 700-2,000

SUBWAY STATION ACCESS

- Within 1/2 of a station

A Waterfront Serving All of Brooklyn

Brooklyn Bridge Park and the BQP are readily accessible by a wide range of Brooklynites on foot, bicycle, or via public transit. Park users come from many different neighborhoods and have a wide range of income levels. The BQP would enhance access to this waterfront for visitors from across the city.

JOBS WITH ANNUAL INCOME > $40,000

- 80-350
- 350-1,100
- 1,100-3,500
- INDUSTRIAL BUSINESS ZONE

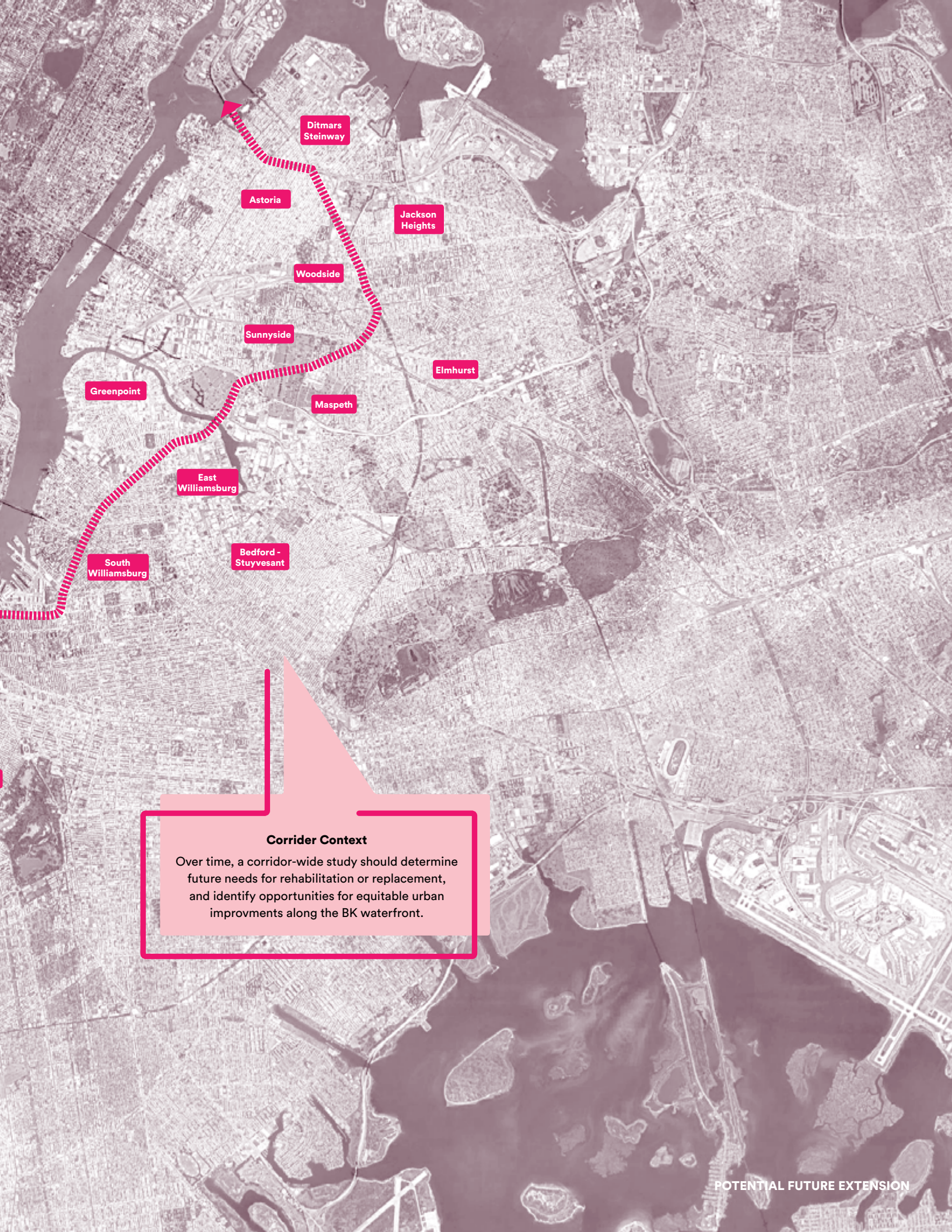
SUBWAY STATION ACCESS

- Within 1/2 of a station

A Live-Work Corridor

The BQE sits along an important corridor of neighborhoods that not only house many residents but also host high-paying jobs. The BQP would strengthen this corridor and enhance connections between residents and high-quality employers.

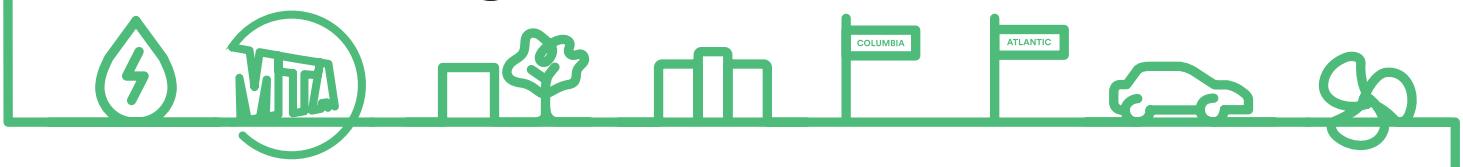

BQP
17.4 MILES
Vinegar Hill
Brooklyn Heights
Downtown Brooklyn
Boerum Hill
Carroll Gardens
Gowanus
Red Hook
Park Slope
South Slope
Greenwood Heights
Sunset Park
Borough Park
Bay Ridge
Dyker Heights
Fort Hamilton



Corrider Context

Over time, a corridor-wide study should determine future needs for rehabilitation or replacement, and identify opportunities for equitable urban improvments along the BK waterfront.

Planning Constraints



Any infrastructure project confronts a number of planning constraints. Large-scale projects weave their way through the territory of multiple city agencies, landowners, and stakeholders.

The BQP concept encounters similar constraints to any proposal that will repair or replace the BQE in this area. Each of these constraints is readily addressable within the context of a multi-billion dollar roadway project, and the team's studies suggest that none encountered are too complex or costly to outweigh the benefits of and other savings found with the scheme. Planning constraints, with high-level solutions and associated costs, have been developed in conversation with facility owners and experts, and are outlined in the following pages.

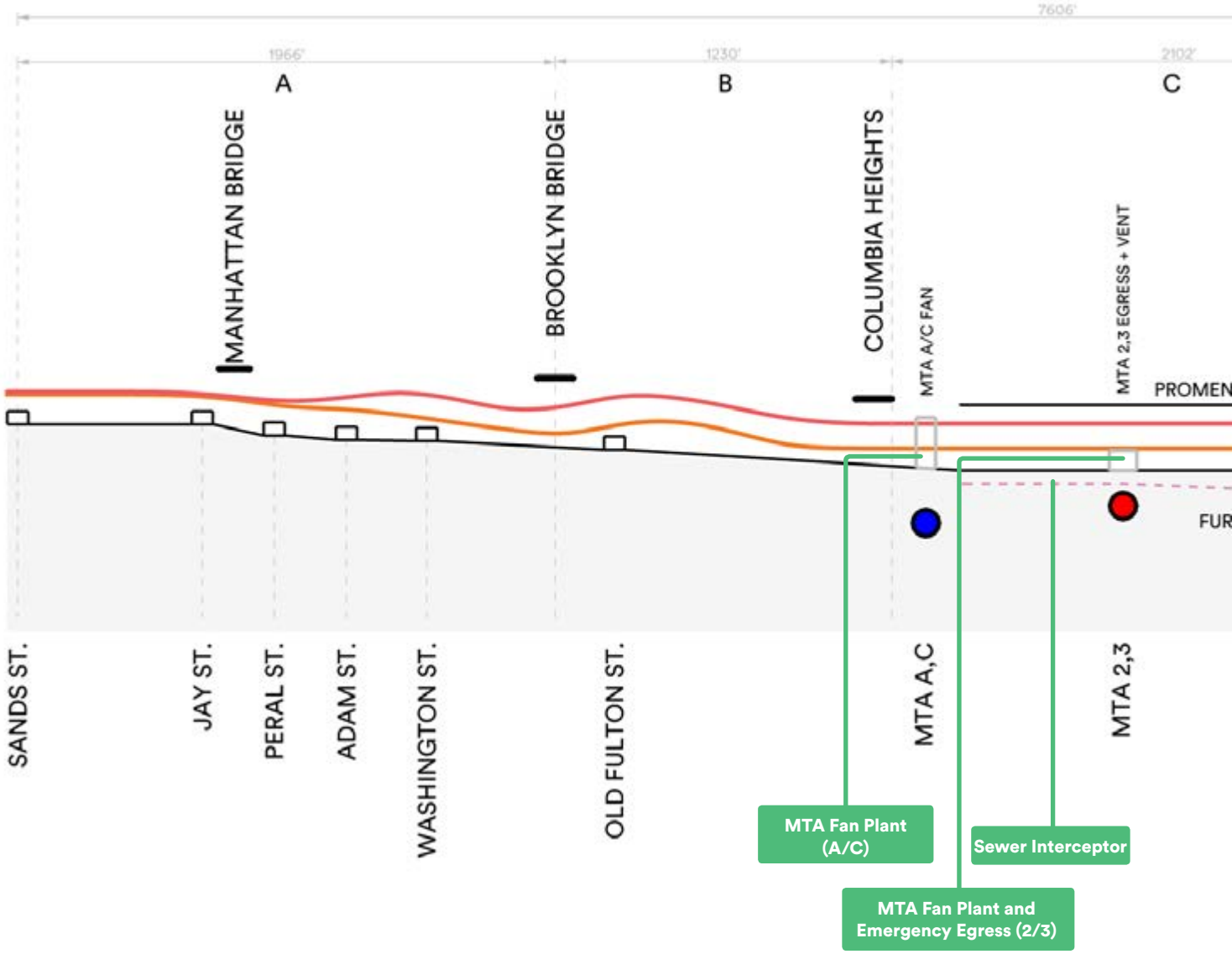
These include:

TRIPLE CANTILEVER CONSTRUCTION , 1947

Planning Constraints

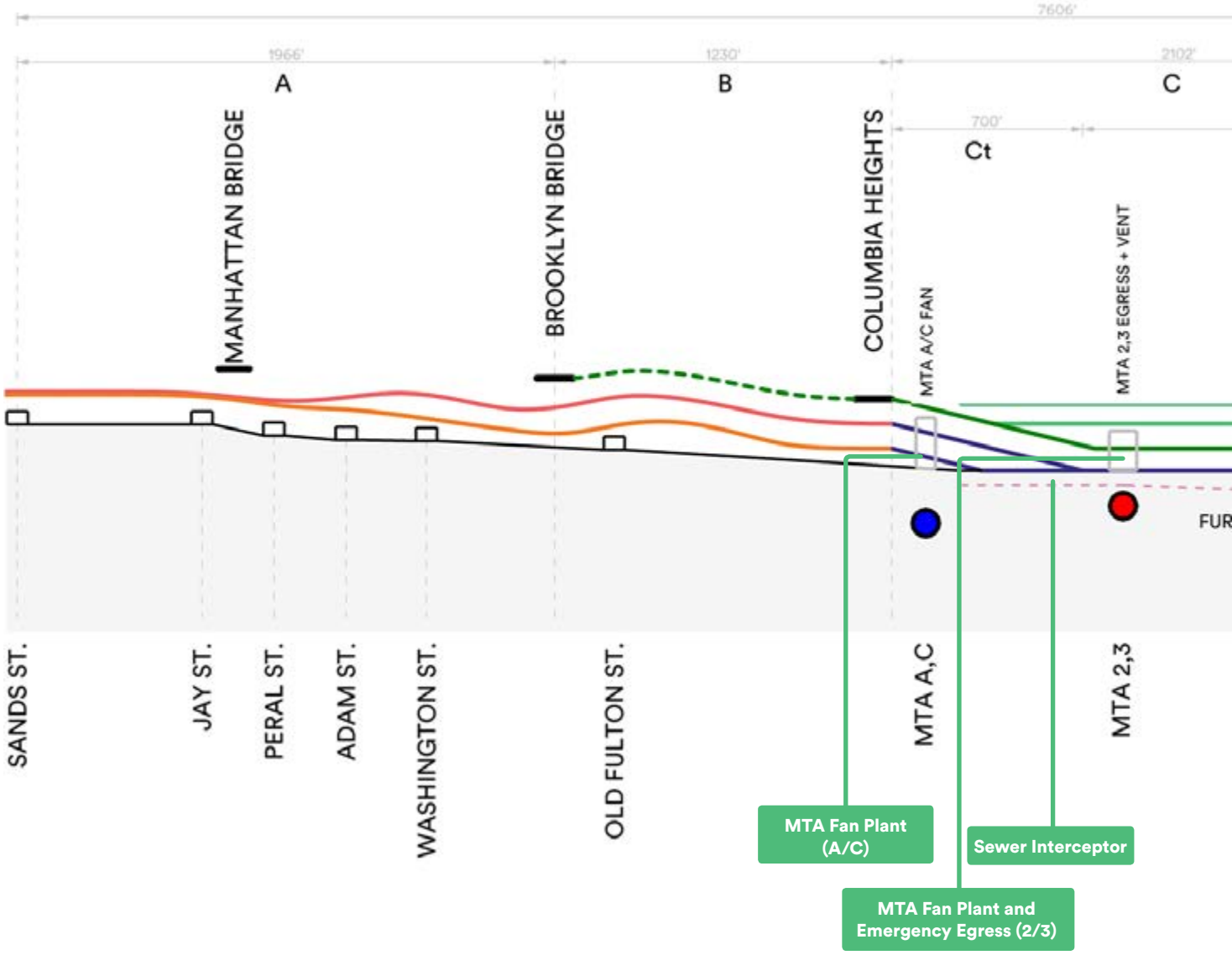

Smith St
Court St
Clinton St
Henry St
Hicks St
Columbia St
R
4
5
MONTAGUE ST
Remsen St
JORALEMON ST
Slate St
ATLANTIC AVE
Atlantic Ave
Van Voorhees Playground
SEWER INTERCEPTOR
Port of NY Authority
BBQ HQ
Pier 5
Pier 6
Fan Plant (R)
BQP M&O Area
360 Furman St.
N
0'
100'
200'
400'
800'

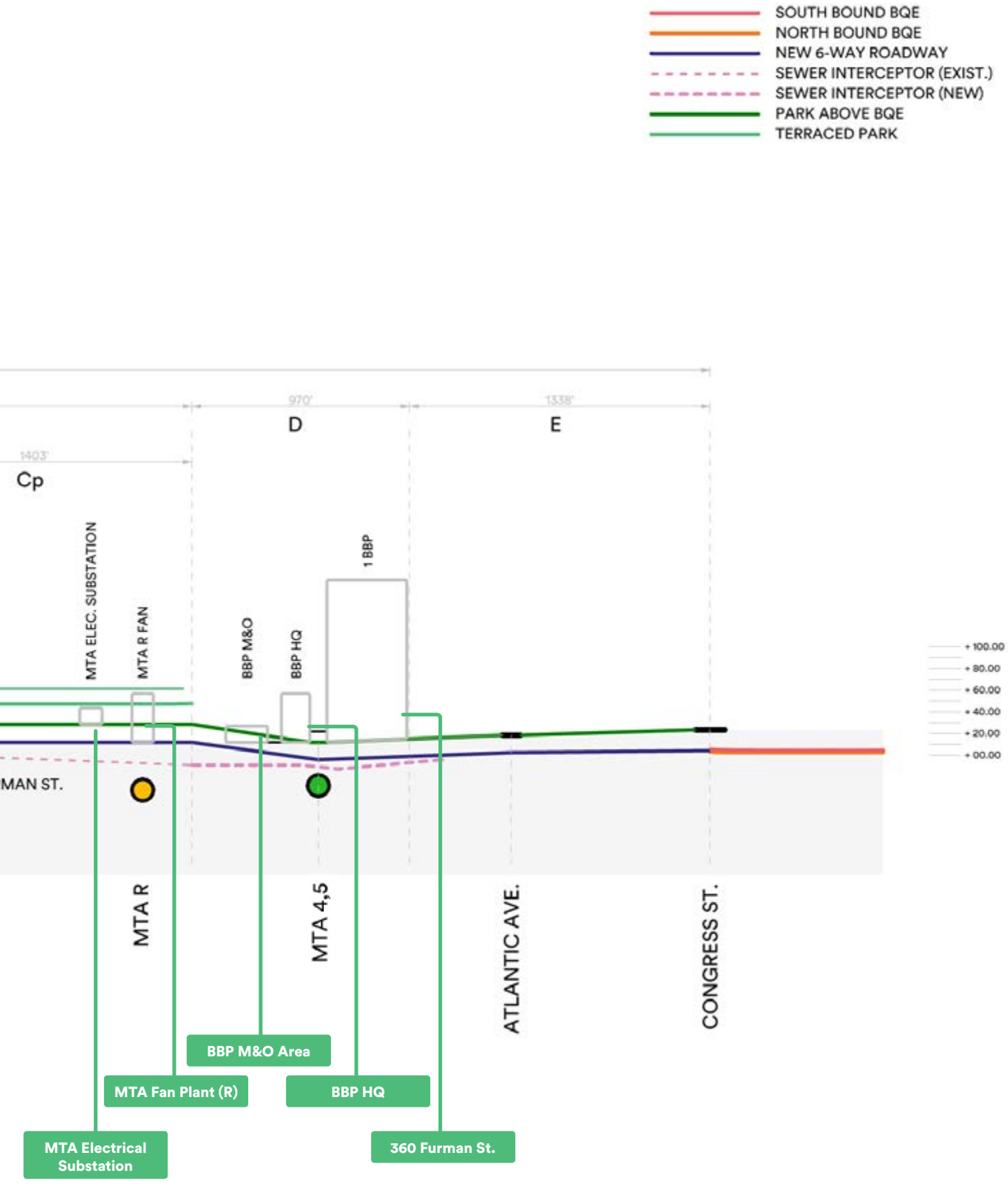
Existing BQE Profile




SOUTH BOUND BQE
NORTH BOUND BQE
SEWER INTERCEPTOR
970'
1338'
D
E
MTA ELEC. SUBSTATION
MTA R FAN
BBP M&O
BBP HQ
1 BBP
+ 100.00
+ 80.00
+ 60.00
+ 40.00
+ 20.00
+ 00.00
MTA R
MTA 4,5
ATLANTIC AVE.
CONGRESS ST.
BBP M&O Area
MTA Fan Plant (R)
BBP HQ
MTA Electrical Substation
360 Furman St.

Proposed BQE Profile




SOUTH BOUND BQE
NORTH BOUND BQE
NEW 6-WAY ROADWAY
SEWER INTERCEPTOR (EXIST.)
SEWER INTERCEPTOR (NEW)
PARK ABOVE BQE
TERRACED PARK
970'
1338'
D
E
1403'
Cp
MTA ELEC. SUBSTATION
MTA R FAN
BBP M&O
BBP HQ
1 BBP
+ 100.00
+ 80.00
+ 60.00
+ 40.00
+ 20.00
+ 00.00
MAN ST.
MTA R
MTA 4,5
ATLANTIC AVE.
CONGRESS ST.
BBP M&O Area
MTA Fan Plant (R)
BBP HQ
MTA Electrical Substation
360 Furman St.

Brooklyn Bridge Park (BBP➡BQP)

Brooklyn Bridge Park is a 60 acre, world-class park that opens up Brooklyn's former working waterfront to parkgoers from all over the city and visitors from all over the world.

Given the current configuration of the highway as it passes through this area, the park was designed to include a series of sound-attenuating berms along it's eastern edge, a creative solution to mitigate the impacts of the exposed highway.

If an at-grade, capped roadway is introduced along the Furman St. corridor, these berms would no longer be as critical for the park, and could be converted to lower slopes providing access to the park deck.

The BQP would not only add 8 or more acres of usable new parkland to the waterfront, but also add new access and enhance existing access points. At the northern end, park users could access the park through the Columbia Heights Bridge via new pathways on top of the roadway cap. Across the length of the cantilever, terraced gardens would provide additional access points and space for new park amenities along a spectacular vertical escarpment.

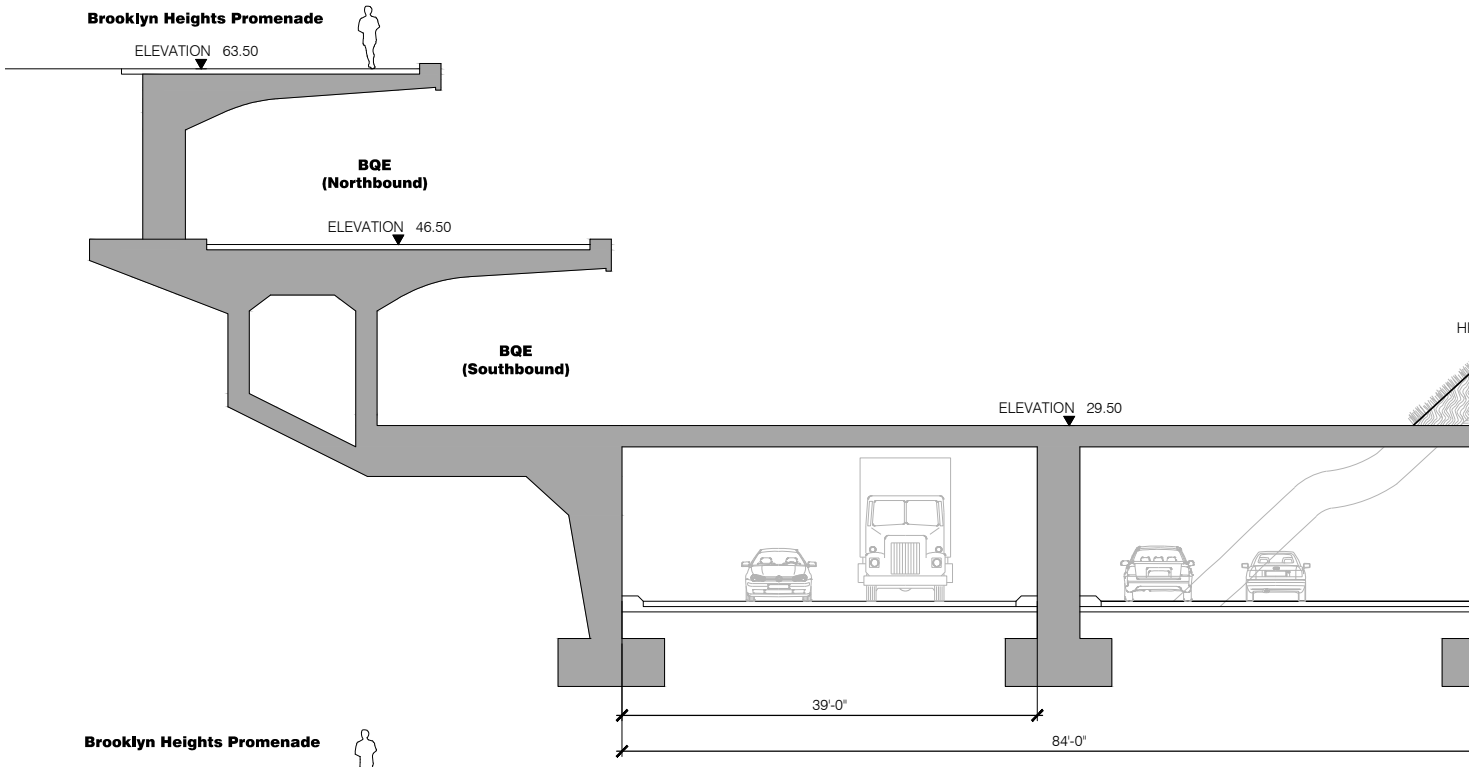
In total 1 acre (1.6%) of the existing 60 acre park would require regrading in order to accommodate the scheme.

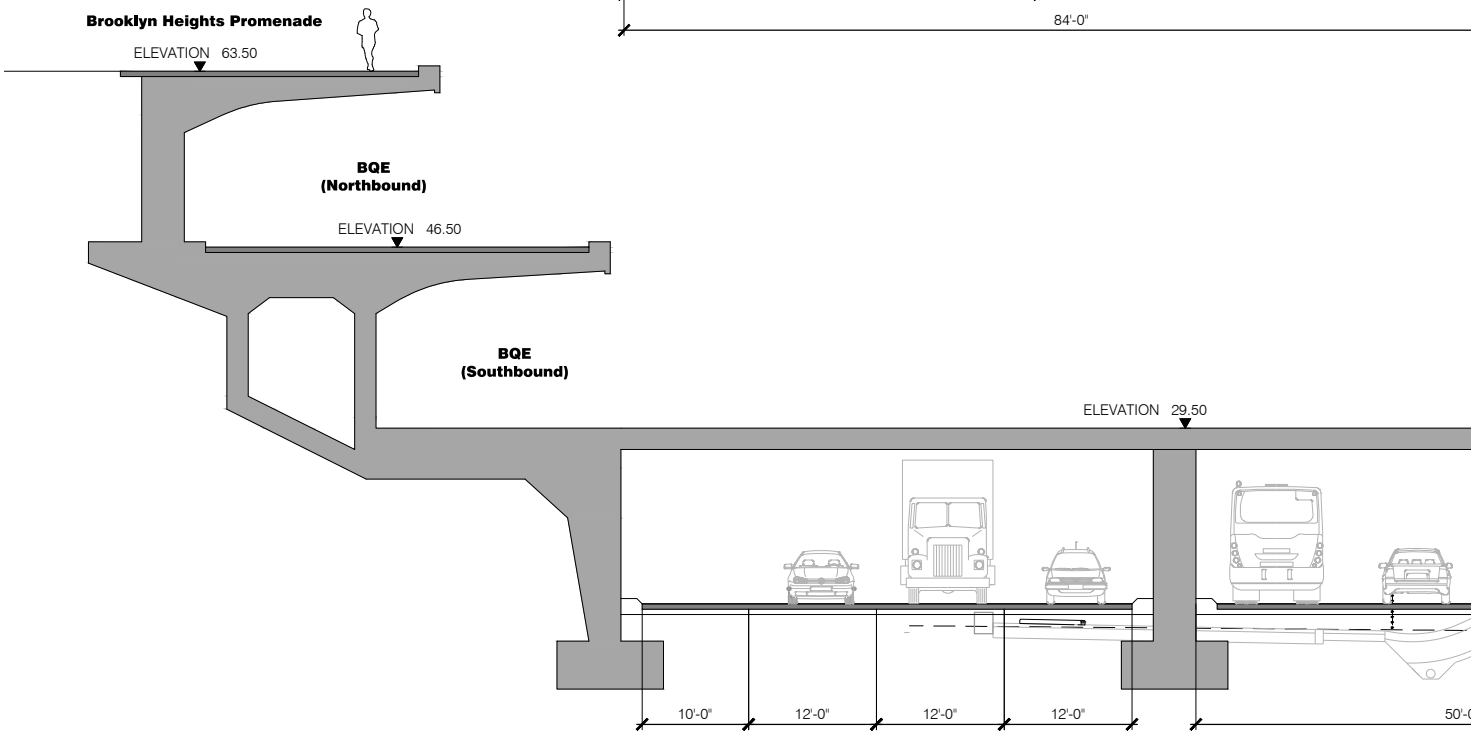
Governance of new parkland should ideally be absorbed by Brooklyn Bridge Park, which would require an amendment to its General Plan.

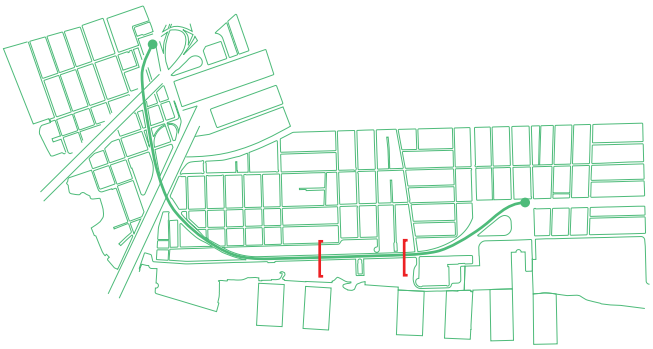
A series of images on page 64-69 illustrate the transformative potential of the BQP scheme for Brookyln Bridge Park.

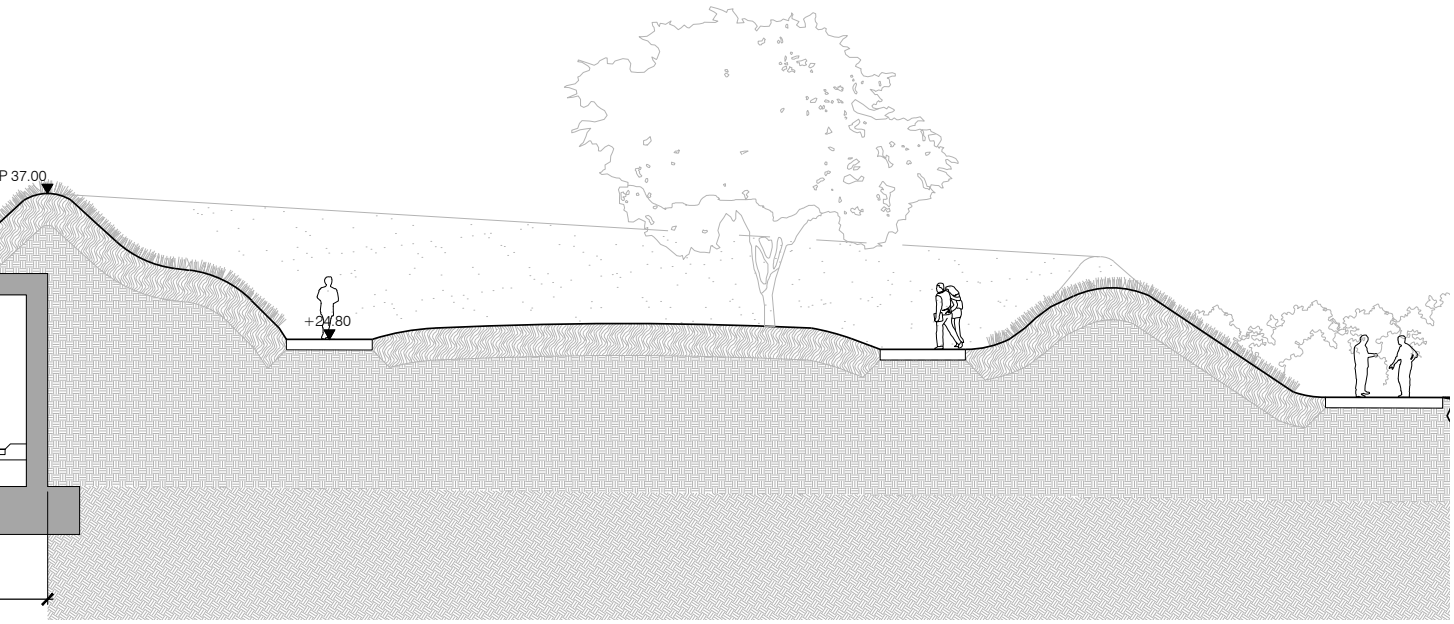
TEMPORARY CONSTRUCTION BOUNDARY AT BBP

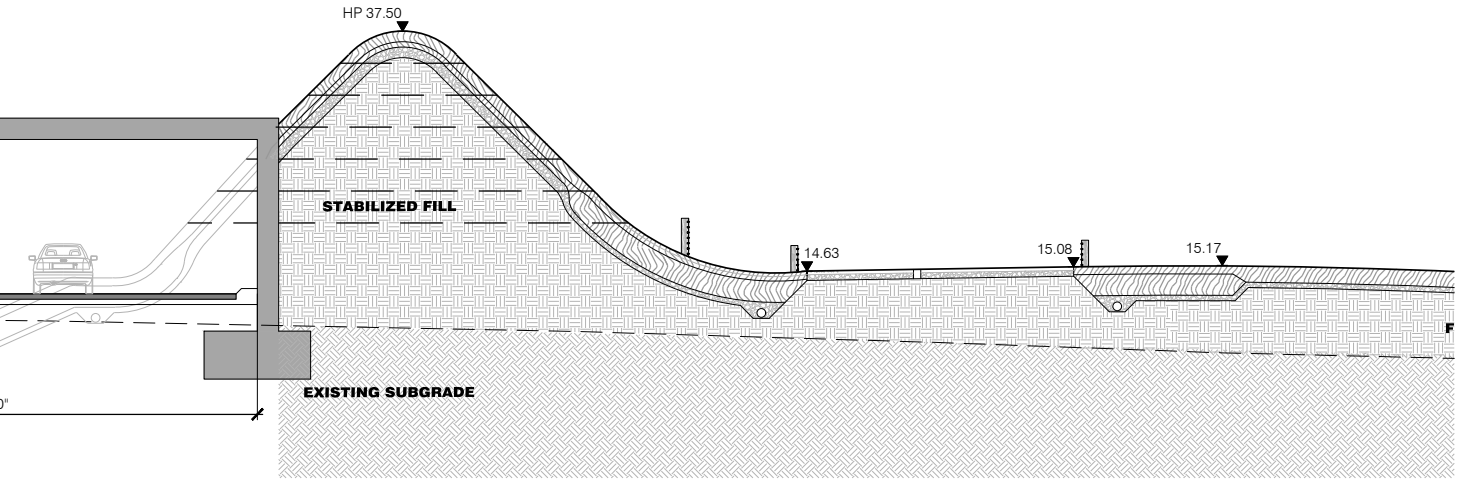
Top Section through Proposed BQP at Pier 5 Uplands, 4-Lane Option
Bottom Section through Proposed BQP at Pier 3 Uplands, 6-Lane Option



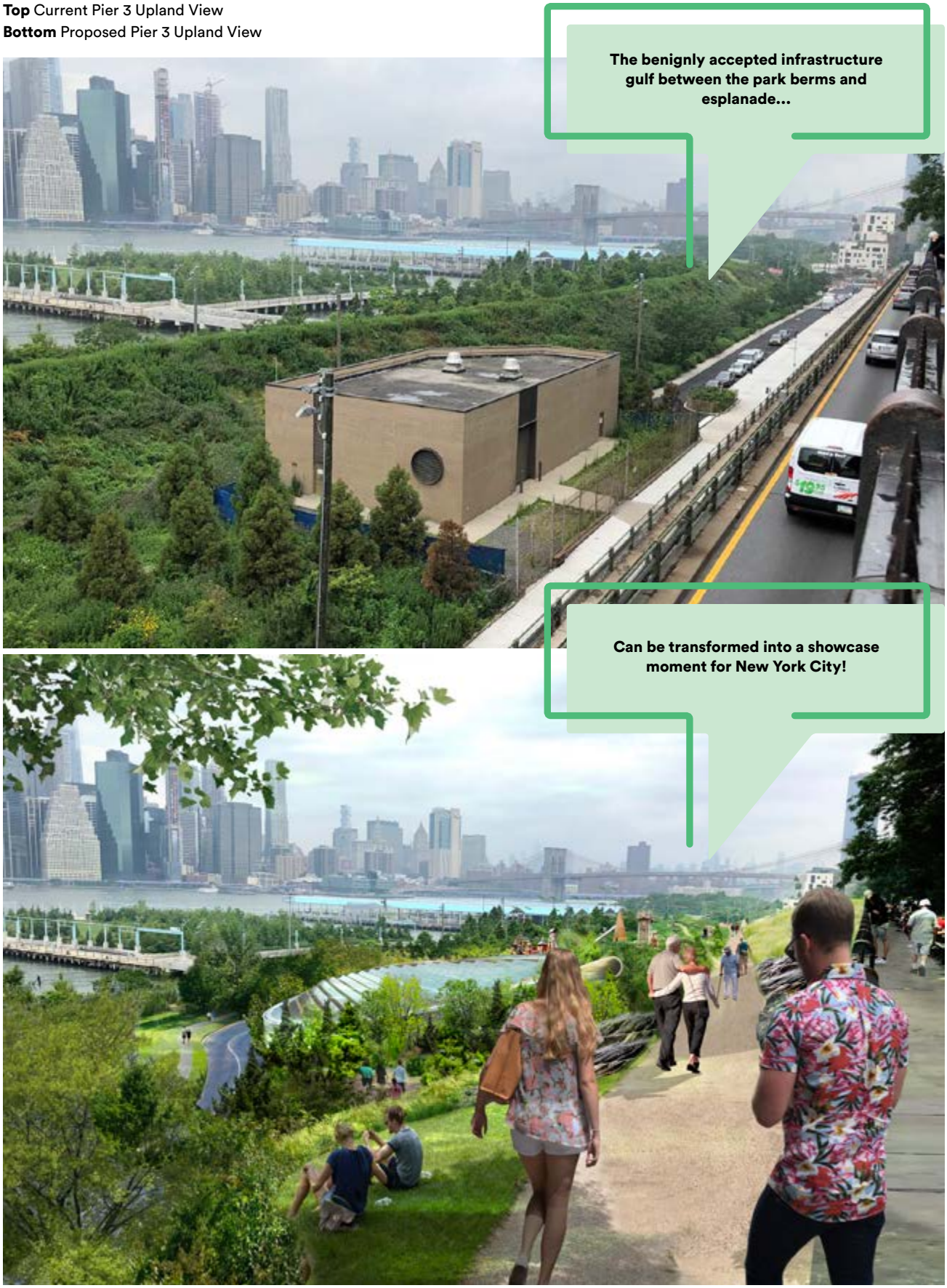





P 37.00
+24.80

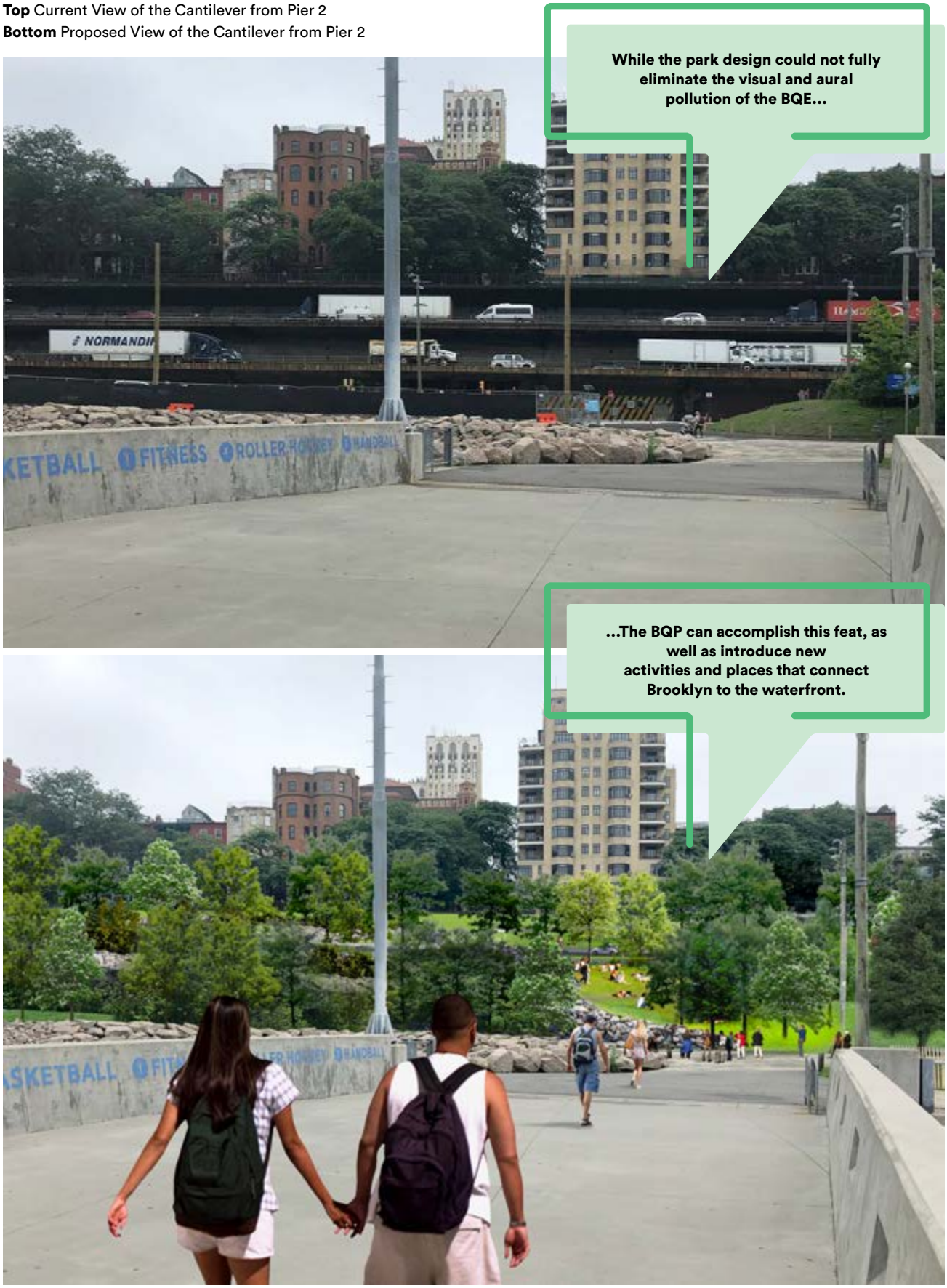

HP 37.50
STABILIZED FILL
14.63
15.08
15.17
EXISTING SUBGRADE

Top Current Pier 3 Upland View
Bottom Proposed Pier 3 Upland View



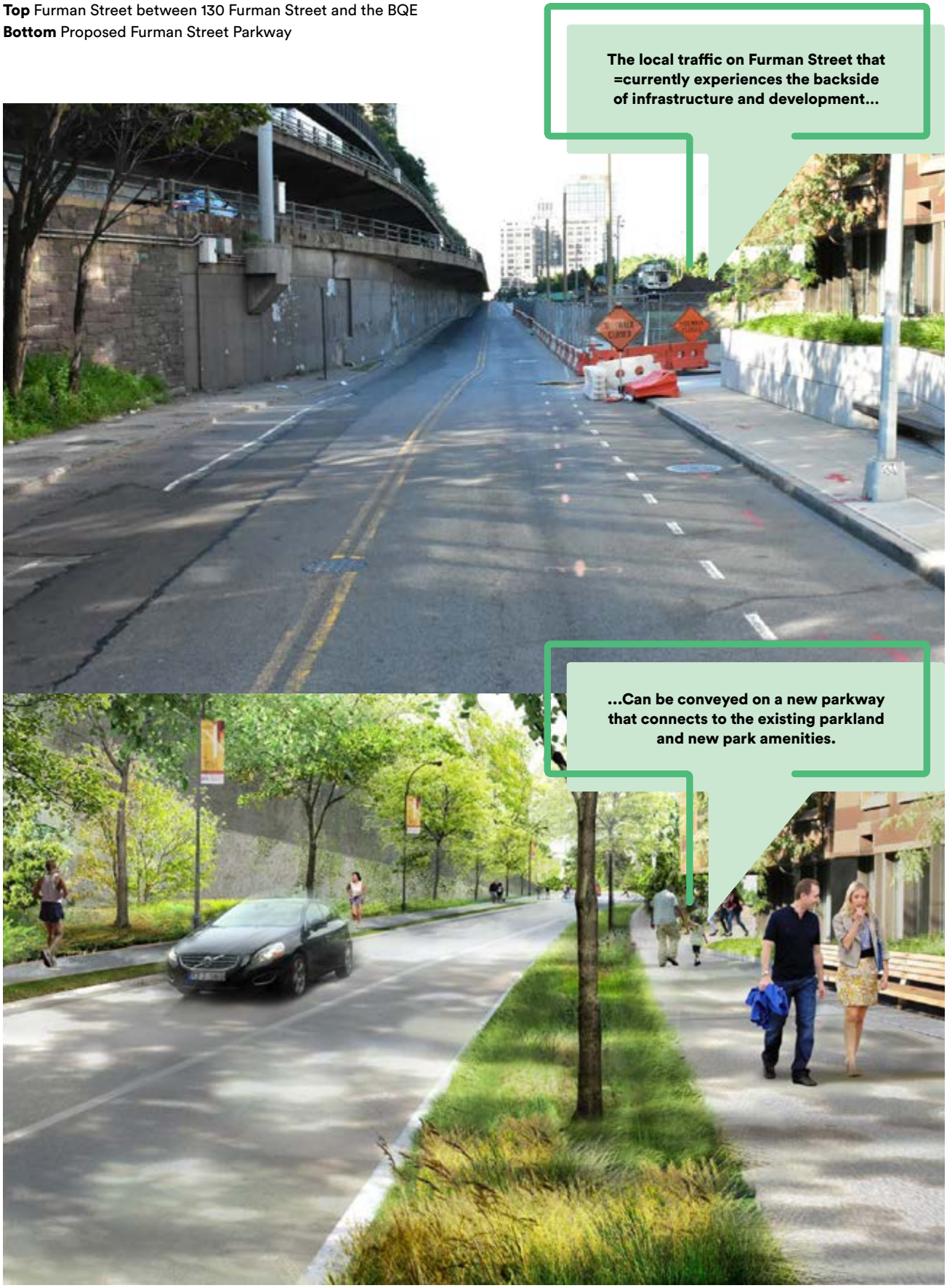
Top Water Garden Construction Site (Pier 2 Upland)
Bottom Proposed Pier 2 Upland Connection to Promenade

Top Current View of the Cantilever from Pier 2
Bottom Proposed View of the Cantilever from Pier 2



Top Current View of the Joralemon Underpass
Bottom Proposed View of the Joralemom Connection

Top Furman Street between 130 Furman Street and the BQE
Bottom Proposed Furman Street Parkway



Top Pier 5 Uplands Looking toward Brooklyn Heights
Bottom Proposed Pier 5 Uplands Connection to Park Cap

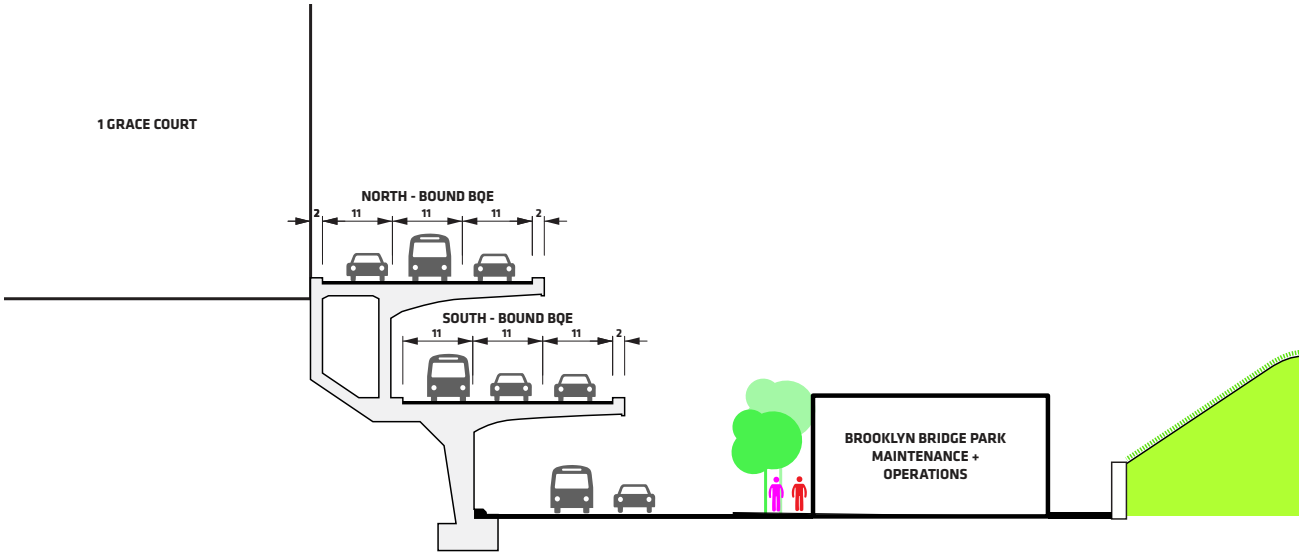

Brooklyn Heights Promenade
Relocated Furman Street
8 New Acres of Usable Parkland
Infrastructural Heritage


Existing Brooklyn Bridge Park

BBP Maintenance and Operations

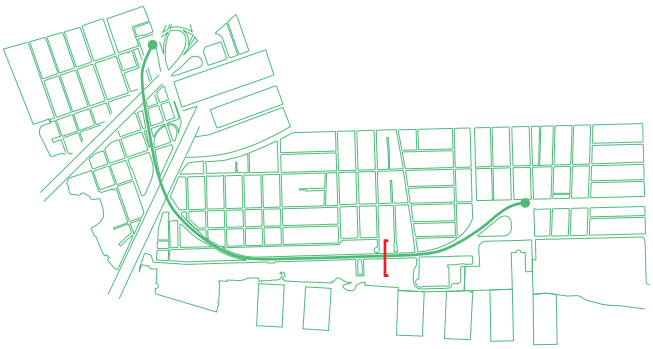
Brooklyn Bridge Park's maintenance and operations functions are spread over several facilities, including a recently built facility along Furman Street at Grace Court (just north of the Brooklyn Bridge Park Headquarters). The building would be within the bounds of the BQP at-grade roadway, which would require it to relocate vertically above the highway structure. Access to the building and associated staging areas would be provided via the new Furman Street or via park paths.

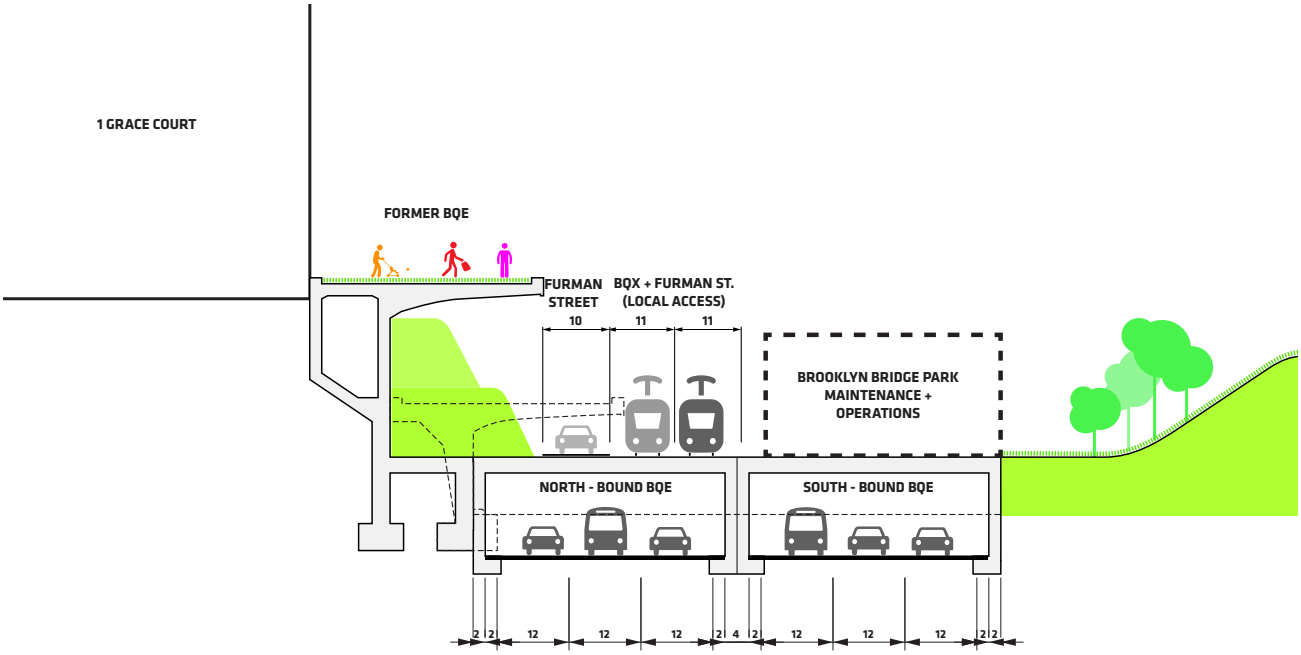
Top BBP Maintenance and Operations Facility
Bottom BBP Maintenance and Operations Location



Current
Section at BBP M&O Building

The current Brooklyn Bridge Park maintenance and operations facility is located directly along Furman street.





Proposed Section at BBP M&O Building

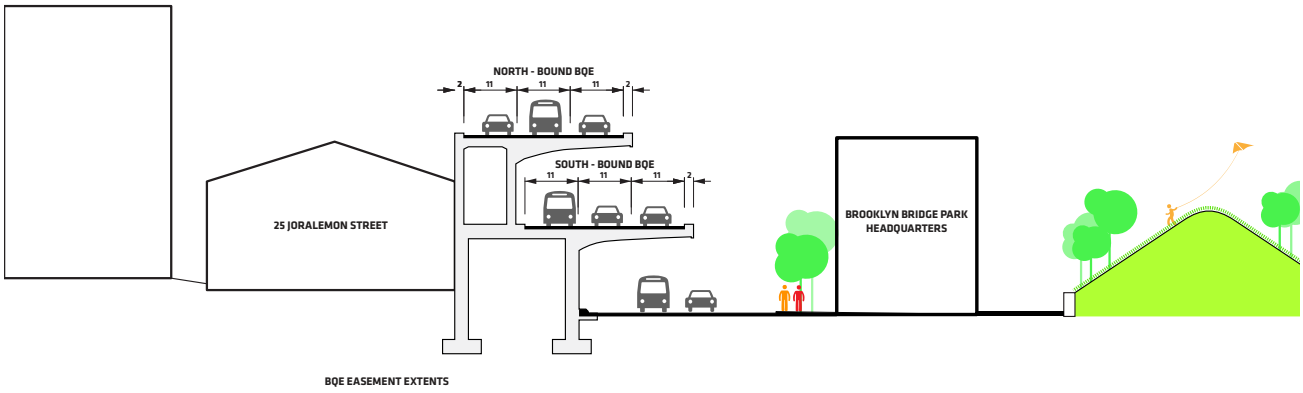
The proposed configuration for the BQP requires the relocation of the facility. It could be built directly above the highway structure close to its current location.

BBP HQ

Brooklyn Bridge Park's administration currently operates out of a deteriorating former MTA NYCT building along Furman Street north of Joralemon Street/Bridge Park Drive. The building lies within the bounds of the proposed cut-and-cover roadway. Although the grade of the roadway cap will nearly be at present grade, the headquarter building would need to be replaced. A new facility could be constructed in its current location on top of the roadway cap, or relocated to a more desirable location within the park.

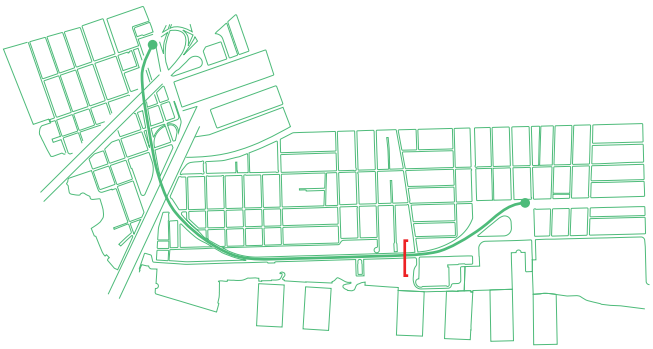
Top BBP Headquarters Building
Bottom BBP Headquarters Building Location

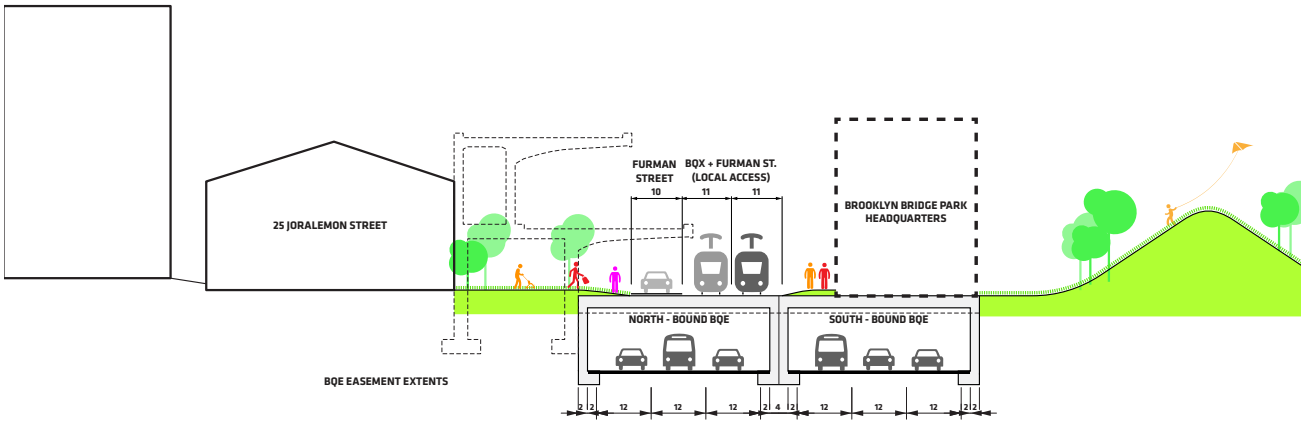
Reconstructing the Brooklyn Bridge Park headquarters is an opportunity to design an iconic new building that better serves the present and future park administration needs.



Current Section at BBP HQ

The Brooklyn Bridge Park Headquarters building is located at the intersection of Furman and Joralemon Street within the structure of an former MTA NYCT facility.





Proposed Section at BBP HQ

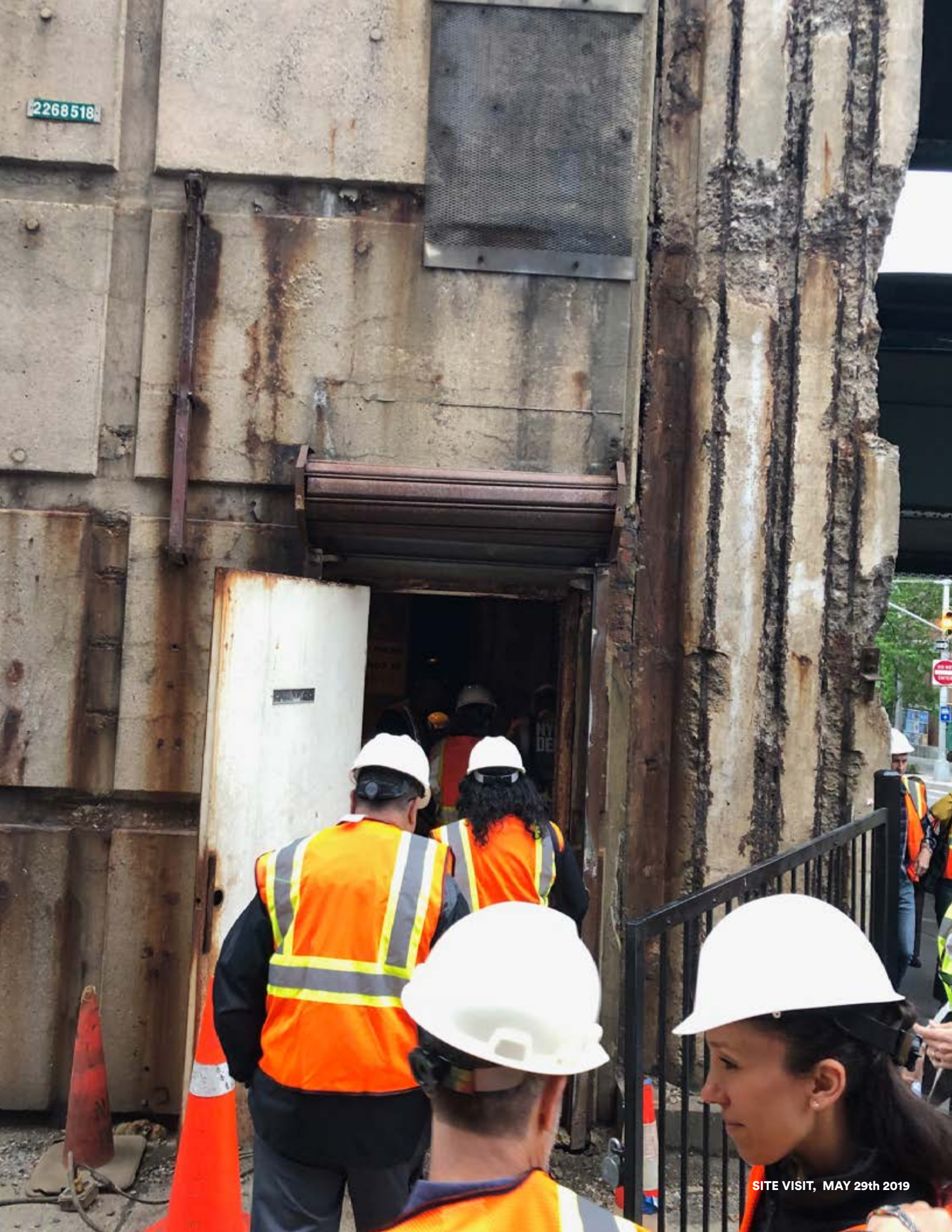
In order to allow for the new BQE structure configuration, the building will need to be demolished. A new building can be built at the same or in a more ideal location, above the new BQE.

NYC DEP Infrastructure and Utilities

The NYC Department of Environmental Protection has a major piece of infrastructure and associated utilities located within and adjacent to the project area. A 96” diameter sewer interceptor that carries wastewater north from Red Hook to the Brooklyn Navy Yards runs underneath Furman Street.

Water, gas, and electrical utilities currently running under Furman Street could remain in place or relocate to a new elevated utility corridor. Relocating the utilities to a corridor adjacent to the buried roadway would have resiliency benefits as well as improve access and maintainability.

All of the utility structures and access points in the project area lie within NYC Franchise Area. This means that for any public improvement project that the city initiates, the utilities must accommodate any request for relocation if required. This process unfolds as a negotiation between the utilities, the city, and contractors under the Section U program established for large roadway projects.



SITE VISIT, MAY 29th 2019

Electrical Utilities

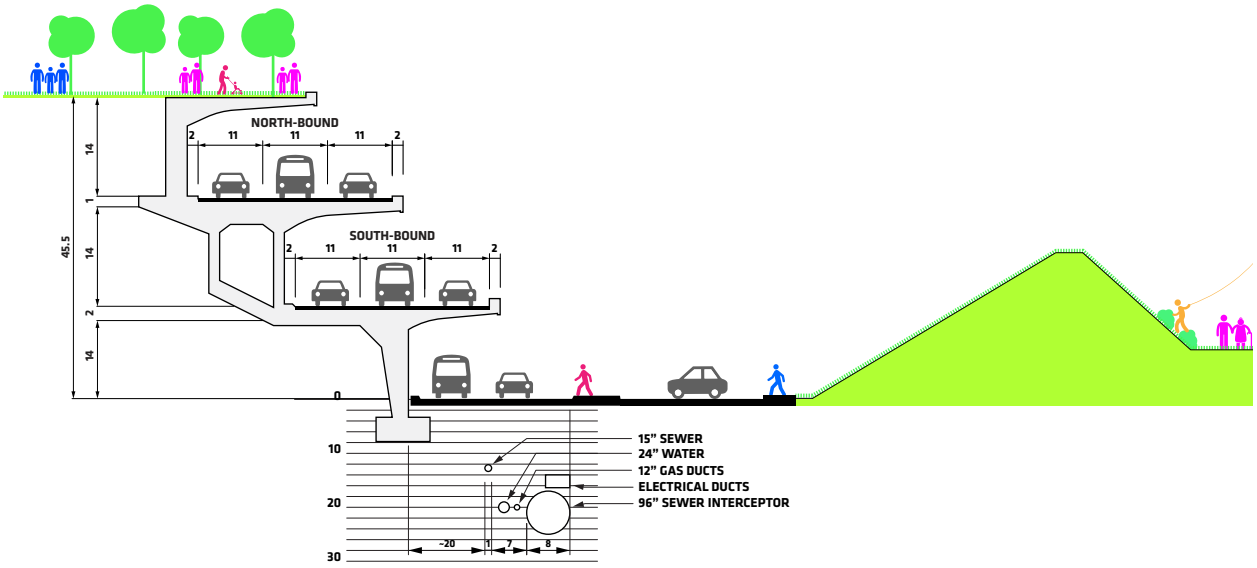
The utilities located in Furman Street are for the supply of electric power to various New York City structures. These include 2 MTA Fan Plants and 1 MTA Substation. Also included are various other structures that are incorporated within the park area.

There are approximately 50-60 utility structures located in the project area in Furman Street. The structures are manholes and service boxes, which are used as splice chambers to provide utility power to the customer's point of entry. Several vaults, which include transformers, are also present for the various high-tension facilities.

Furman Street contains a significant amount of utility infrastructure serving multiple agencies and as such, a strategy to relocate and organize these utilities in an accessible trench would create the opportunity to relocate the BQE to grade and maintain access to the utility infrastructure.

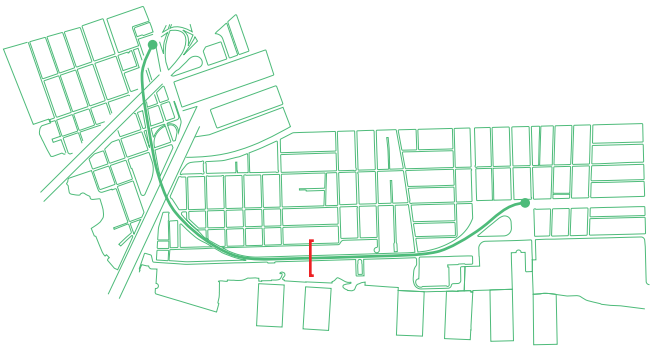
Top Con Edison Workers on Furmon Street
Bottom Utility Map

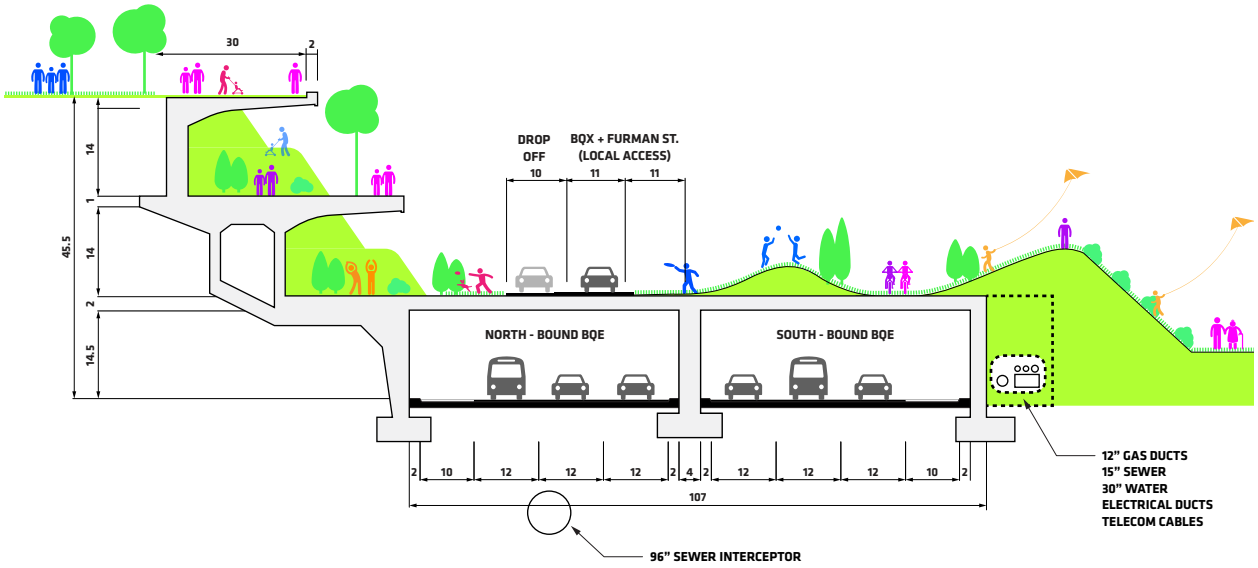
Utilities are currently accessed via manholes on Furman Street. A dedicated utility corridor would provide resiliency benefits and improved access as part of the BQP.



Current Utilities Location

Various utilities run below Furman street. A 96" diameter sewer interceptor is located approximately 15-20' below ground. In addition, smaller sewer lines, water, gas and electrical ducts are present.





Proposed Utilities Location

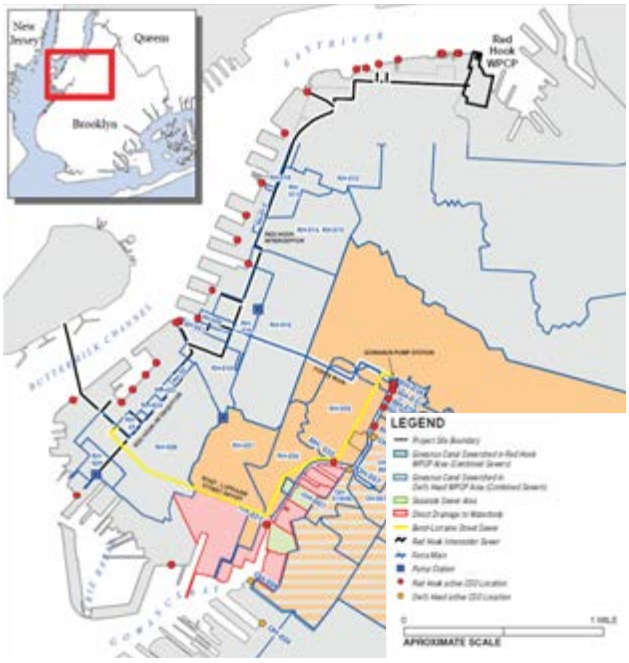
For the majority of the length of the proposed new BQE length, the sewer interceptor is not impacted, but it may be reconstructed or relocated to allow for better maintenance access. Additional utilities may remain in place or be relocated to a dedicated utility corridor.

Sewer Interceptor

A 96” (8’) diameter sewer interceptor built in the 1970s runs through the project area. Along its length, the sewer interceptor ranges from 40’ below the existing street surface to 15-20’ from the existing street surface. There are 4 sewer regulators located along Brooklyn Bridge Park from Atlantic Avenue to the northern end of Furman St.. Of these, 3 are adjacent to the interceptor and 1 is located directly above, next to the Cranberry Street A/C Fan Plant. This interceptor is the last line that runs to the Red Hook Wastewater Treatment Plant.

The BQP proposal does not impact the interceptor more significantly than any other proposal for the reconstruction of the BQE in this area. The baseline DOT proposal would partially obstruct access to this line, requiring it’s relocation in that scenario. Interceptor reconstruction projects are commonplace and occur throughout New York City and the region.

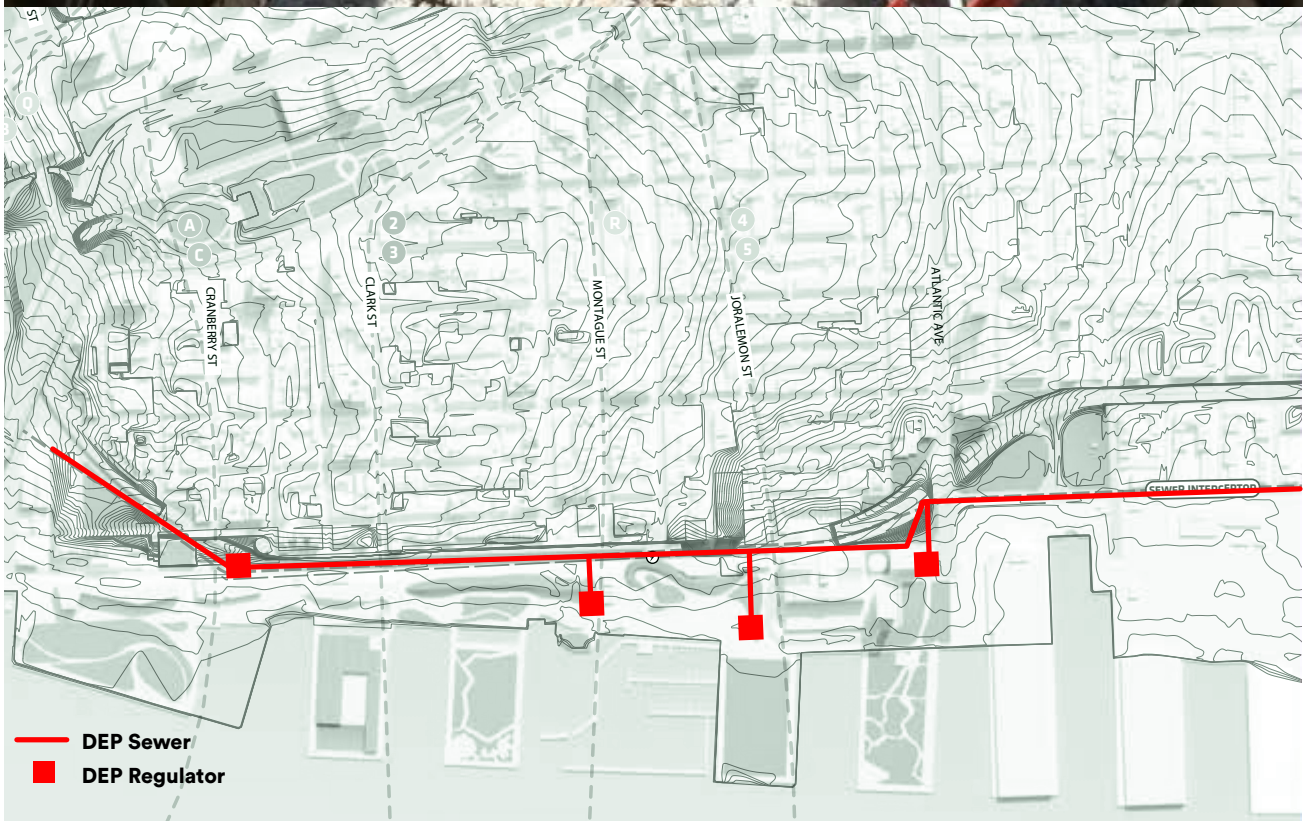
Alternatives for the interceptor’s preservation in place, or reconstruction and downsizing to reflect future green infrastructure as part of park build-out, have been identified and are illustrated on the following pages.

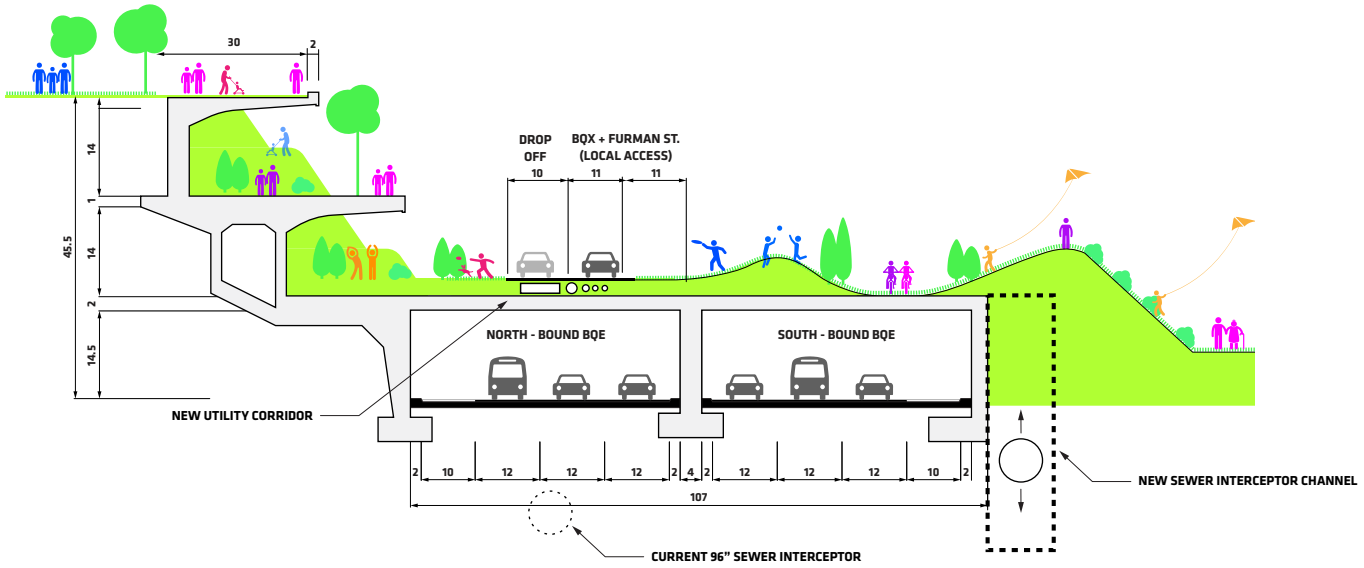


DEP Interceptor and Regulator Locations

Top Sewer Interceptor Construction in College Point
Bottom DEP Interceptor and Regulator Locations

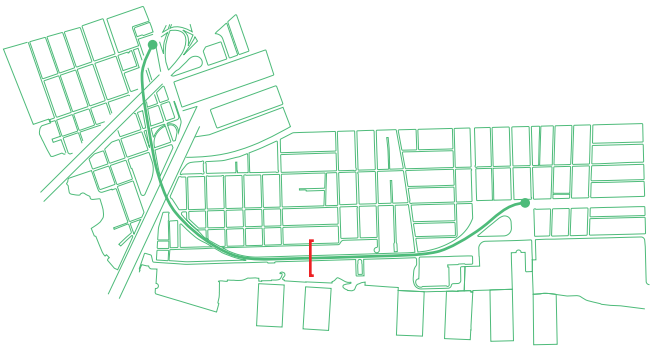
Sewer interceptor reconstruction projects are commonplace and have been completed throughout New York City.

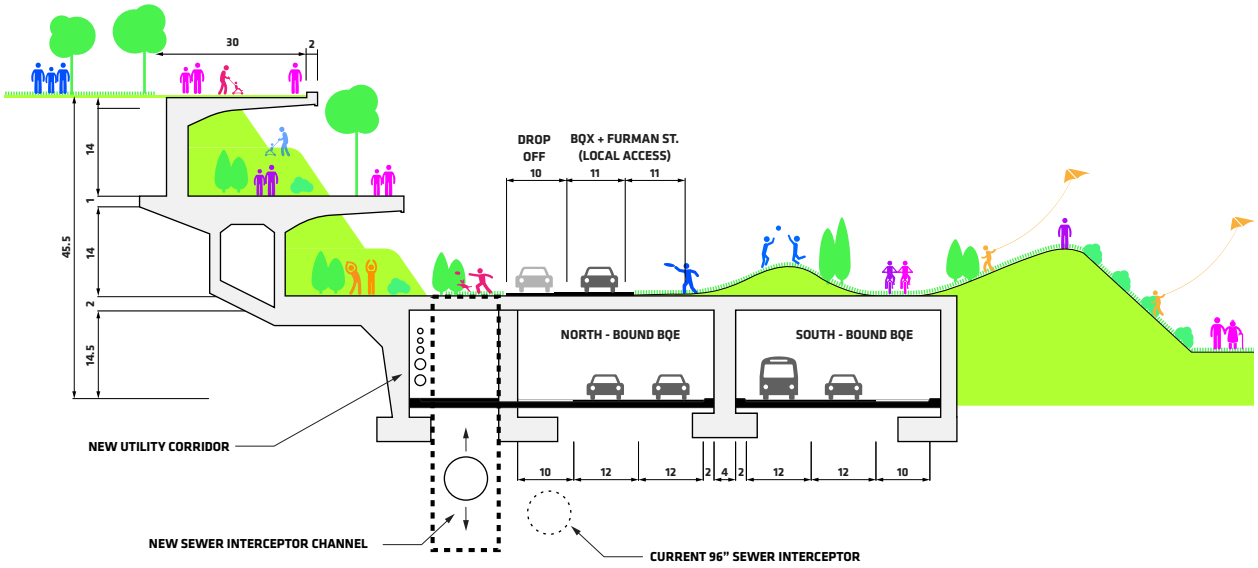




Interceptor Relocation Alternative 1 Western Alignment

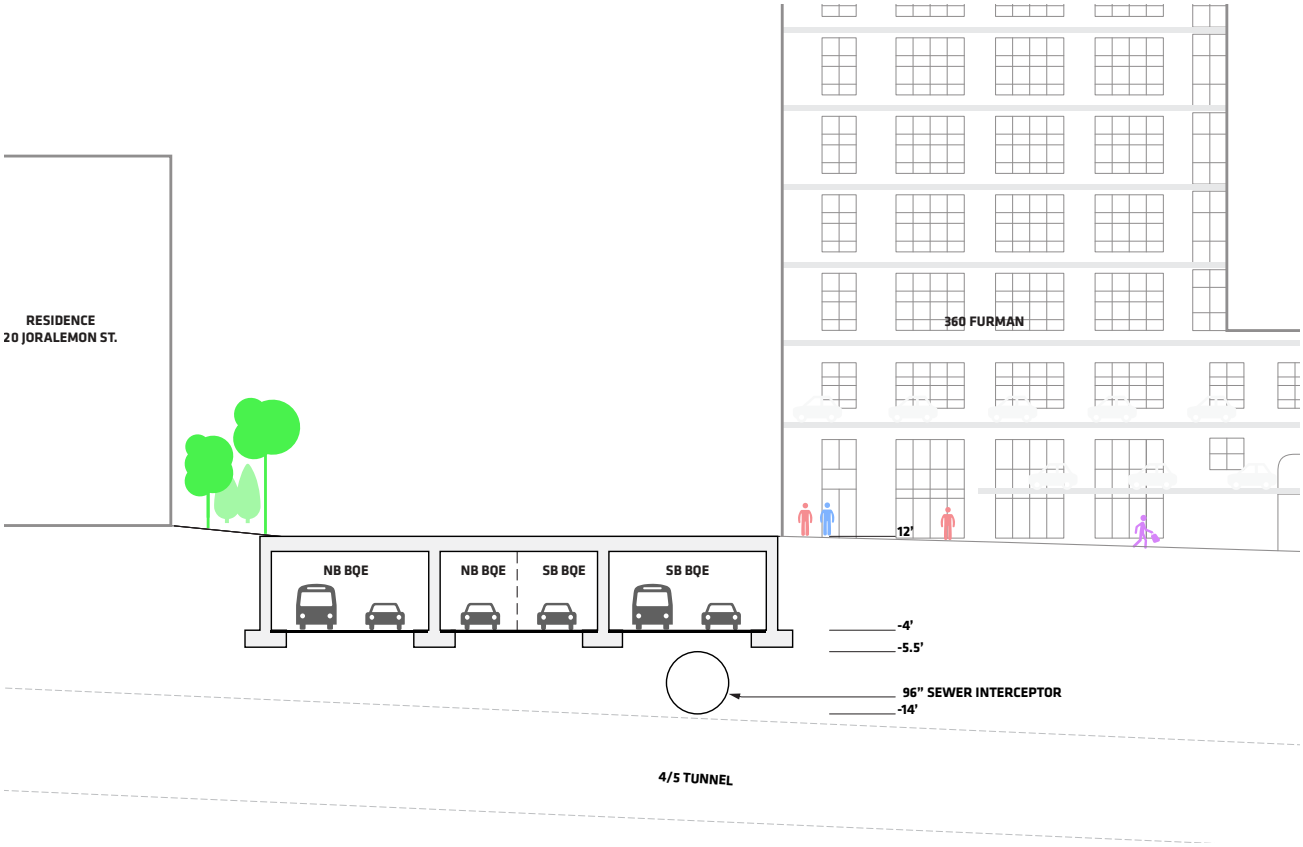
The interceptor is relocated to the western edge of the structure with continuous access above. The line may be downsized to reflect future hard conservation measures and the increase of green infrastructure with new park buildout.





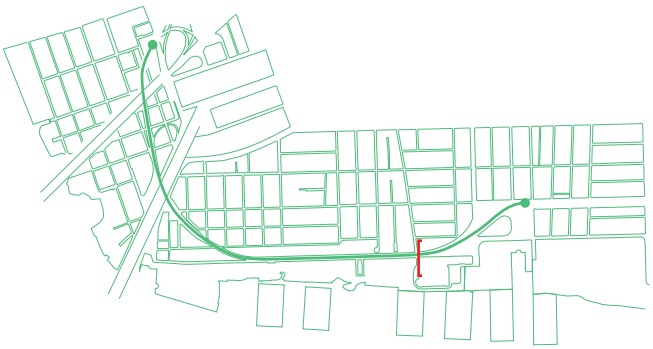
Interceptor Relocation Alternative 2 Eastern Alignment

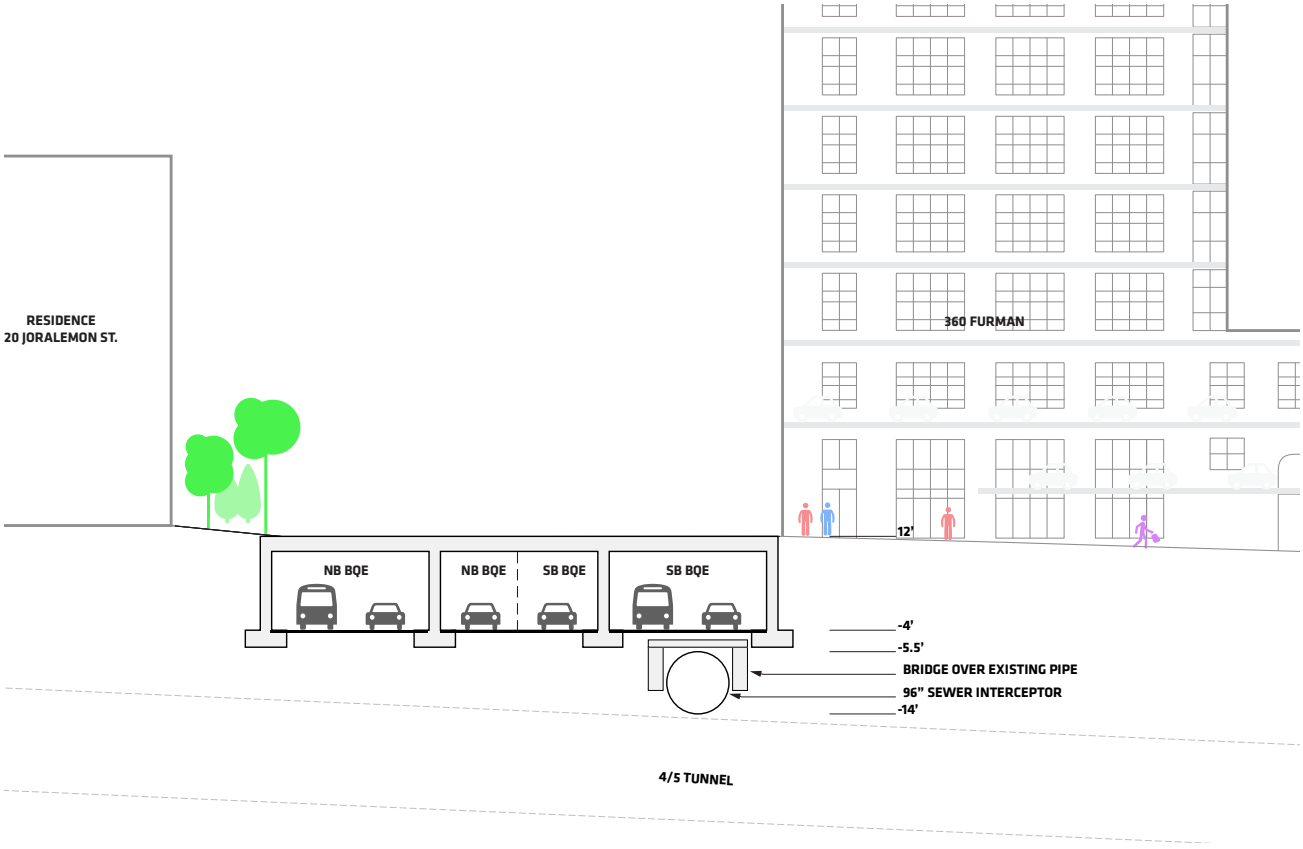
A dedicated utility corridor along the eastern edge of the roadway provides continuous access to the interceptor and other utilities.



Proposed Section at Joralemon

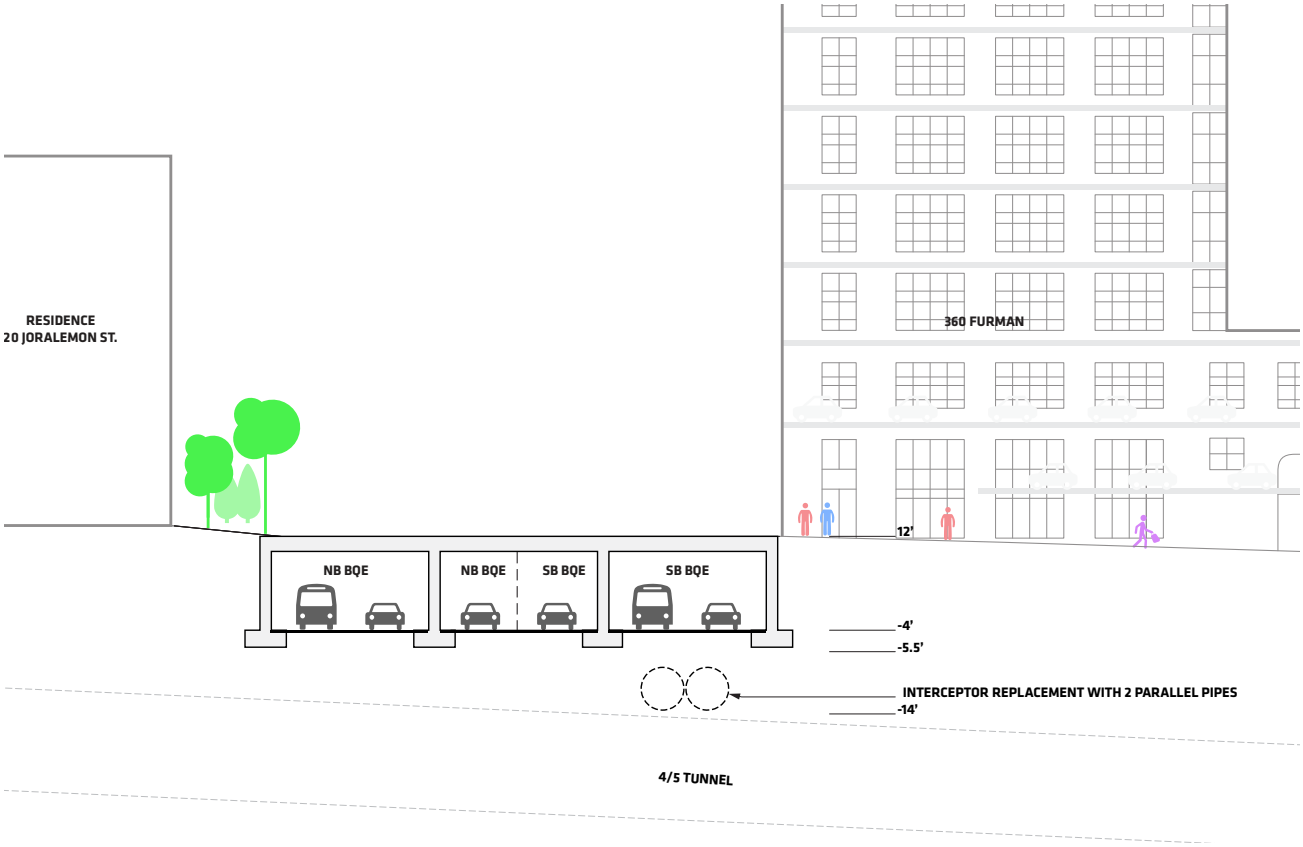
The sewer interceptor runs underneath Furman Street. If possible, it will remain in place underneath the cut-and-cover roadway.





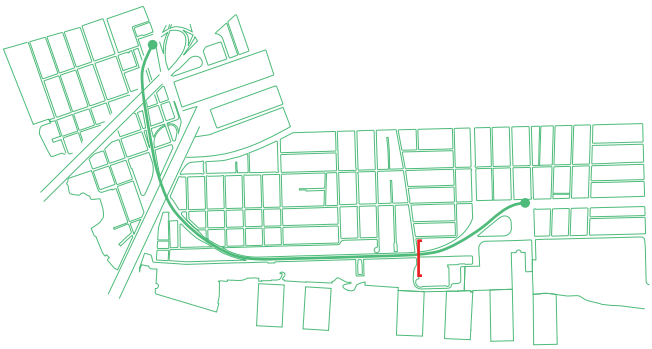
Proposed Alternative 1 Section at Joralemon

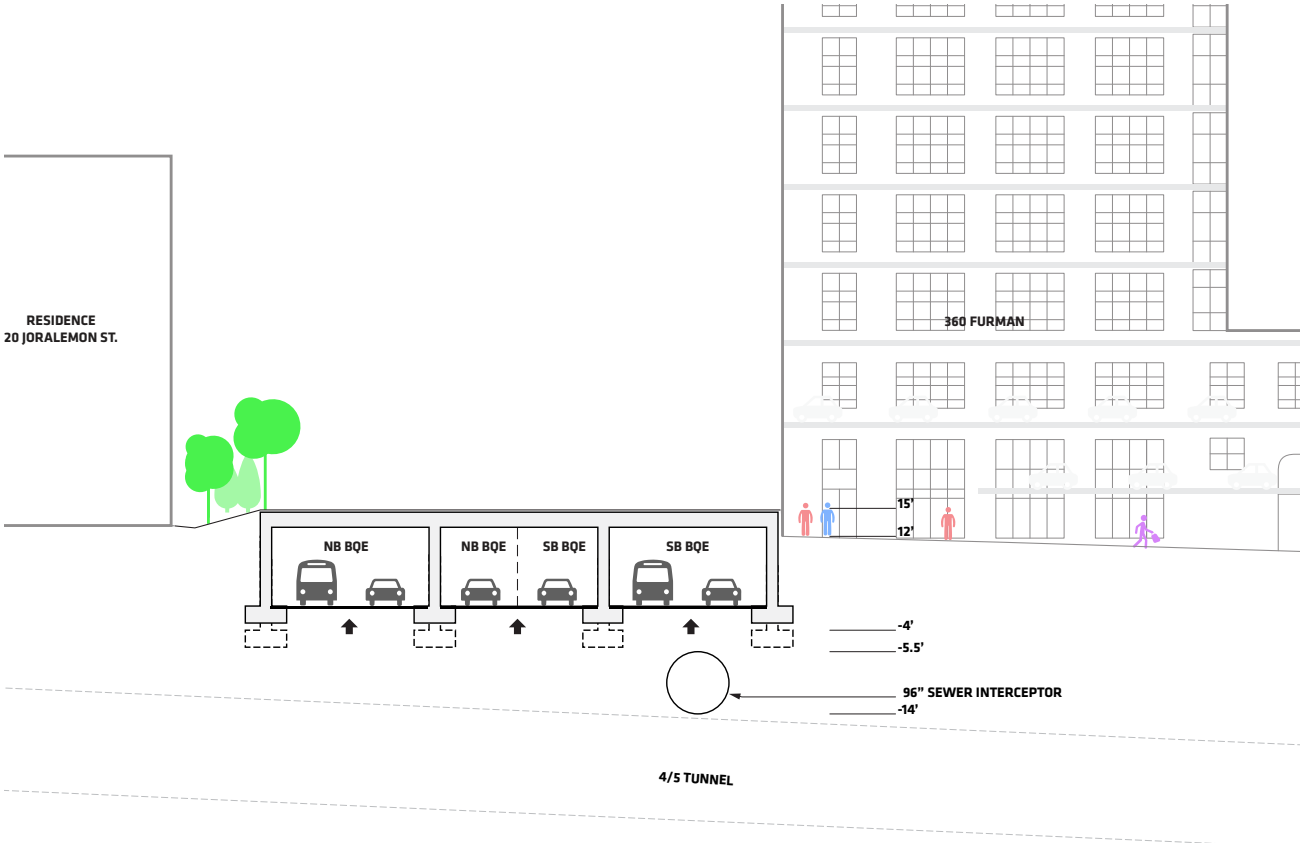
If need be, a structural bridge can be built over it for the length of the cut-and-cover trench with manhole access provided via the roadway.



Proposed Alternative 2 Section at Joralemon

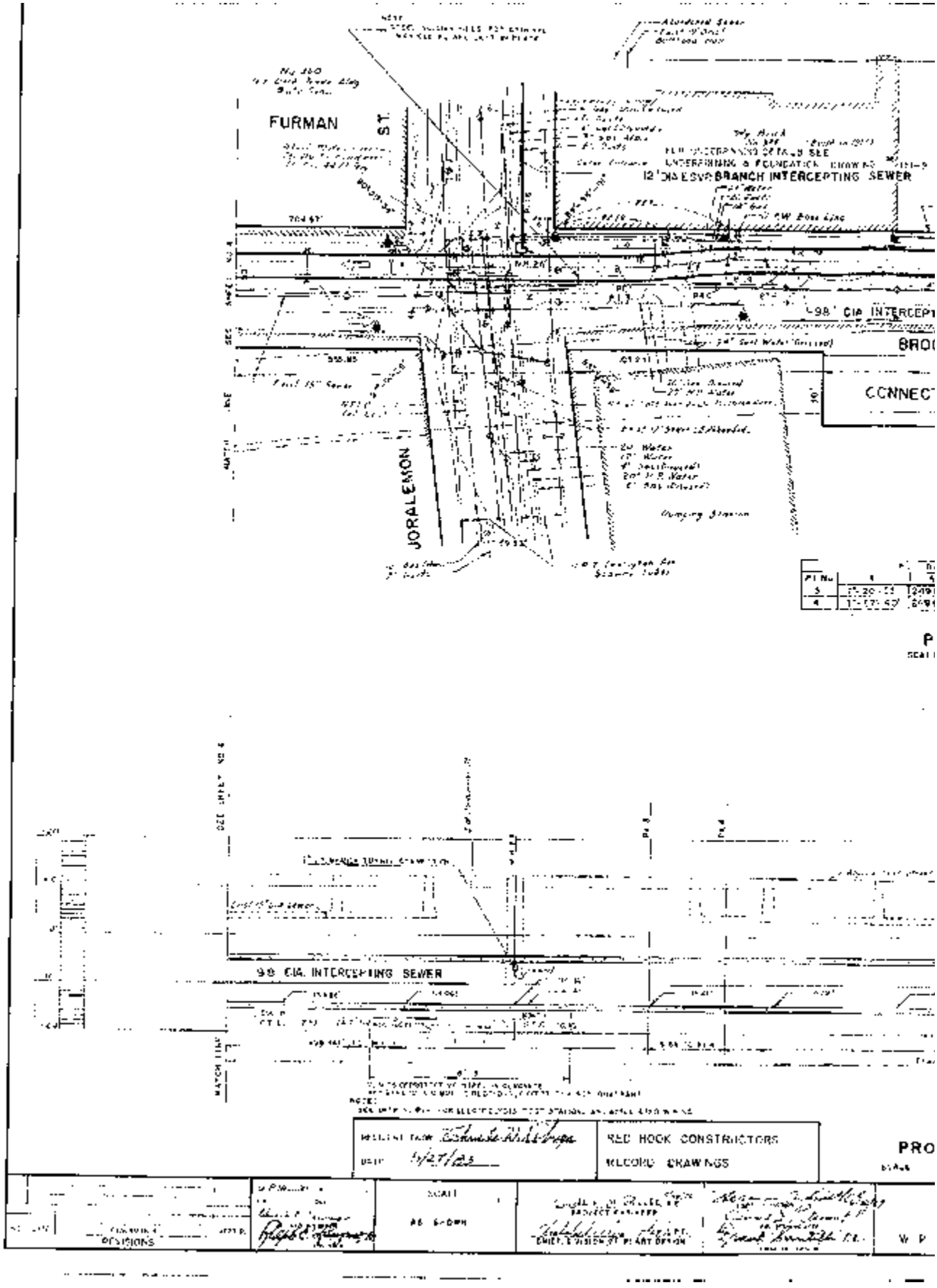
If the interceptor needs to be reconstructed, it could be replaced with shallower depth parallel pipes running along the same alignment.

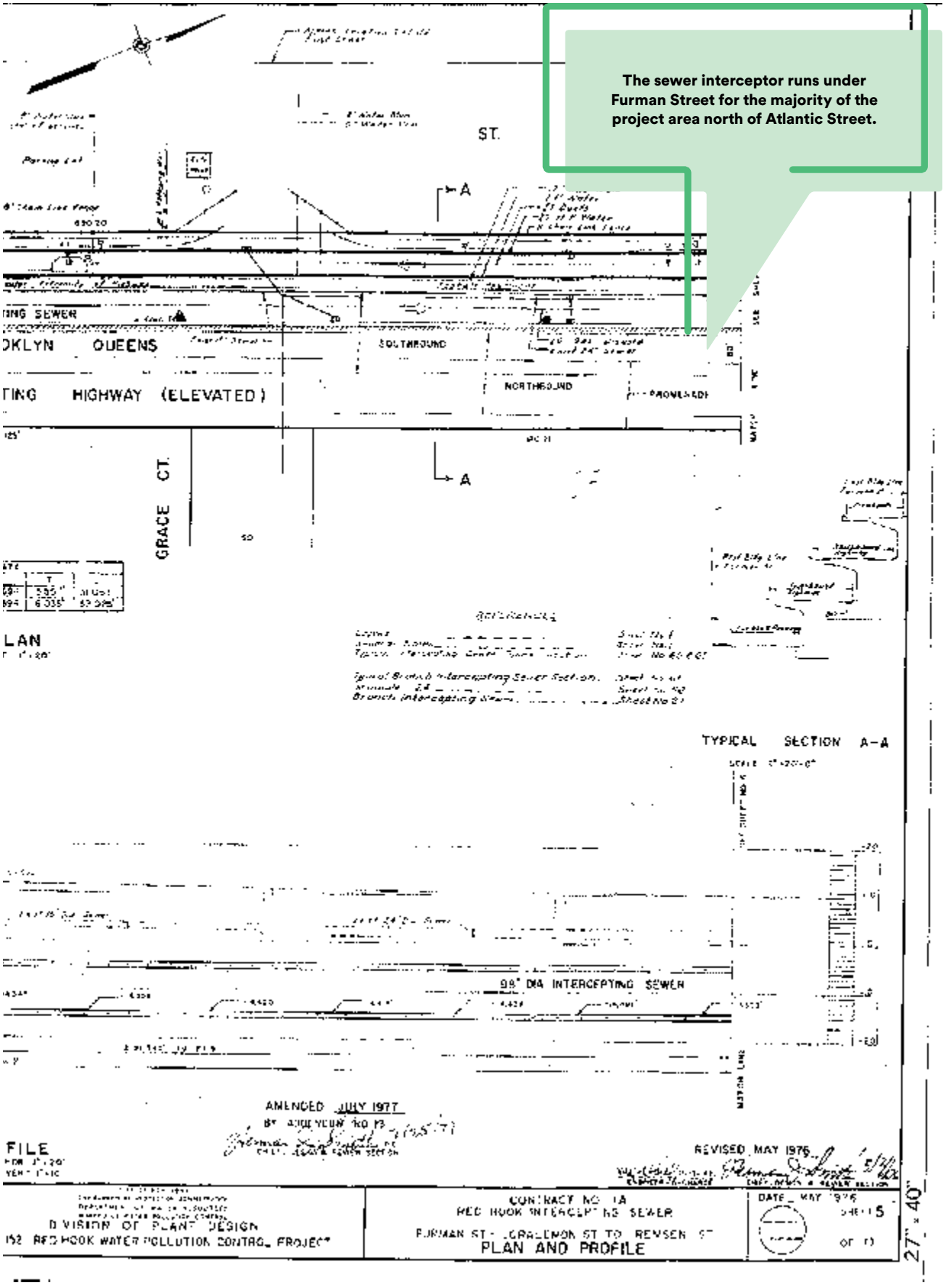




Proposed Alternative 3 Section at Joralemon

If reconstruction is deemed unfeasible, the cut-and-cover trench could be constructed several feet higher to avoid impacting the intercepter, requiring targeted modifications to the 360 Furman St. ground floor entries.


FURMAN ST.
JORALEMON ST.
12' DIA. ESVD BRANCH INTERCEPTING SEWER
99' DIA. INTERCEPTING SEWER
RED HOOK CONSTRICTORS
RECORD DRAWINGS


The sewer interceptor runs under Furman Street for the majority of the project area north of Atlantic Street.
ST.
A
A
SOUTHBOUND
NORTHBOUND
HIGHWAY (ELEVATED)
GRACE CT.
TYPICAL SECTION A-A
96" DIA INTERCEPTING SEWER
AMENDED JULY 1977
REVISED MAY 1976
FILE
DIVISION OF PLANT DESIGN
152 RED HOOK WATER POLLUTION CONTROL PROJECT
CONTRACT NO. 1A
RED HOOK INTERCEPTING SEWER
FURMAN ST - LORRAINE ST TO RENSEN ST
PLAN AND PROFILE
DATE MAY 1976
SHEET 5
OF 13
27" x 40"

MTA Infrastructure

Four major subway lines run from Brooklyn to Manhattan under the project area. The A/C train runs from the High Street stop under Cranberry Street to Manhattan. The 2/3 train tunnel runs under Clark Street from the Clark Street Station to Manhattan. The R Train tunnel runs beneath Montague Street from the Court Street Station to Manhattan. The 4/5 Train tunnel travels from Borough Hall under Joralemon Street on its way to Manhattan.

All of the tunnels are approximately 30-40' below grade as they pass beneath Furman St. None of the MTA fan plants (A/C, 2/3, and R) will need to be relocated for the proposal.

The 2/3 Train Vent and Emergency Egress is currently located in the BQE cantilever structure along Furman Street. In the proposal, it would remain in place with the addition of a simple stair and chimney accommodated in the new deck structure.

The MTA Electrical Substation at Pierrepont Street lies both within the BQP proposed at-grade roadway and within the 100-year floodplain. Re-location vertically can accommodate the at-grade roadway while providing resiliency and modernization benefits.

Although the 4/5 tunnel would be below the cut-and-cover portion of the BQP, it is at sufficient depth for excavation of the roadway trench that accommodates 360 Furman St. access at existing grade. Solutions are available to ensure that vertical buckling of the tube does not occur due to the reduced loading after excavation.

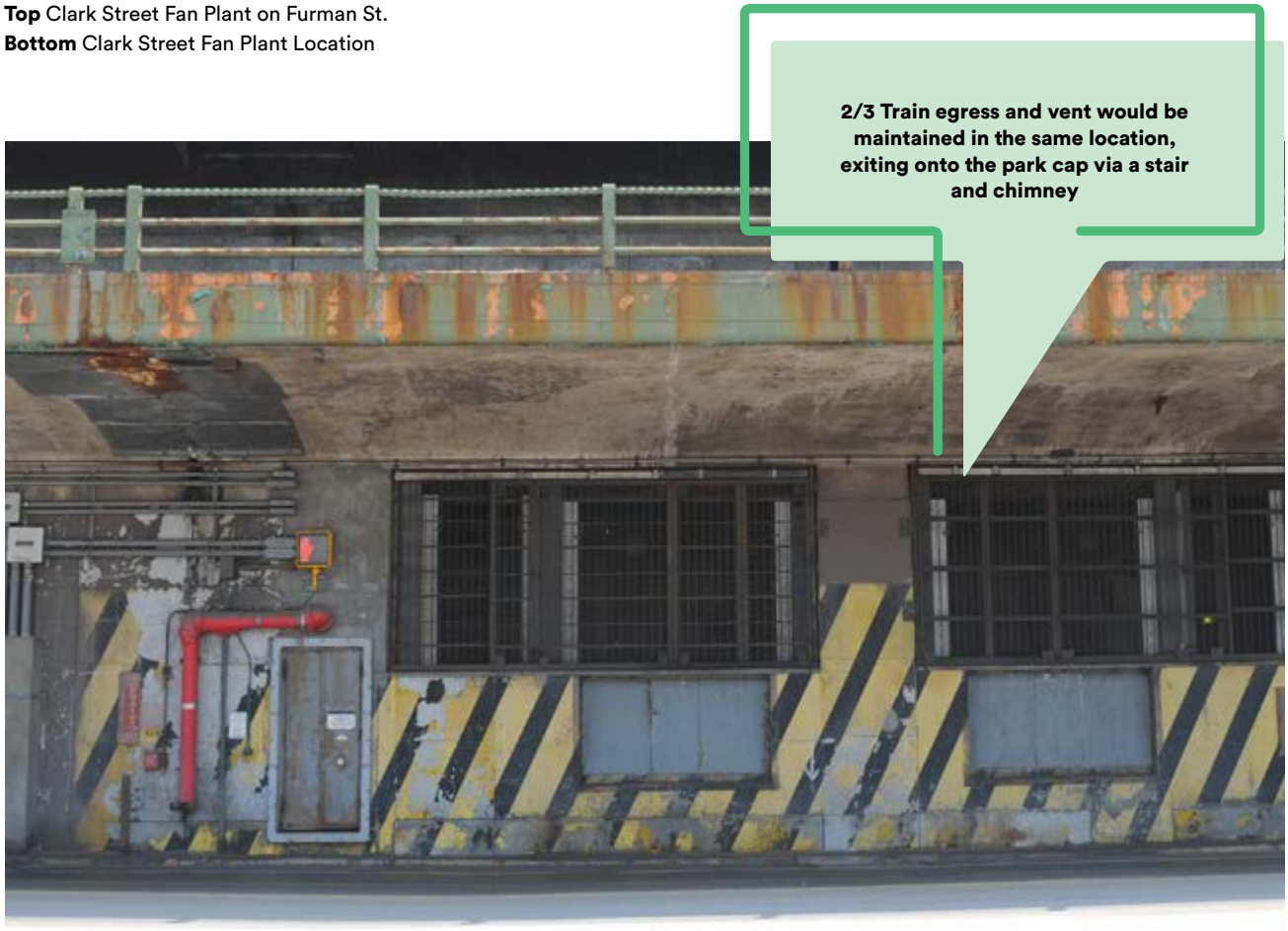
MONTAGUE R TRAIN TUBE

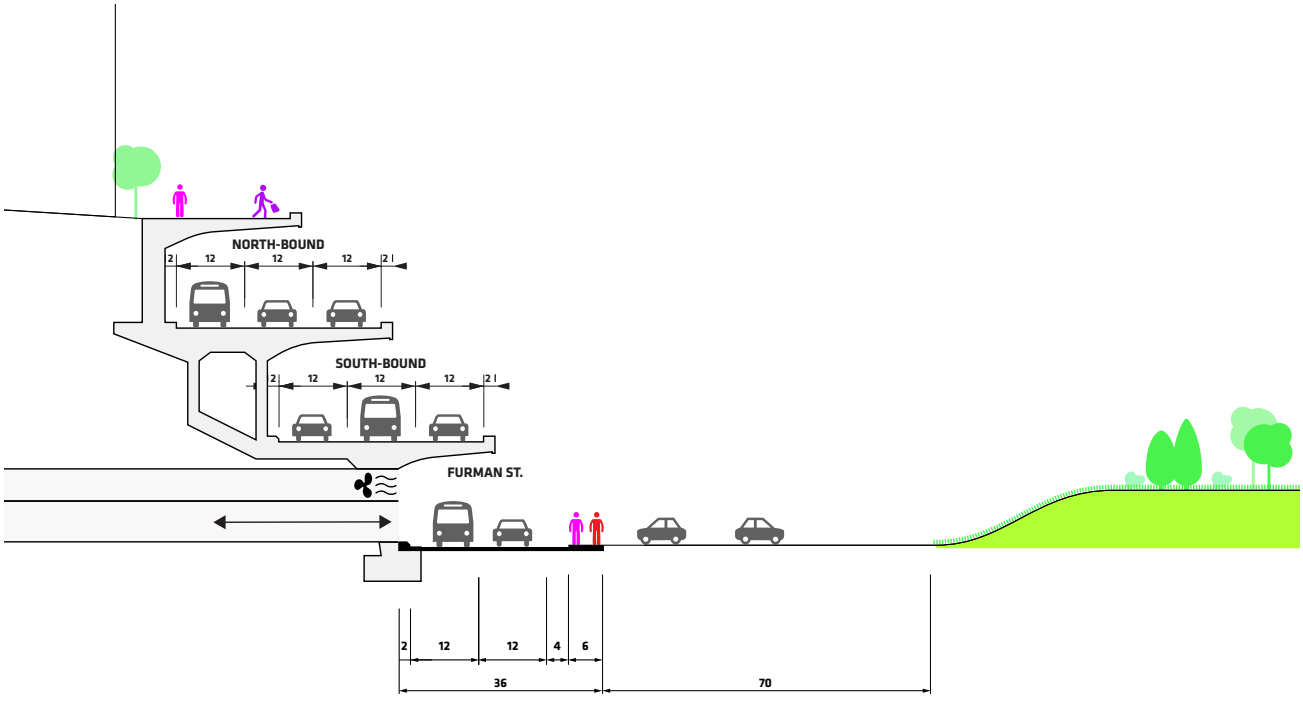
Clark Street Fan Plant

The 2/3 train has an emergency egress and exhaust vent at current grade on Furman Street within the BQE cantilever structure. The BQP proposal does not require these to be moved. A new staircase and ventilation shaft would be incorporated into the BQP cap structure. The staircase would egress directly into the park instead of the current (more dangerous) condition of exiting onto Furman Street.

If desired, additional egress points for the Clark St. 2/3 station could be explored in conjunction with the BQP scheme.

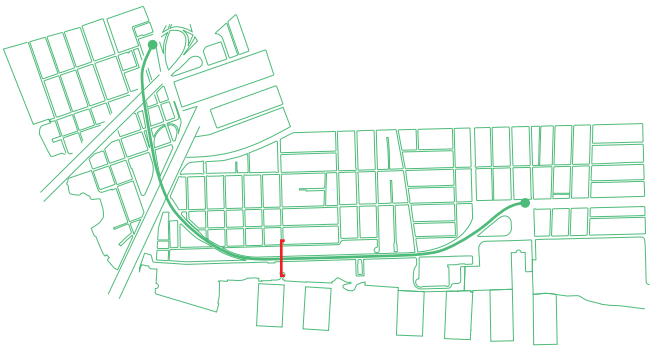
Top Clark Street Fan Plant on Furman St.
Bottom Clark Street Fan Plant Location

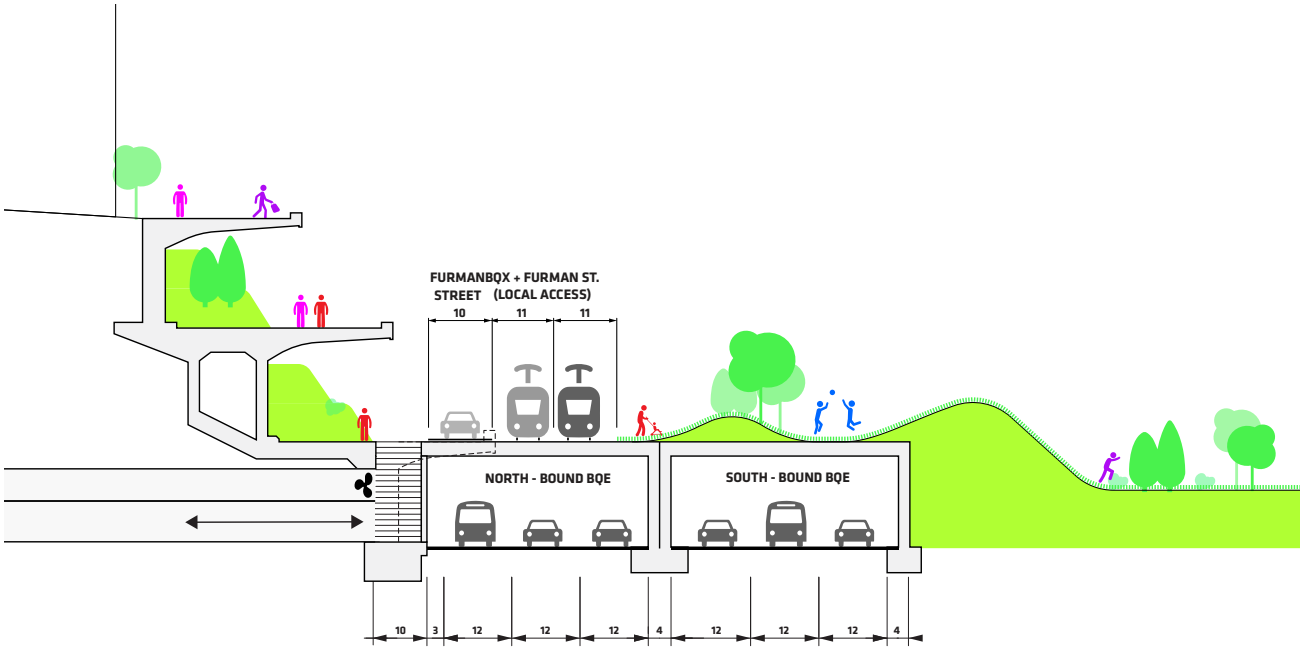




Current Section at Clark Street

The current exhaust grills and exits from the 2/3 train tunnel are located at grade on Furman Street.





Proposed Section at Clark Street

The ventilation ducts are extended to exhaust air at the park level above the new BQE structure. In addition, a new flight of stairs with operable, perforated hatches are added to allow egress directly into the park for emergencies.

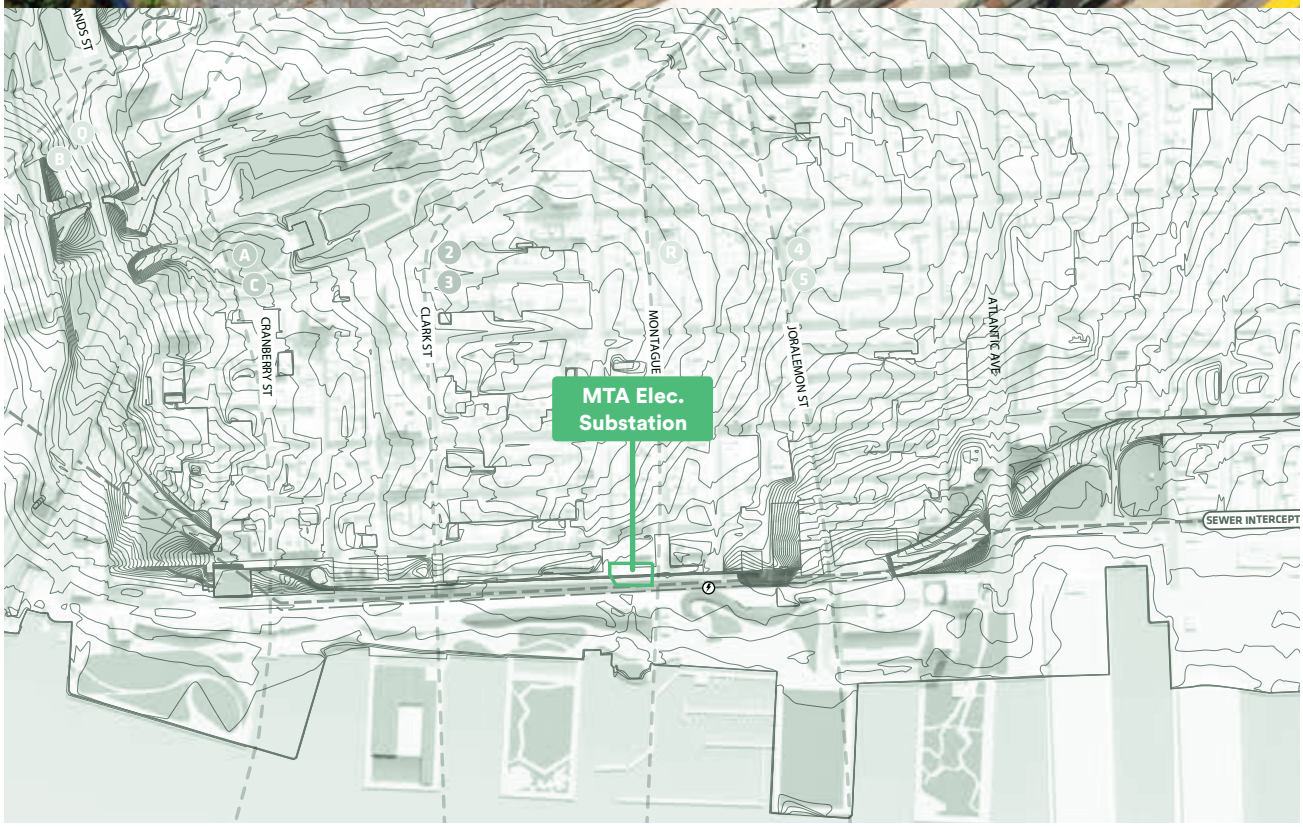
MTA Electrical Substation

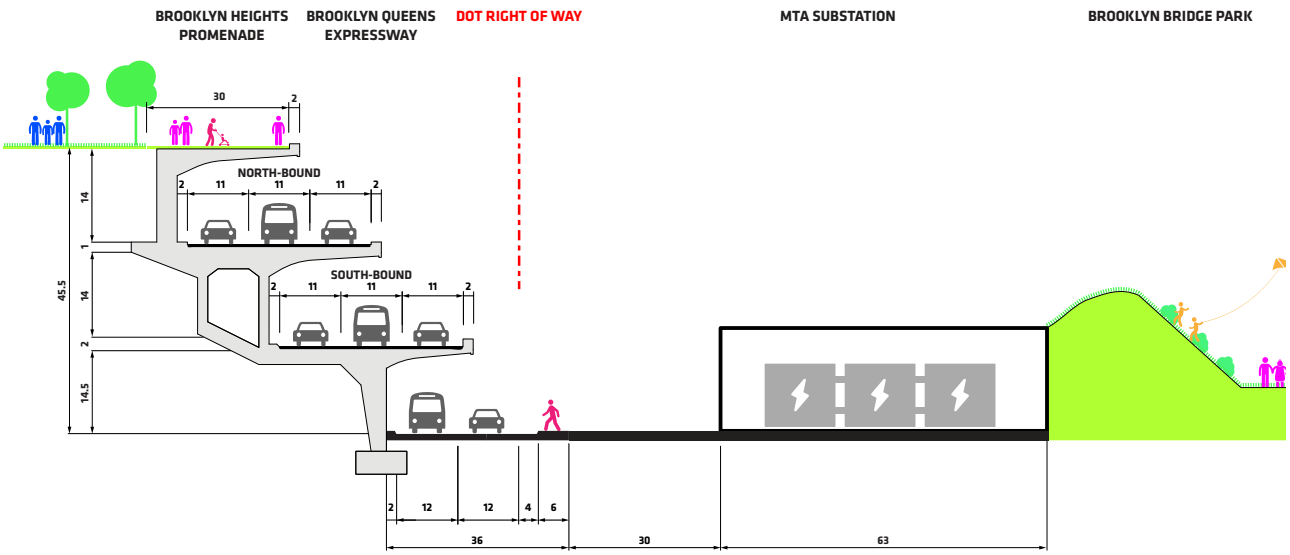
The MTA Electrical Substation at Pierrepont Street lies both within the BQP proposed at-grade roadway and within the 100-year floodplain. Re-location vertically can accommodate the at-grade roadway while providing resiliency and modernization benefits.

Before construction of the at-grade roadway begins, a structural scaffold is constructed around the current substation building (with the eastern edge aligned to become part of the cap structure). A new substation is built on top of the scaffold at the future elevation of the park cap. Once the new substation is completed, it is taken online, while the existing substation is taken offline and deconstructed. Construction then begins on the adjacent at-grade roadway.

Top Existing Electrical Substation
Bottom Electrical Substation Location

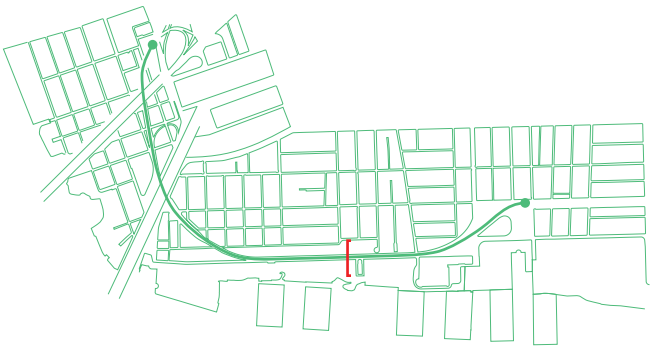
Elevating the MTA substation would have additional resiliency benefits by modernizing and bringing it above the floodplain.

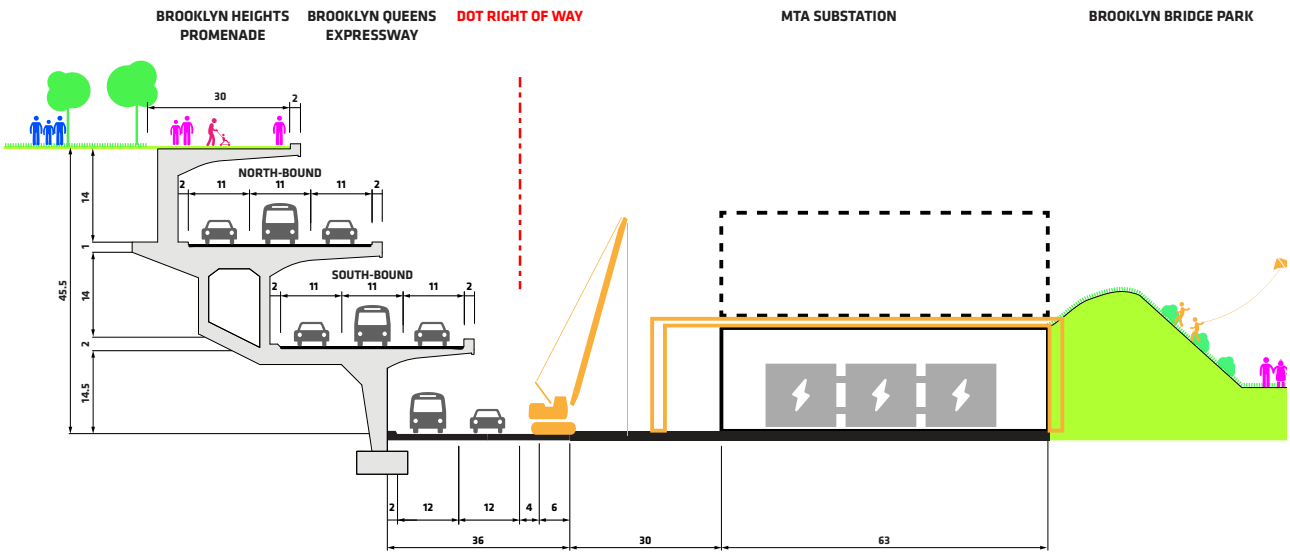




Current
Section at MTA Electrical Substation

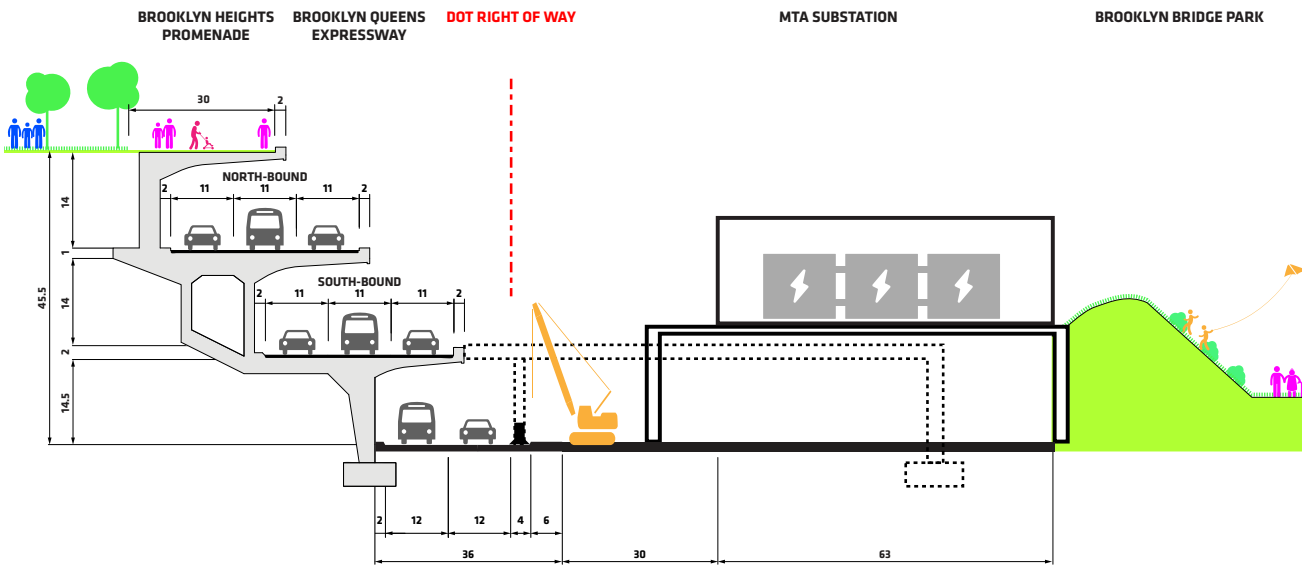
The substation is located 66’ west of the lower retaining wall of the triple cantilever structure.





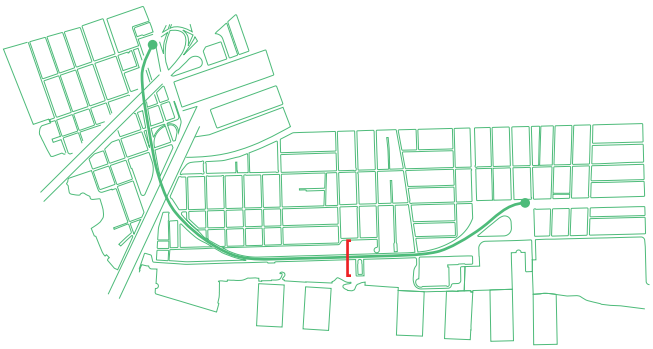
Construction Phase 1
Section at MTA Electrical Substation

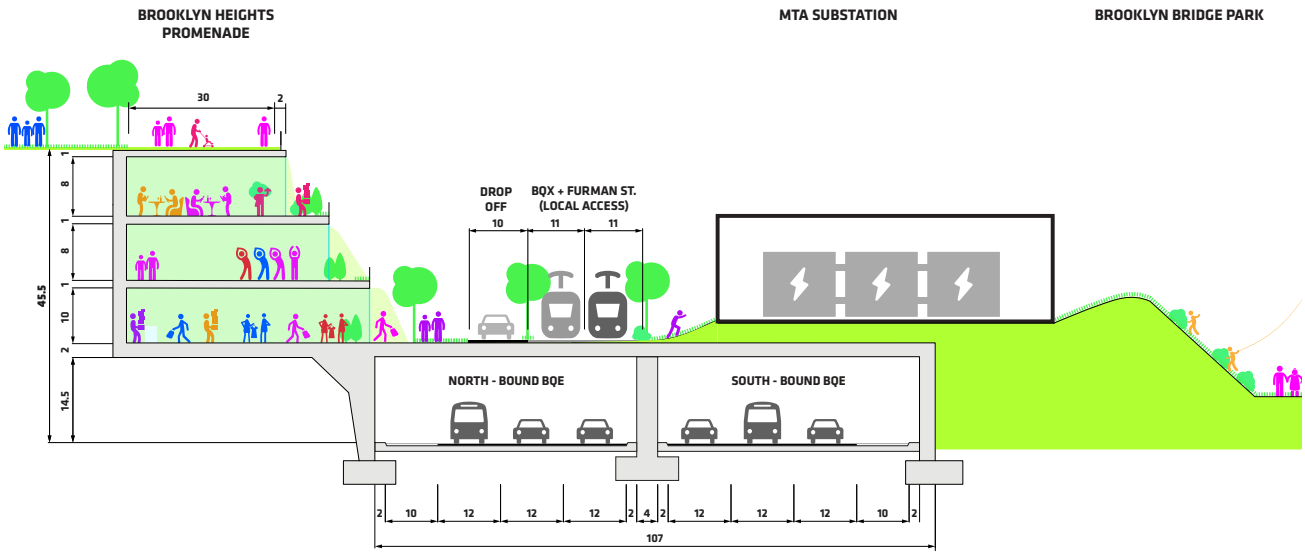
Before work on the roadway begins, a new substation is constructed on a temporary structure on top of the current substation. The current substation remains operational for the duration of construction.



Construction Phase 2
Section at MTA Electrical Substation

Once the new substation is completed, it is brought online and the current substation is deconstructed. Work begins on the new BQP roadway and cap, integrating the temporary structure into the roadway cap structure as needed.





Proposed Section at MTA Electrical Substation

After work is completed, the new substation is at the grade of the park cap and is accessed via a relocated Furman Street.


Reconstruct
MTA Sub-Sta

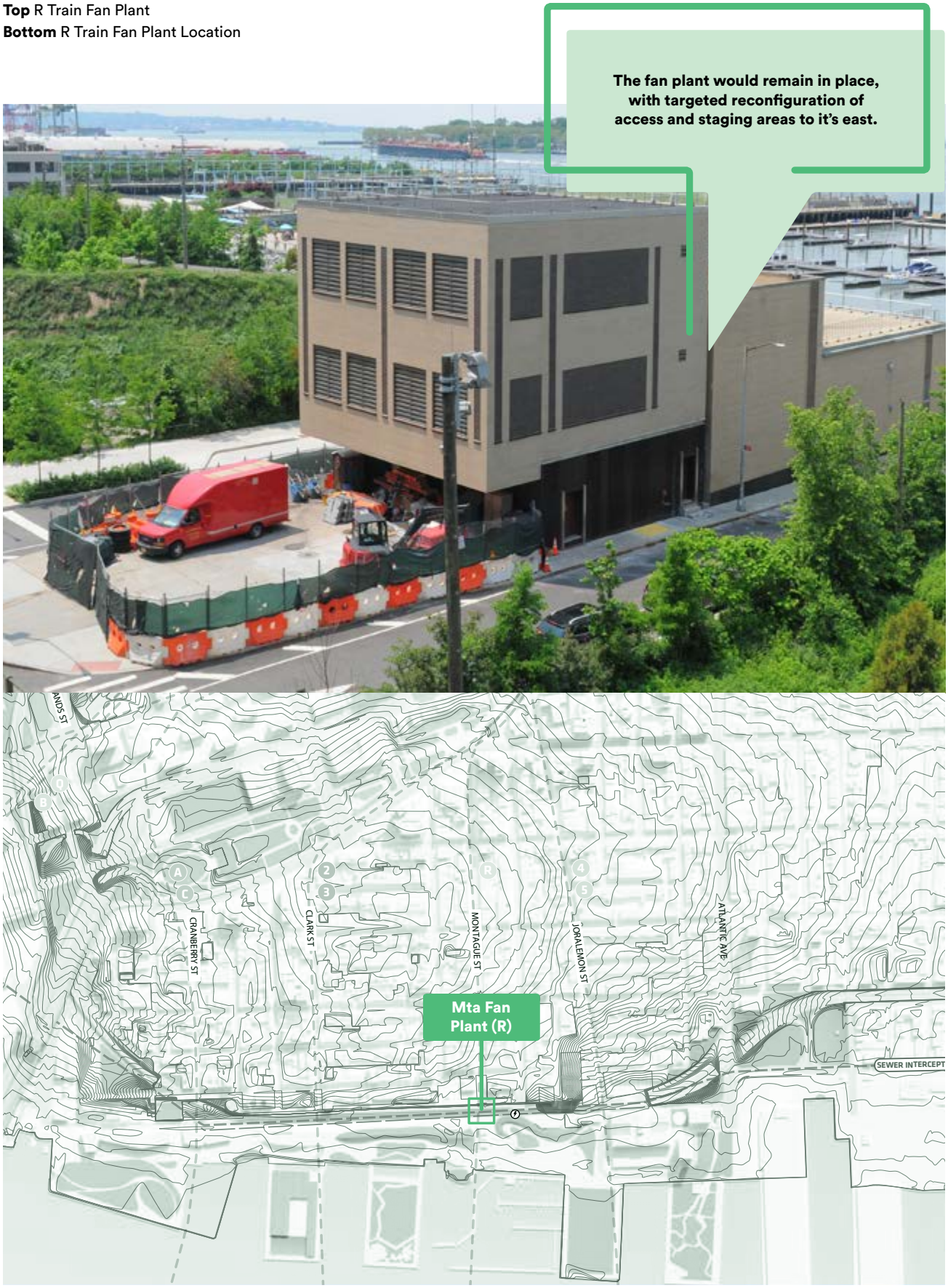

A new accessible connection is created at Montague St., with the relocated MTA Sub-Station at the foot of the slope.
Accessible Connection to Waterfront
Brooklyn Heights Promenade

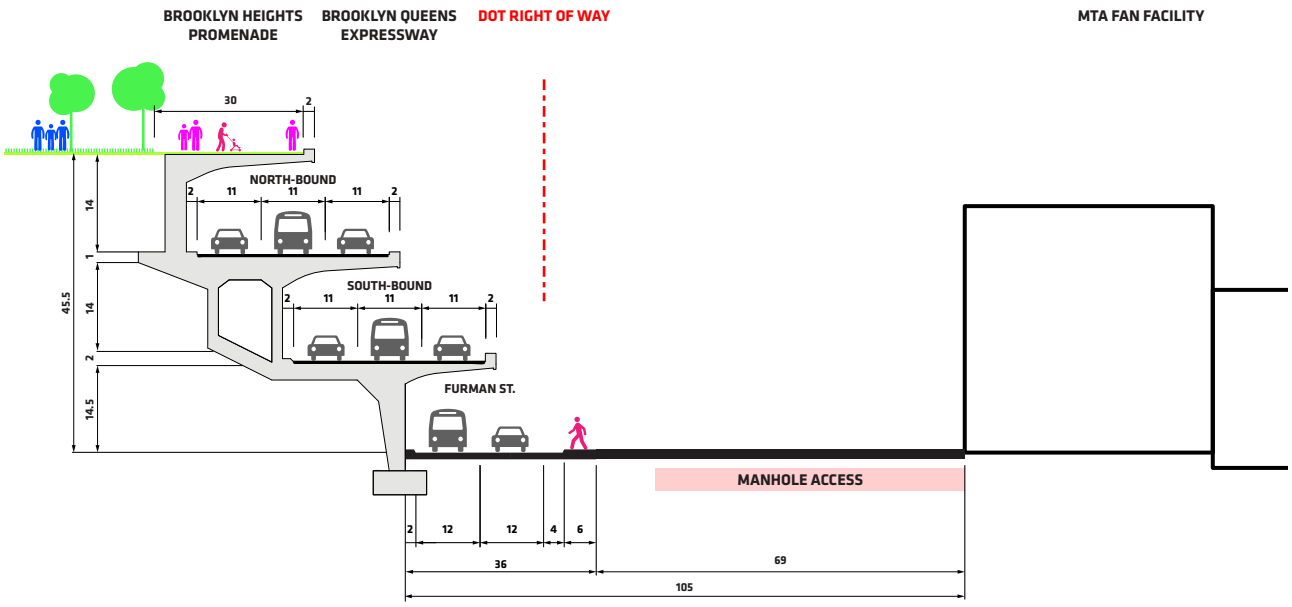
R Train Fan Plant

The R Train has a combination fan plant and sub-station (#5105) along Furman Street at Montague Street. The electrical transmission supplies power to the 3rd rail. The building currently has a large skirt area between it and Furman St. for manhole access and vehicle staging and parking.

The BQP proposal maintains the fan plant in its current location. The roadway would lose its shoulders in order to maintain a portion of the skirt. Manhole access would be maintained both through the roadway and in current locations on the skirt. Additional parking and staging areas could be accommodated to the south of the building.

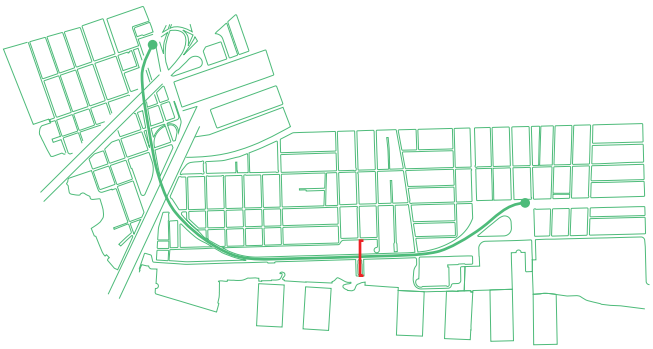
Top R Train Fan Plant
Bottom R Train Fan Plant Location

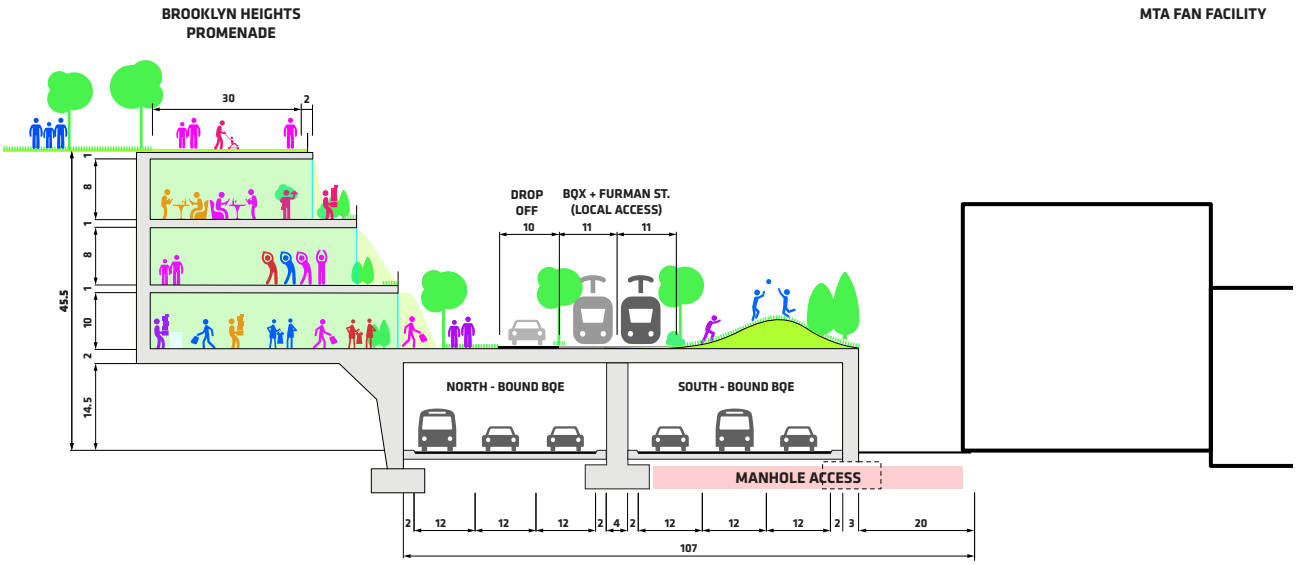




Current Section at R Train Fan Plant

The R train fan plant is 105’ away from the lower wall of the triple cantilever structure. Ducts connected to the facility are accessed through manholes distributed between Furman street and the building.





Proposed
Section at R Train Fan Plant

A 6 lane configuration without shoulders, or 4 lane configuration with shoulders, allows for the plant to remain operational in place. The western portion of the highway structure will need to span approximately 60’ over the underground ducts.

360 Furman Street

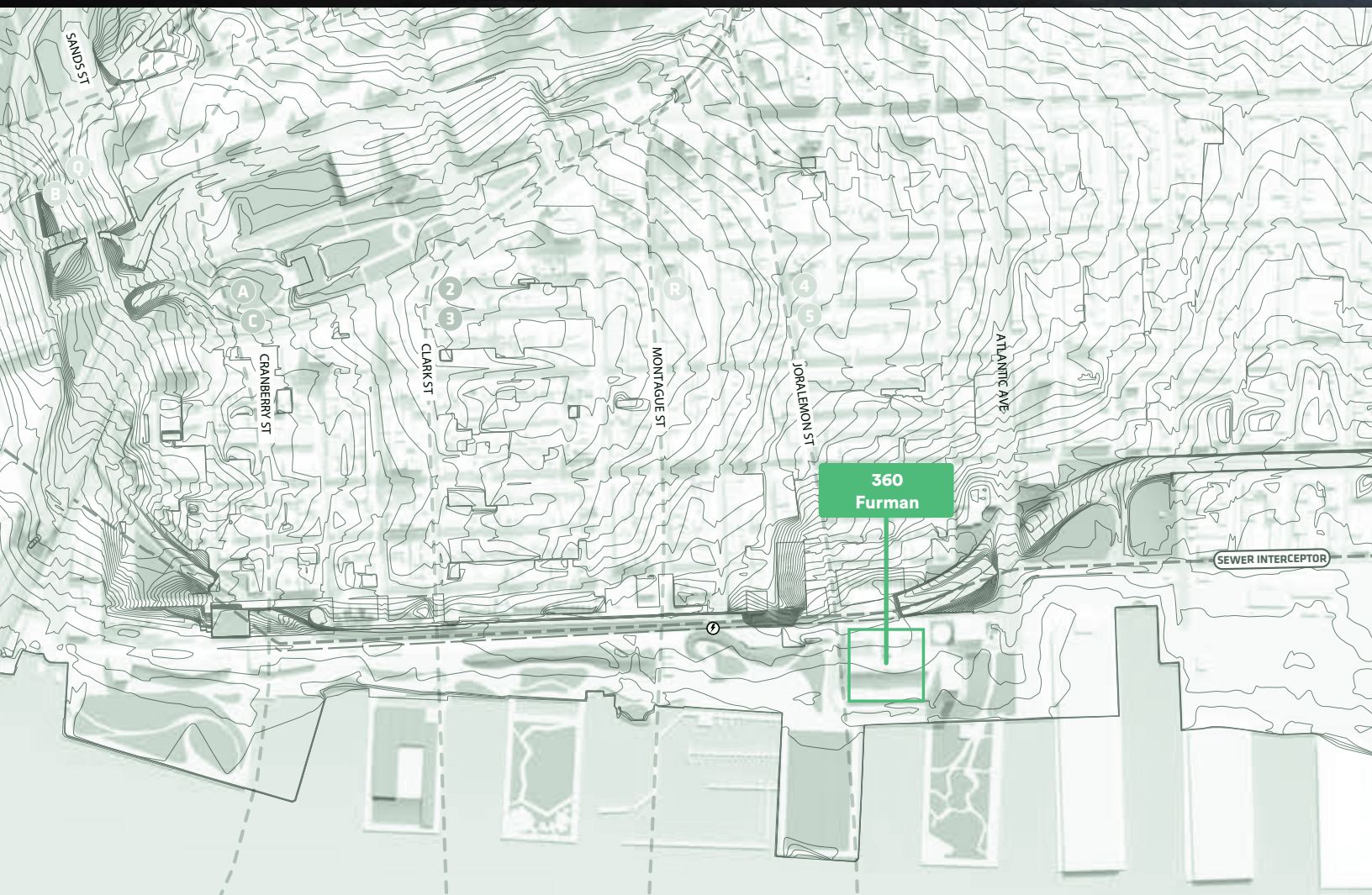
360 Furman Street (also known as One Brooklyn Bridge Park) is a large residential building converted from a 12-story historical warehouse structure. Housing over 1000 residents in 435 units, 360 Furman contains three levels of parking at it's base, and numerous amenities.

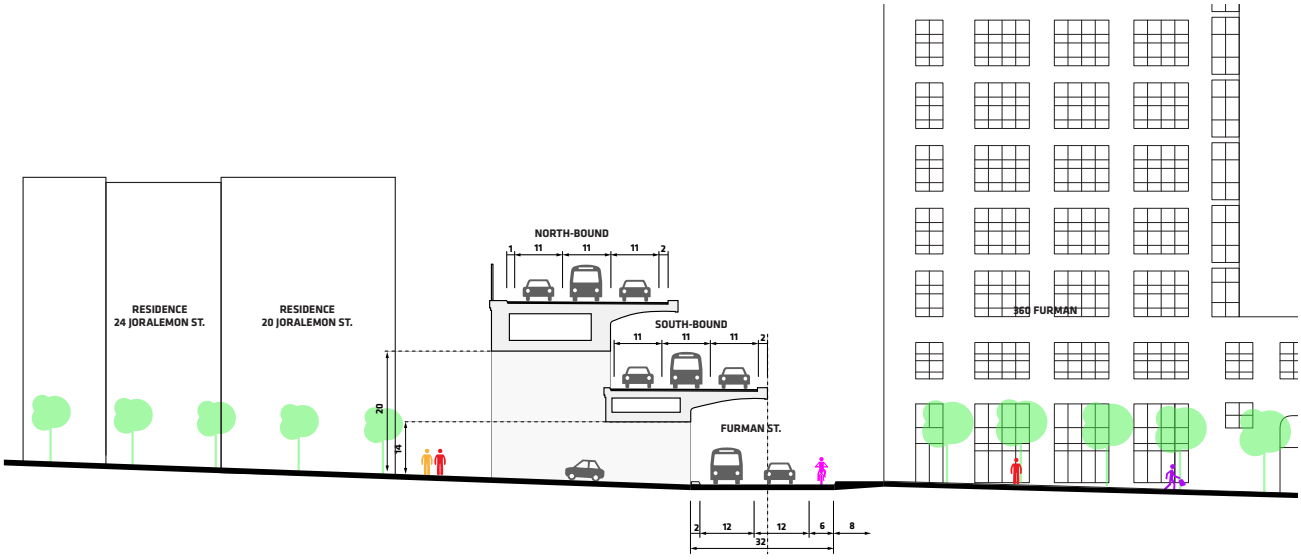
The building has a primary lobby and elevator bank on Furman Street and a wine shop on the corner of Joralemon and Furman Street.

360 Furman currently fronts onto Furman Street and the BQE cantilever. The BQP would bring a park cap on top of a cut-and-cover trench while Furman Street would remain in its current alignment.

During BQP construction, access to 360 Furman would be accommodated via existing entrances to the main lobby at the northern and southern ends of the building.

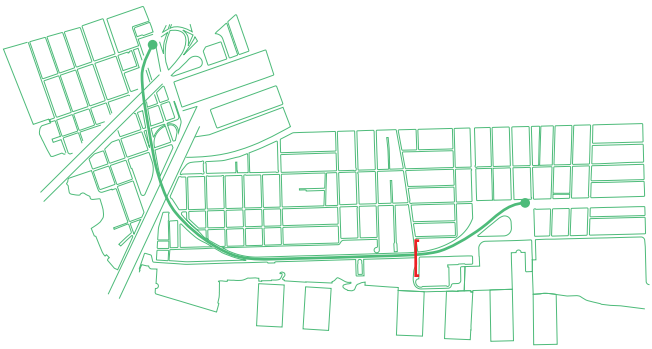
GROUND FLOOR AT 360 FURMAN STREET

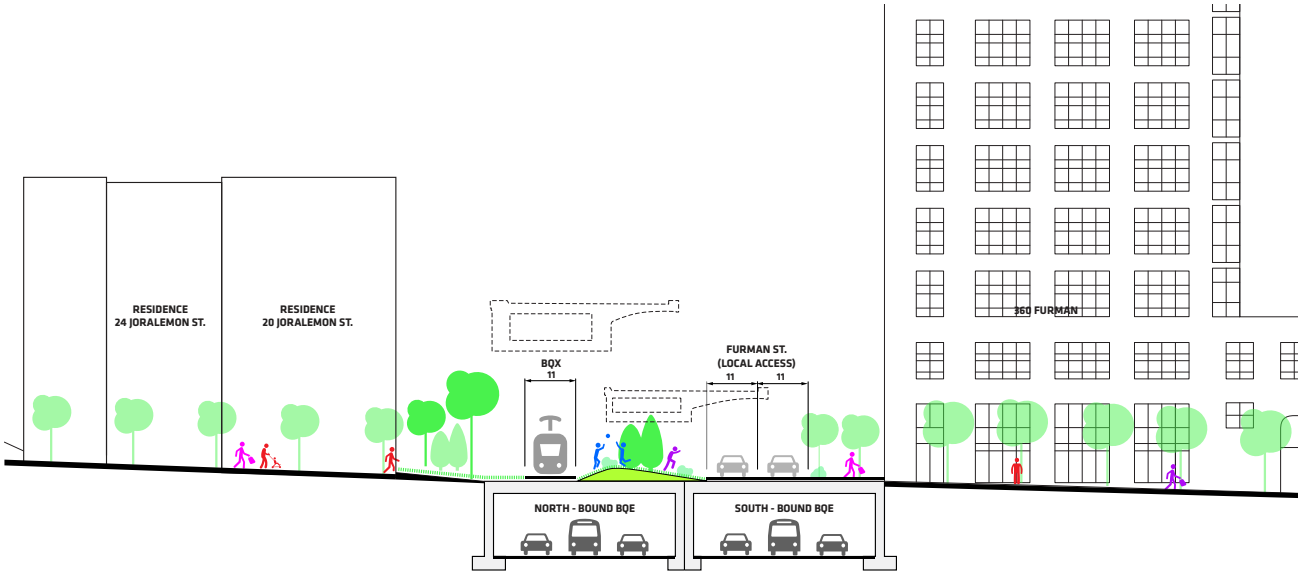




Current
Section at Joralemon Street

The 360 Furman St. building creates one of the more constrained areas along the length of the project area.



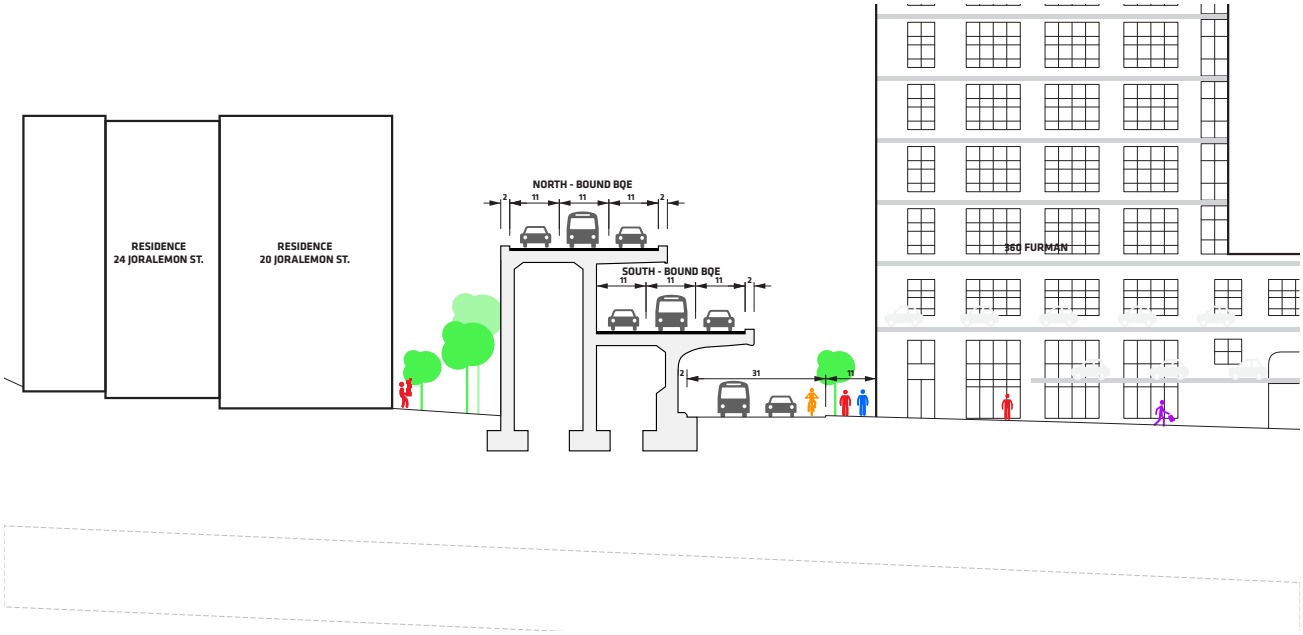


Proposed Section at Joralemon Street

In order to minimize the impact of the new highway on 360 Furman St., the BQE is lowered below current grade. The deconstruction of the cantilever structure would allow for a pleasant street life and dramatically increase the daylight in the lower floors of the adjacent buildings.

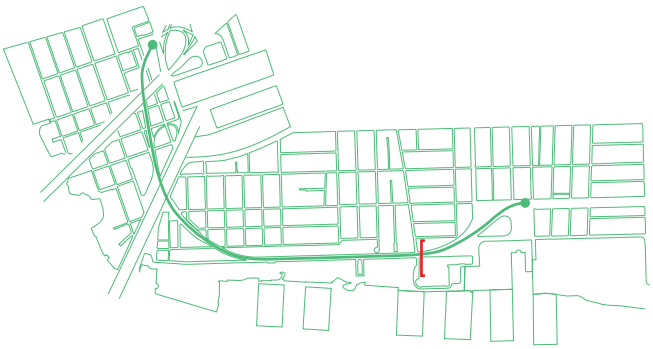

Furman Street Above Submerged BQE
Joralemon St. Park Entry Plaza

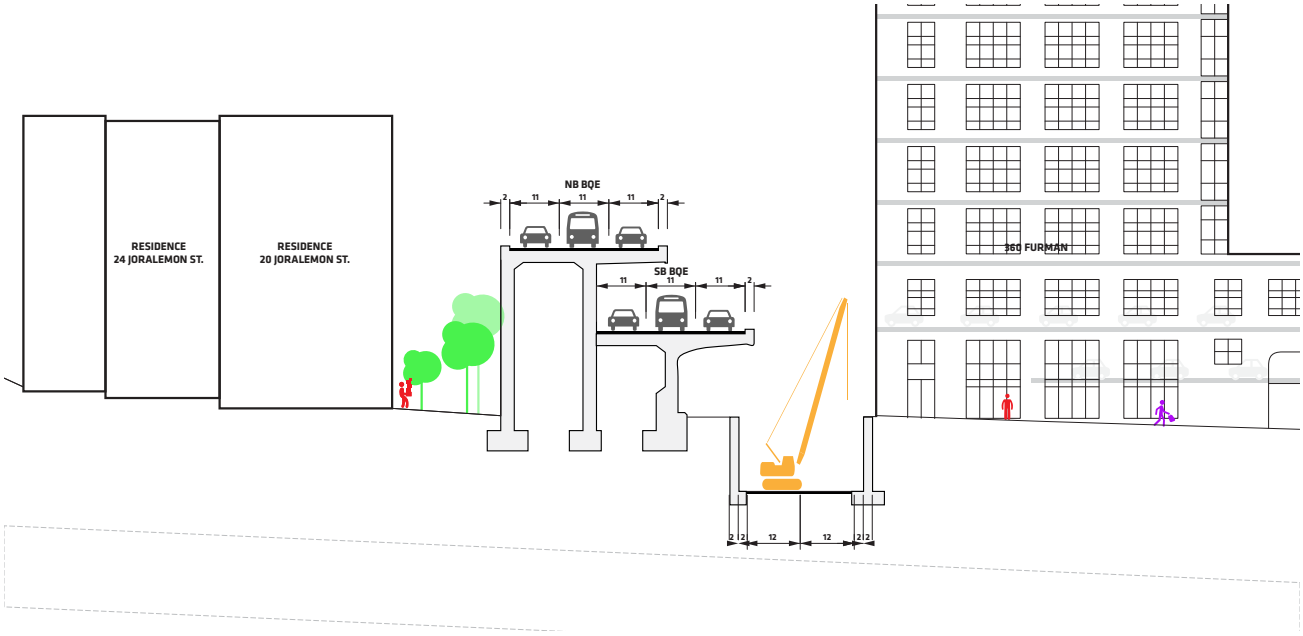

ew Sloping
Lawn
PPNAS



Current Section at 360 Furman

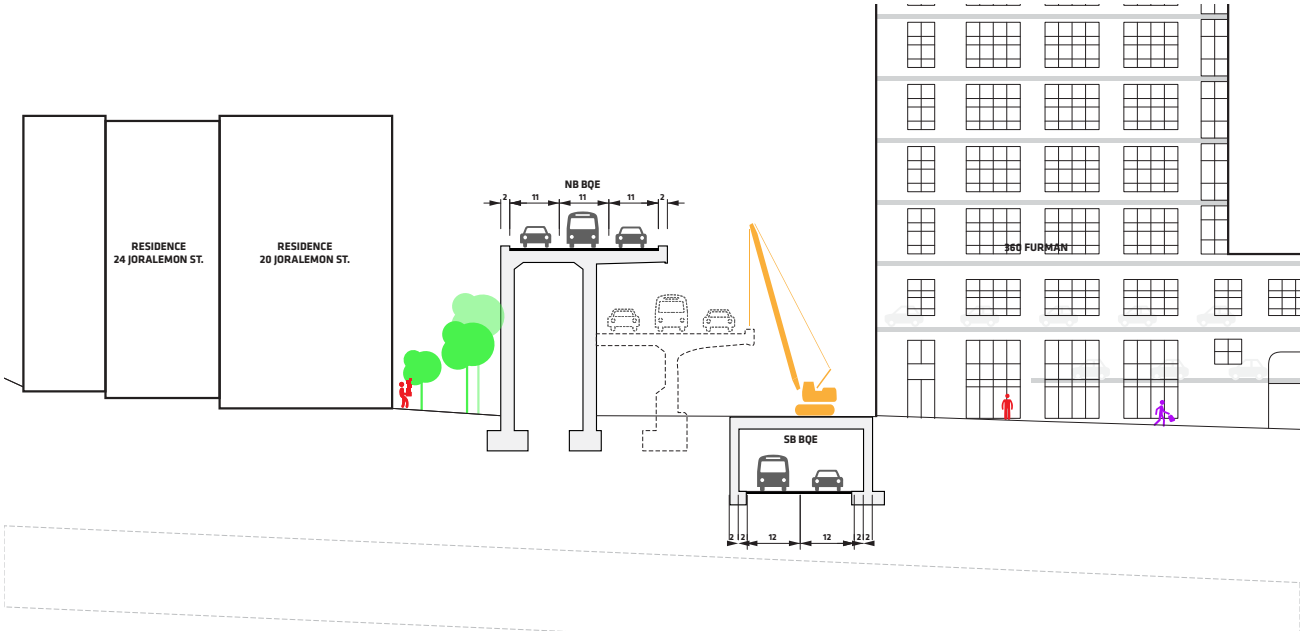
In its current condition, 360 Furman St. and it's main lobby front onto Furman Street under the shadow of the cantilever.





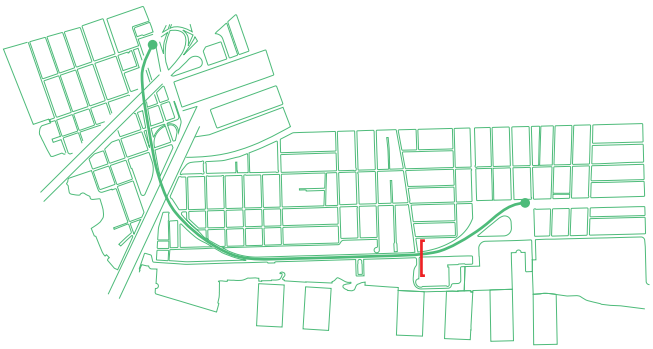
Phase 1
Section at 360 Furman

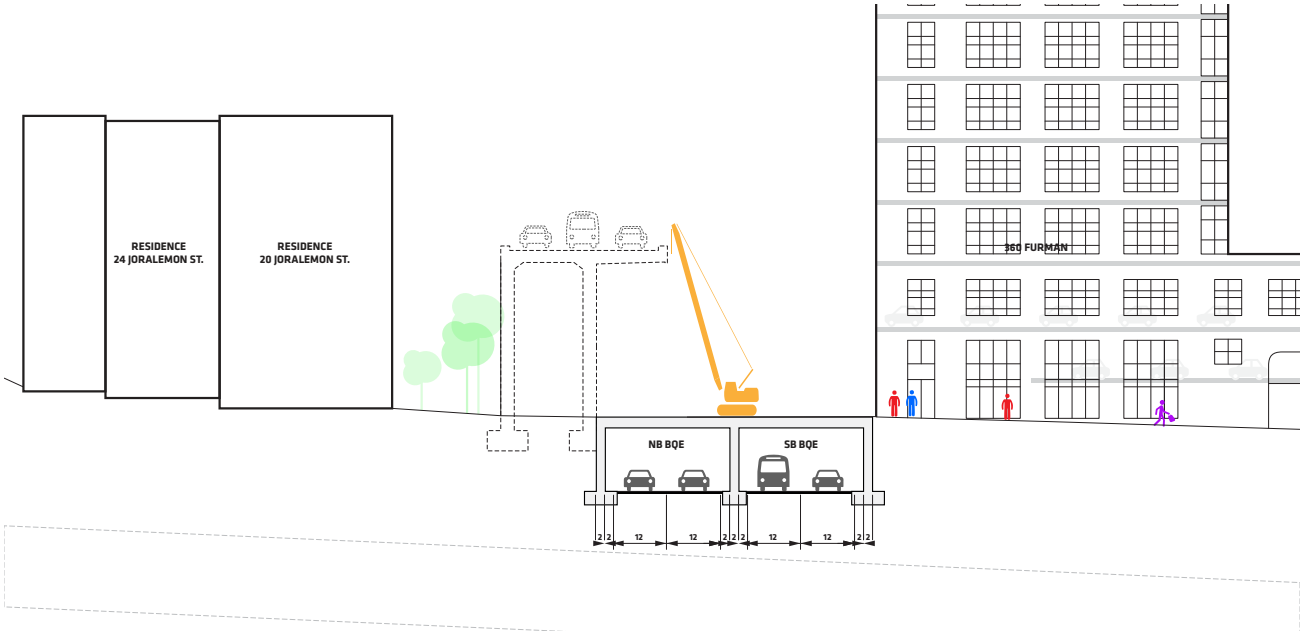
In the first phase of construction, the cantilever roadways remain active in both directions. Furman Street is re-routed and the first two lanes of the cut and cover trench are dug. During the first phase of construction, access to 360 Furman is maintained via existing side entrances at the north and south ends of the building.



Phase 2
Section at 360 Furman

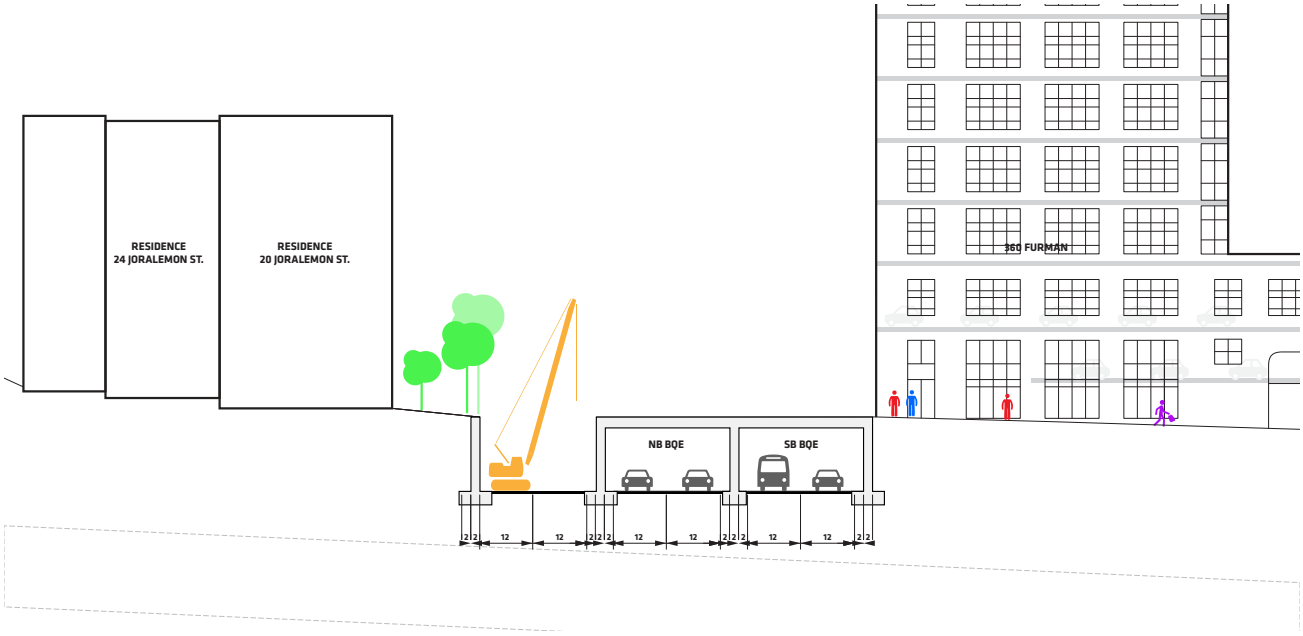
In the second phase of construction, the first portion of the cut-and-cover trench is completed and south-bound traffic is reduced to two lanes routed to the new trench. North-bound traffic remains active on the upper cantilever, with approriate shoring. The lower cantilever is deconstructed and work begins on the second cut-and-cover trench. Access to 360 Furman St. is maintained via a temporary bridge across Joralemon St.





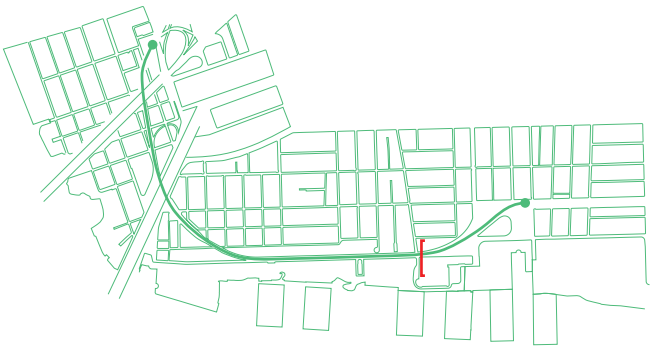
Phase 3
Section at 360 Furman

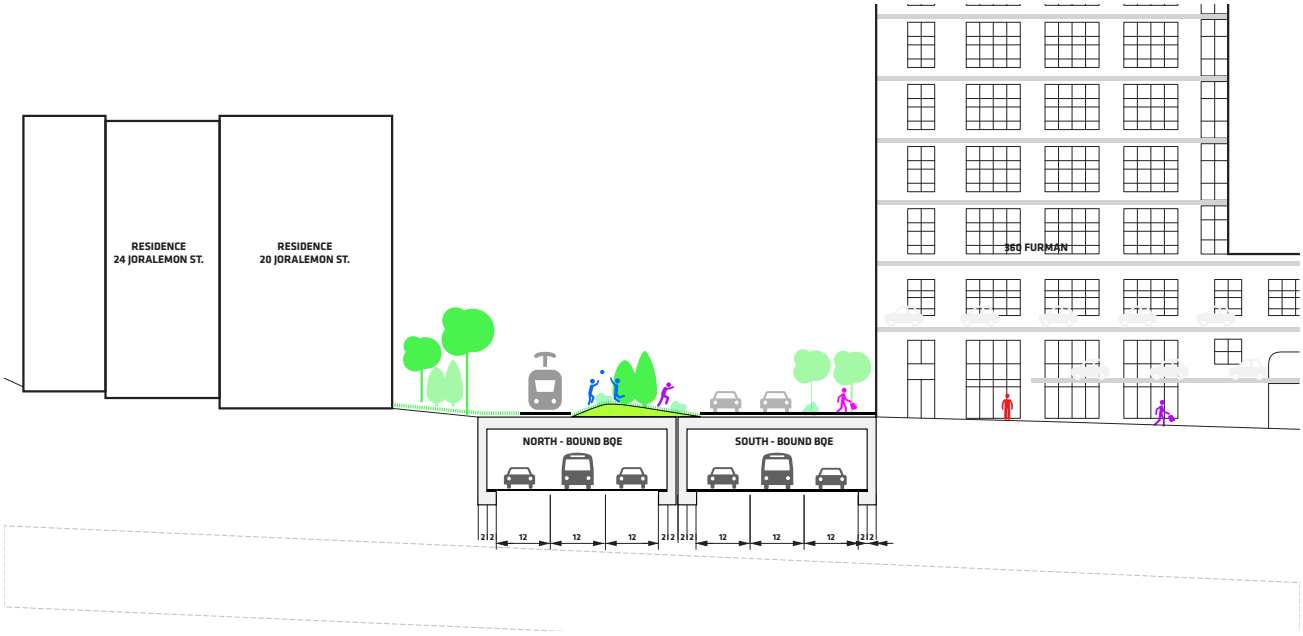
In the third phase, north-bound traffic is reduced to two lanes and routed through the newly completed, second cut-and-cover trench. The upper cantilever is deconstructed. Access to 360 Furman returns to the Furman Street entrance via a protected walkway.



Phase 4
Section at 360 Furman

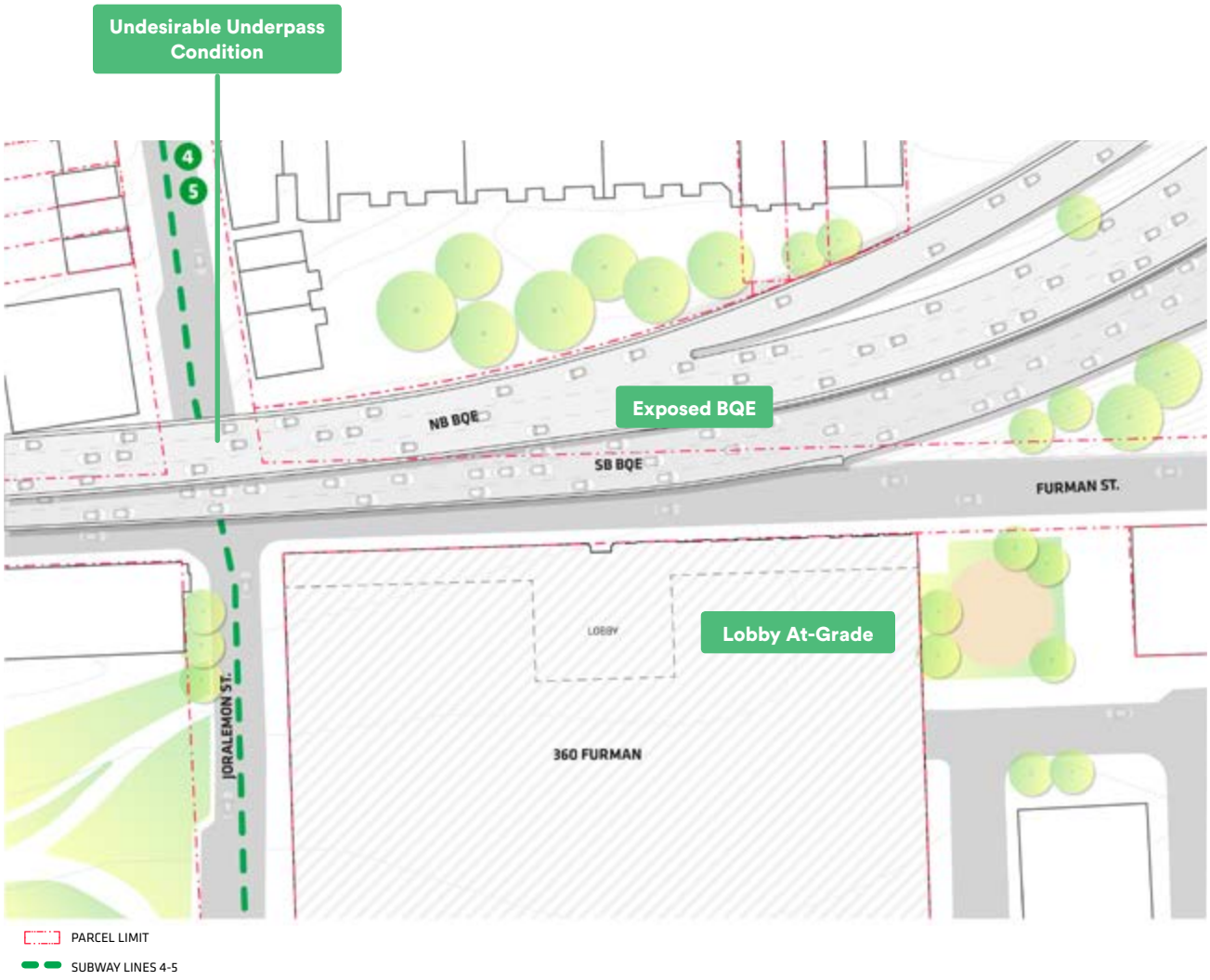
In the fourth phase, if 6 lanes are required, a third cut-and-cover trench is constructed to bring the trench to its full capacity.





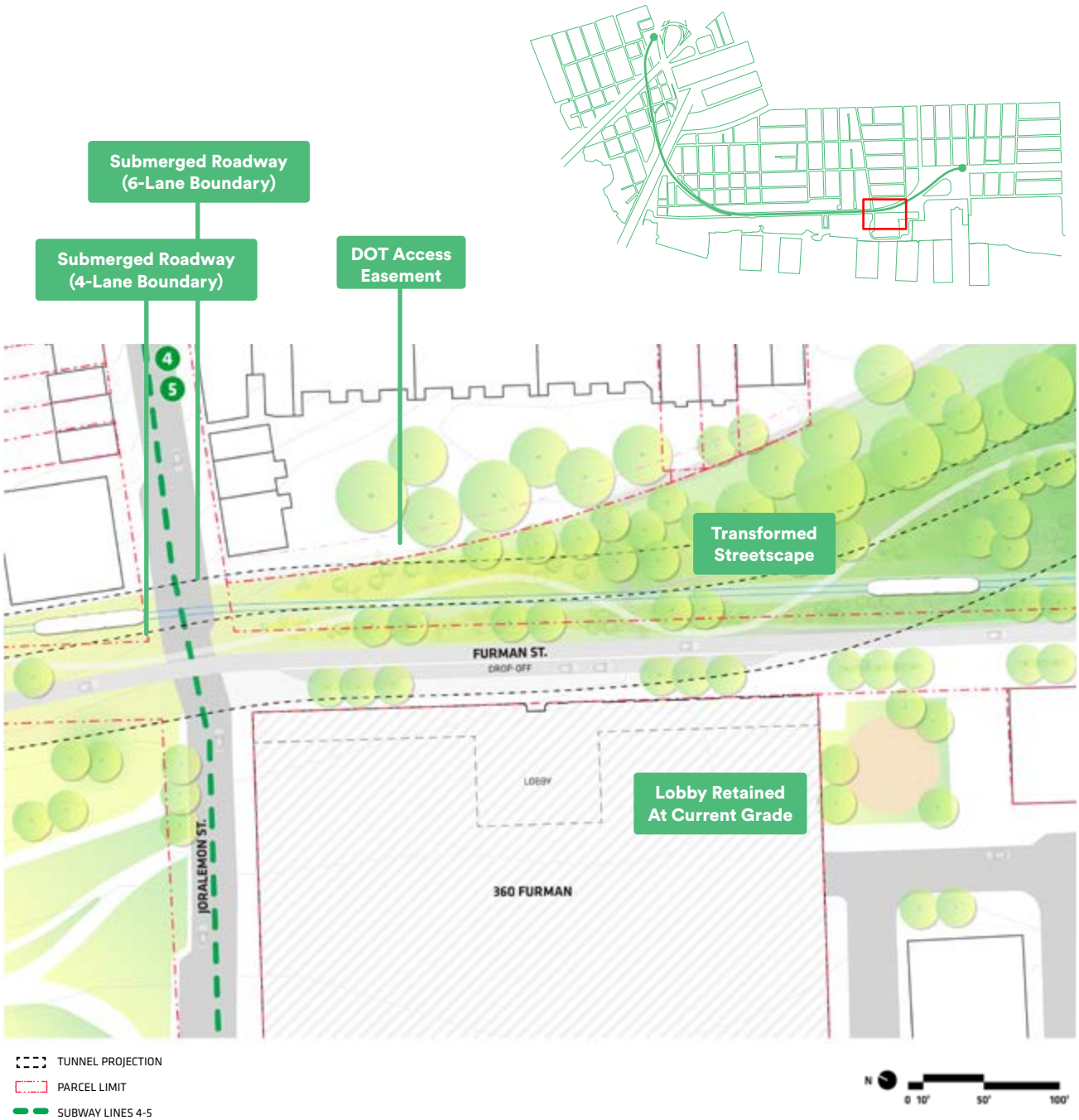
Proposed Section at 360 Furman

In the final phase, traffic capacity increases to three lanes in both directions. The park cap is built out to accommodate Furman Street with additional space to add a potential BQX spur and linear park.



Plan - Existing Conditions 360 Furman St.

6 lanes of exposed traffic currently encumbers the eastern edge of 360 Furman St. An at-grade lobby is accessed on the eastern face, with side entrances on the northern and southern faces of the building.



Plan - Proposed 360 Furman St.

A submerged BQE would have a transformative effect on enviromental quality for 360 Furman St., and on the gateway to Brooklyn Bridge Park along the Joralemon St. corridor.

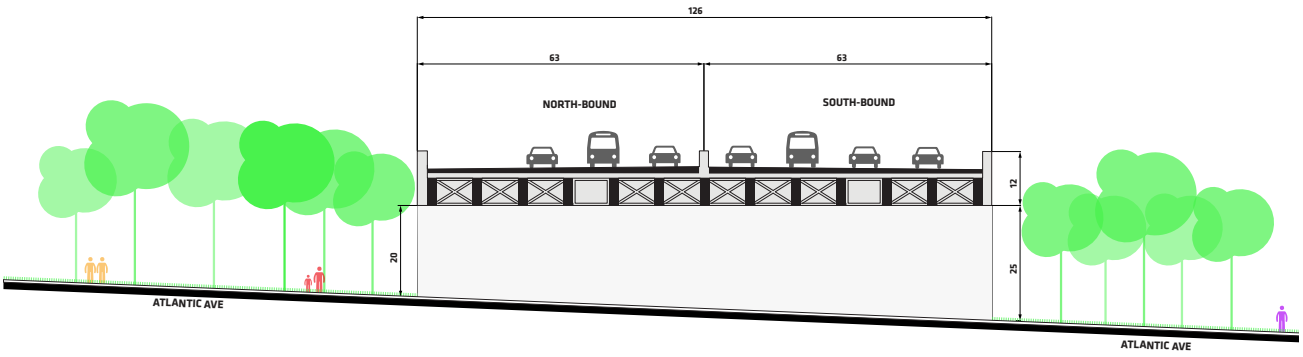
Atlantic Avenue

Atlantic Avenue serves as a major commercial corridor that connects Brooklyn Heights, Cobble Hill, Boerum Hill and Downtown Brooklyn, serving the larger Brooklyn community. It terminates at its western end with a major entrance to Brooklyn Bridge Park.

In its current state, the Atlantic Avenue stretch of the BQE presents a complicated set of on- and off-ramps, elevated highway and at-grade road crossings. Pedestrian and bicycle movement is challenging, unclear, and dangerous. The on- and off-ramps end in awkward locations that result in speeding vehicles and occasionally overturned trucks.

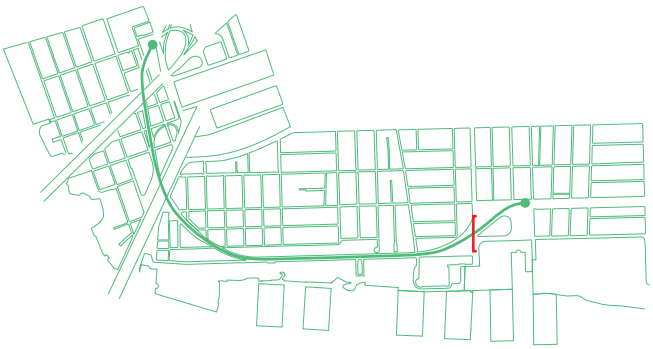
The BQP presents an opportunity to consolidate and reorganize vehicle traffic while also increasing urban safety and comfort; and to create a more welcoming entrance to Brooklyn Bridge Park. At Atlantic Avenue, the BQP buries the north and south bound roadways at the same elevation as the Cobble Hill Trench. Newly configured on- and off- ramps simplify vehicular access to the BQE and enhance safety. A cap over the buried roadways creates more continuous swaths of open space and unlock opportunity zones for building community amenities, and an ideal location for any revenue generating uses if necessary.

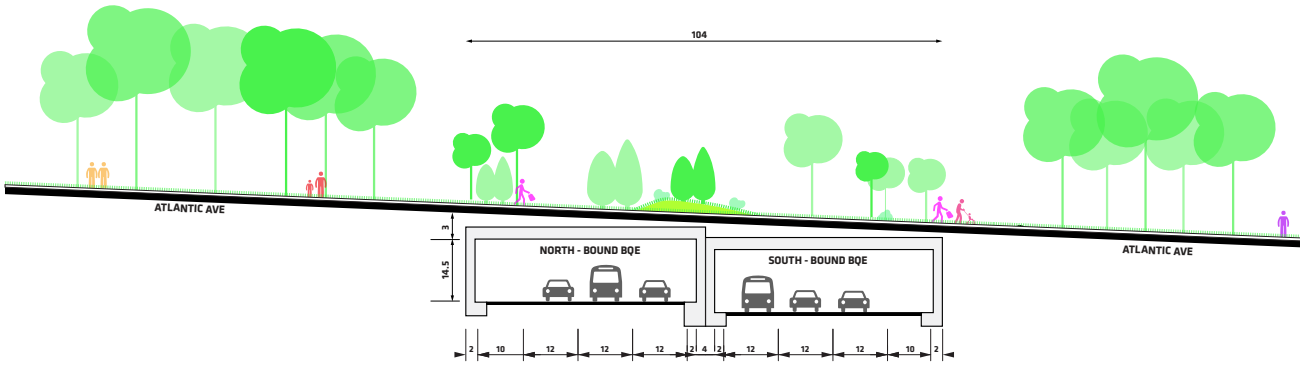
ATLANTIC AVENUE



Current Section at Atlantic Avenue

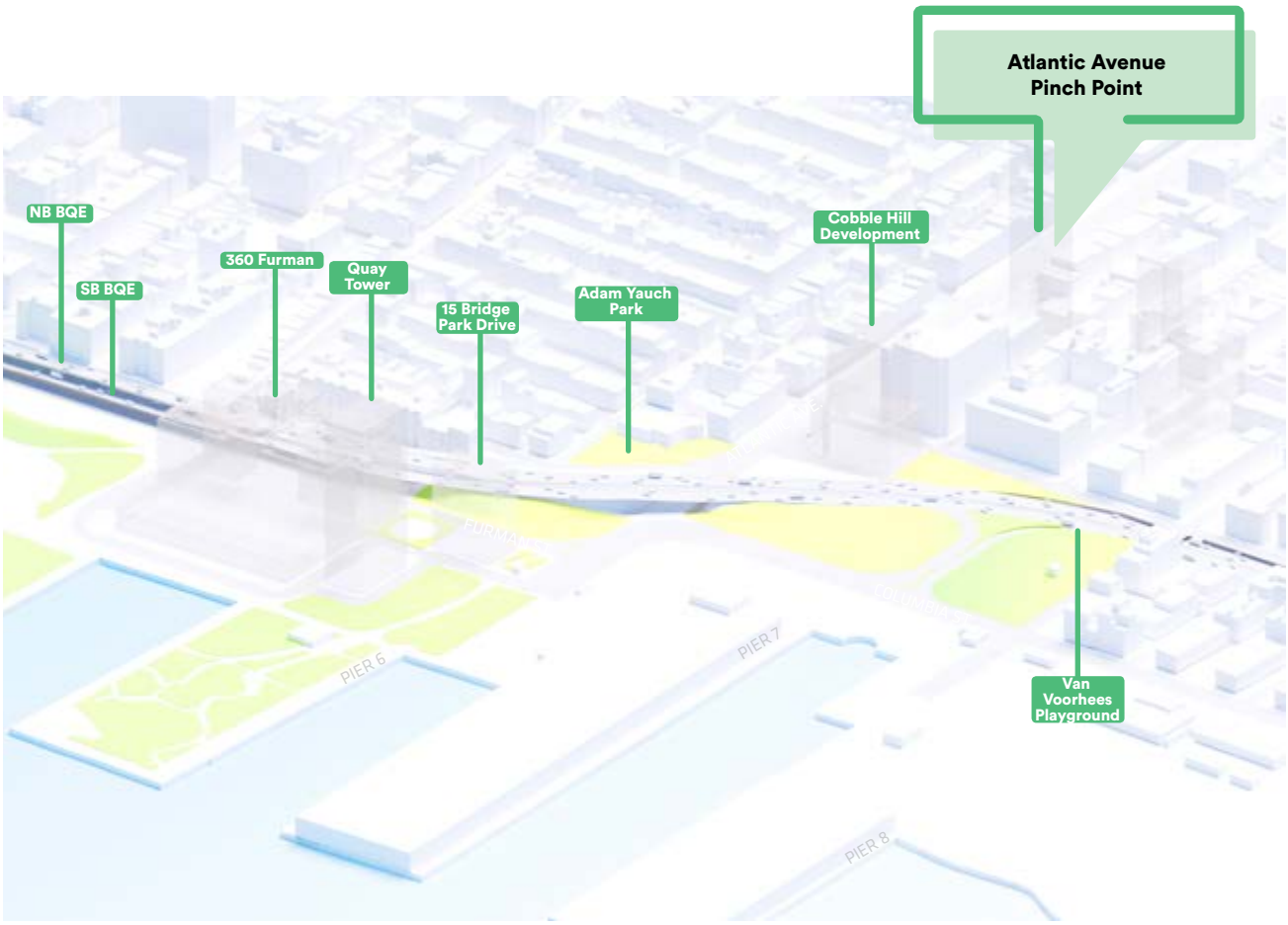
The current BQE roadway bridges above Atlantic Avenue, weakening the pedestrian connection between the neighborhood and the waterfront.





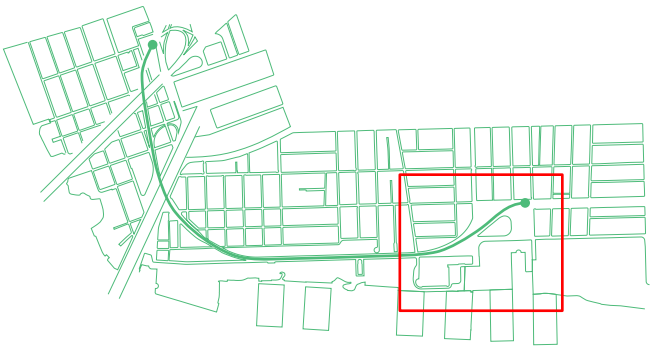
Proposed Section at Atlantic Avenue

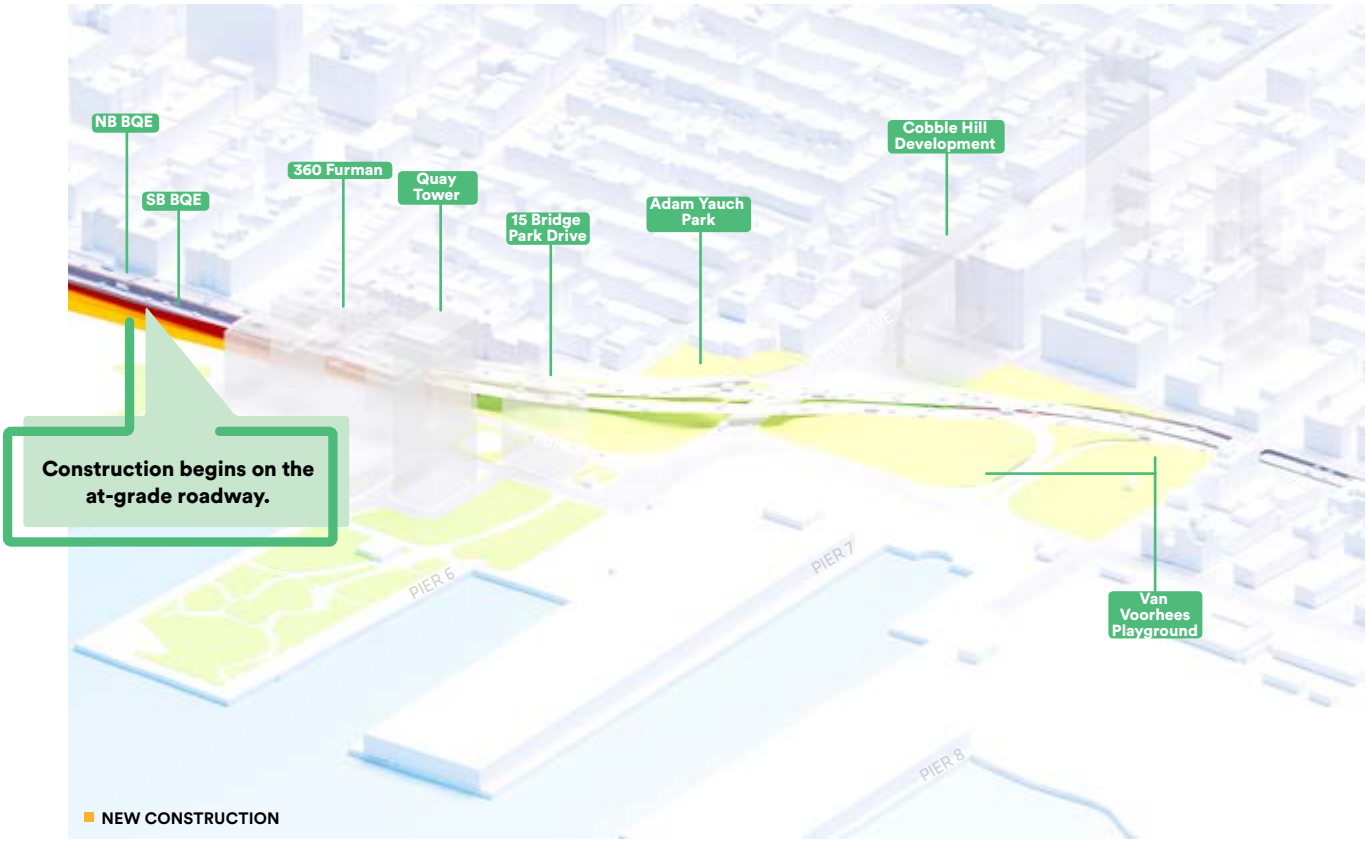
The relocation of the BQE underground allows for a transformation of the pedestrian experience and a seamless transition from the Atlantic Avenue commercial corridor to the waterfront.



Current Atlantic Avenue

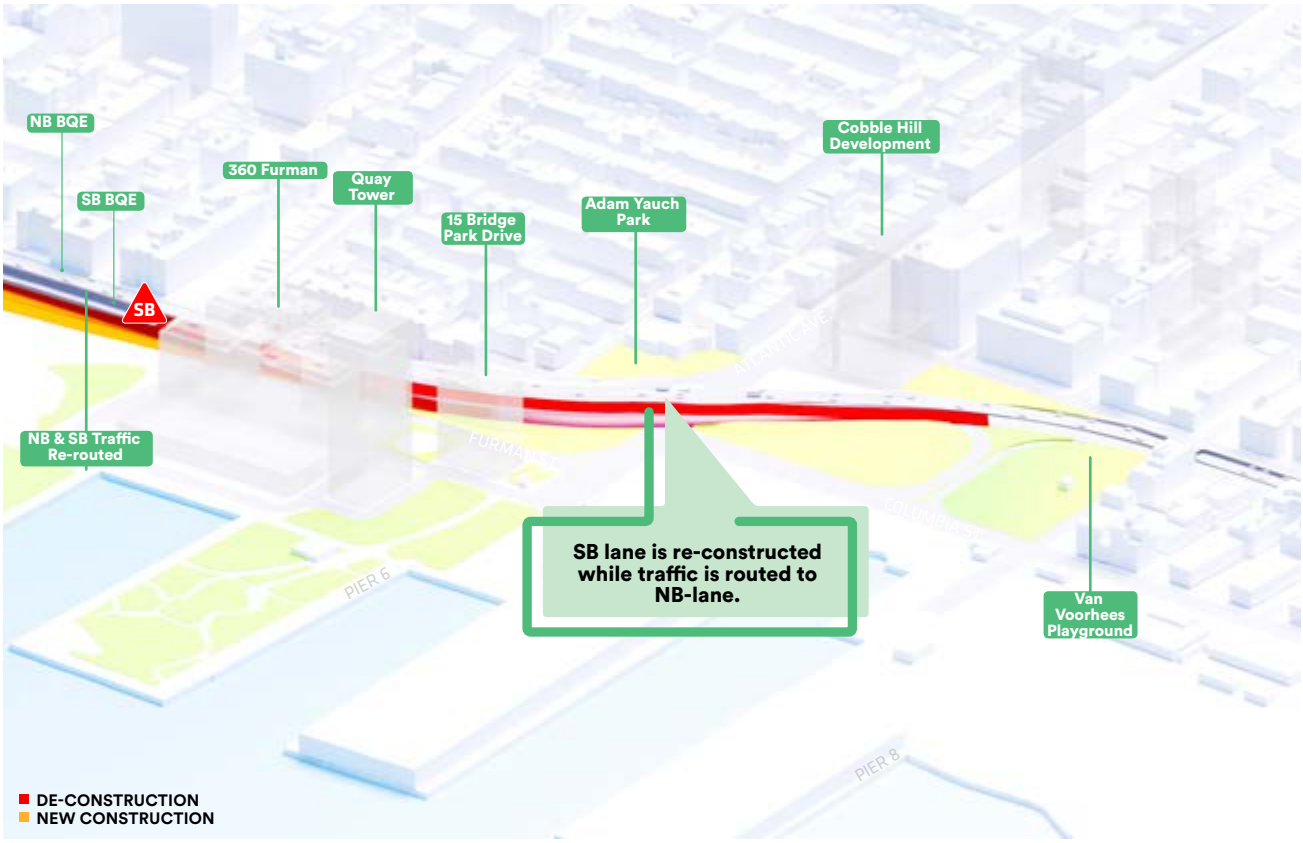
The existing BQE presents a snarl of dangerous mixing zones around Atlantic Avenue. Pedestrians are confronted with speeding vehicles as they race on to or off of the BQE. While existing park space is significant in area, it is fragmented and unusable where there are dramatic grade changes.





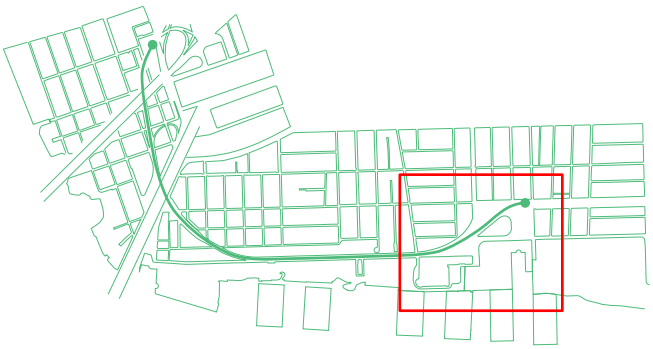
Phase 1
Atlantic Avenue

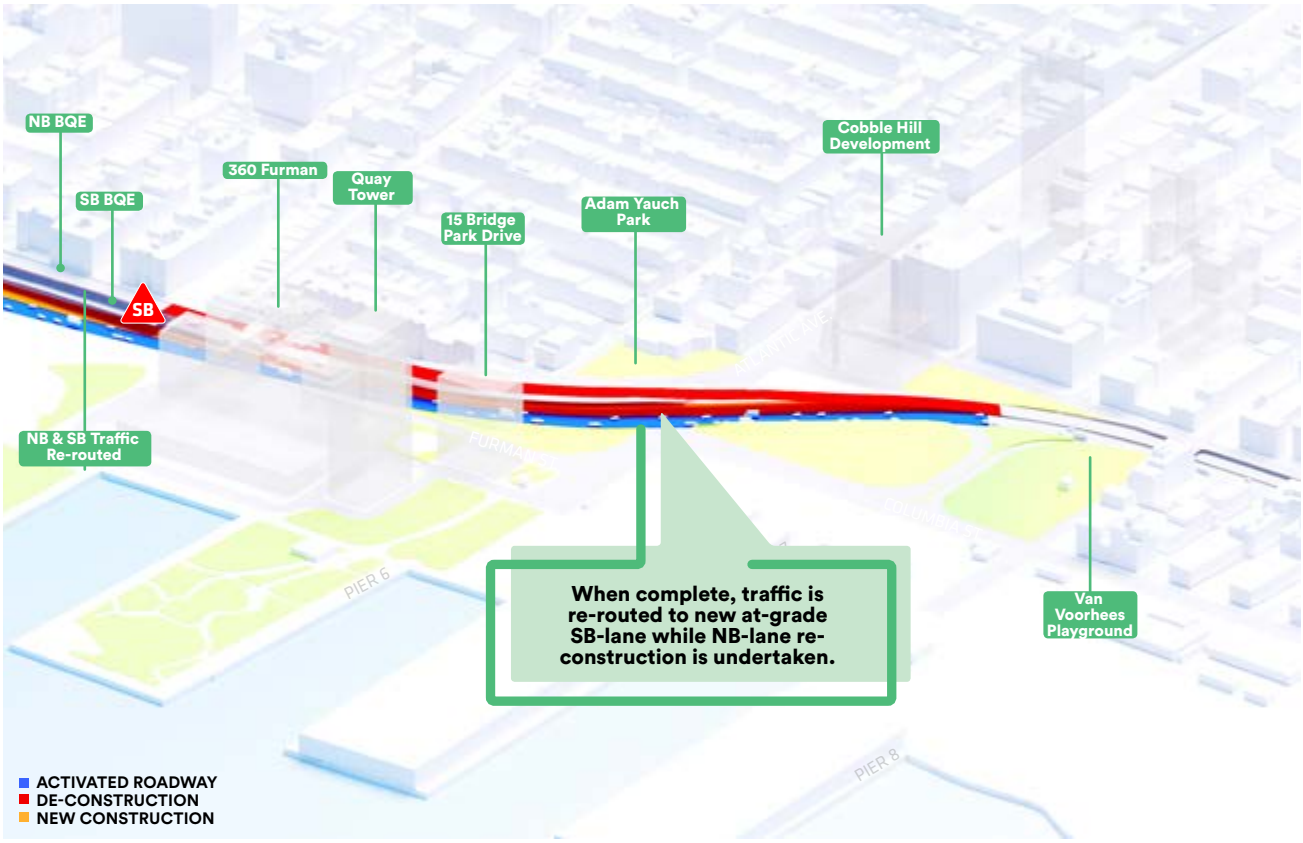
In the first phase, traffic is maintained on the existing cantilever in both north-bound and south-bound directions while the new BQE roadway is constructed along Brooklyn Bridge Park. The trench for the roadway is dug in sections from west to east in front of 360 Furman.



Phase 2
Atlantic Avenue

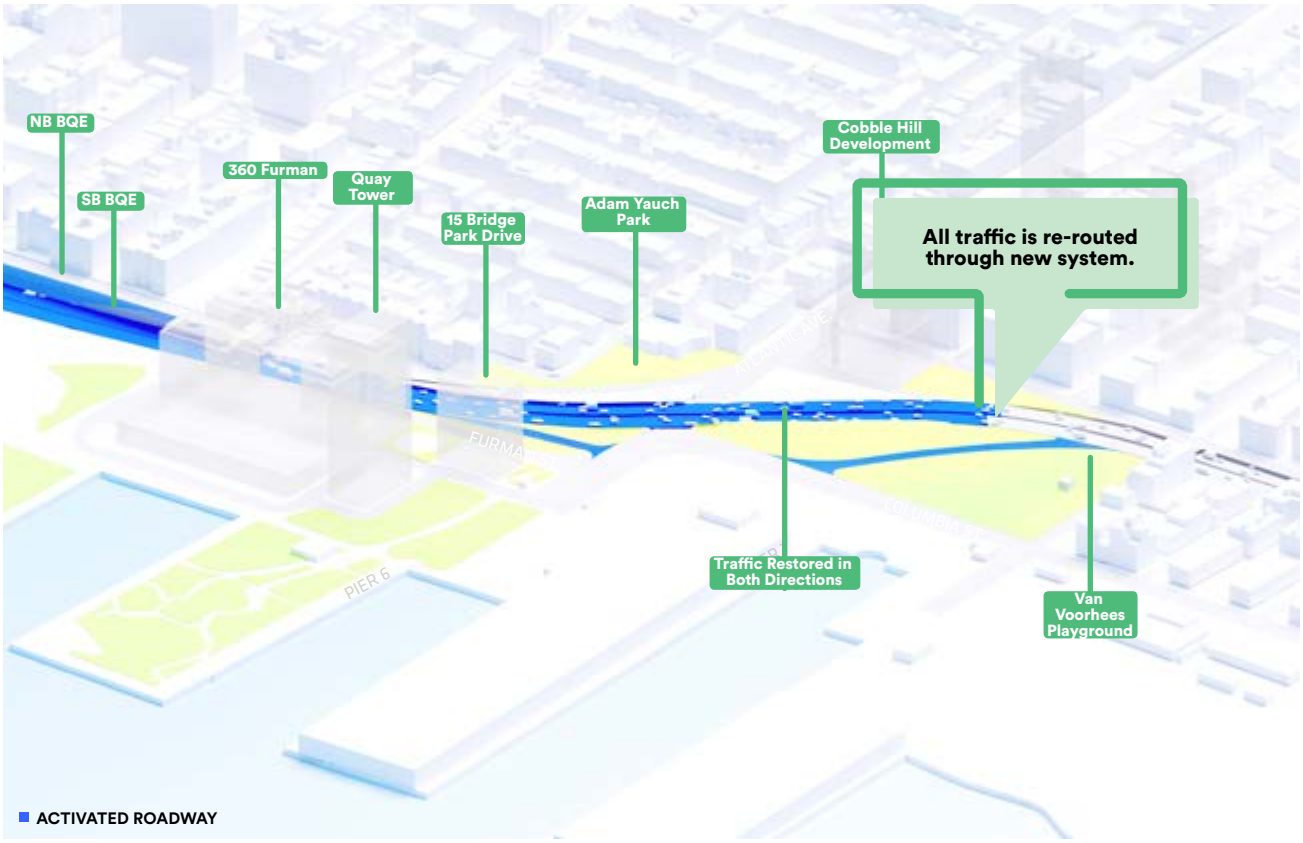
In the second phase, the first portion of the below ground trench is constructed, and a portion of the south-bound lane is brought offline. Structure is deconstructed between Joralemon and the depressed Cobble Hill Trench. North-bound traffic continues to run on the existing north-bound cantilever. South-bound traffic is reduced to 2 lanes and routed to the newly constructed trench.





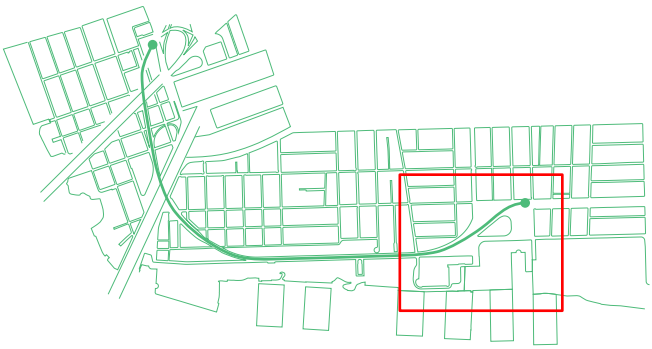
Phase 3
Atlantic Avenue

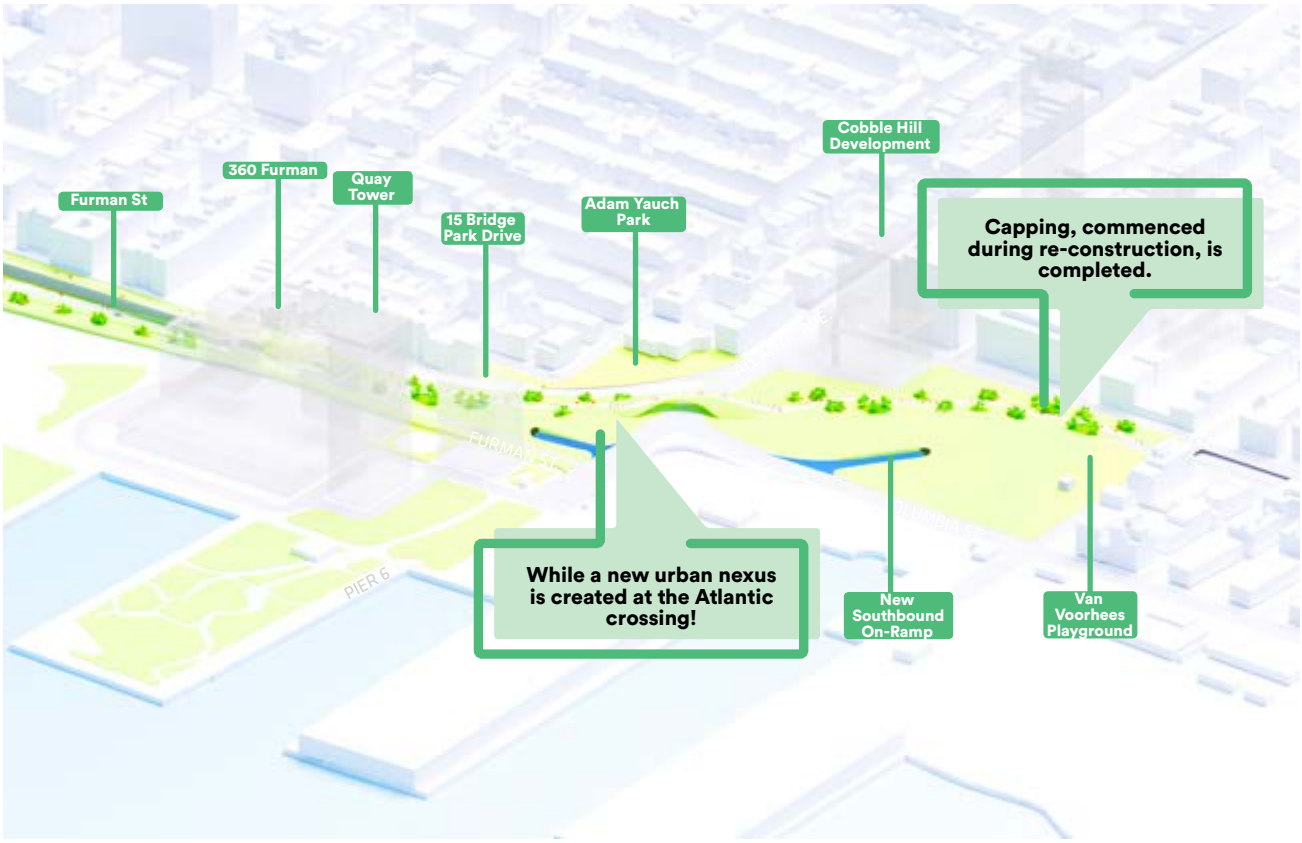
After the lower cantilever is deconstructed, the second portion of the trenched roadway is constructed, adding 2 more lanes to the cut-and-cover roadway. When these lanes are completed, they are brought online and north-bound traffic is reduced to 2 lanes and re-routed to this new trench section. The upper cantilever is deconstructed from Joralemon Street to where it meets the Cobble Hill trench near Van Voorhees Playground.



Phase 4
Atlantic Avenue

The third section of the below grade trench is constructed to meet the Cobble Hill Trench. In parallel, new entrance and exit ramps are constructed to meet the lower roadway. 3 lanes of traffic in both south- and north-bound directions resume operation.





Proposed Atlantic Avenue

Work continues on the roadway cap to add soil, vegetation, and programming. What is currently a fragmented patchwork of parkland becomes a continuous greenspace connecting Cobble Hill to the waterfront.


From DUMBO to Red Hook
In conjunction with a future capping of the Cobble Hill trench, the BQP would create the beginnings of a linear park, stretching 2.4 miles from DUMBO to Red Hook!

2.4


Brooklyn Bridge
Downtown Brooklyn
Brooklyn Heights
Atlantic Avenue
MILES
Cobble Hill
Columbia Street Waterfront District
Carroll Gardens
Redhook

Columbia Heights

COLUMBIA

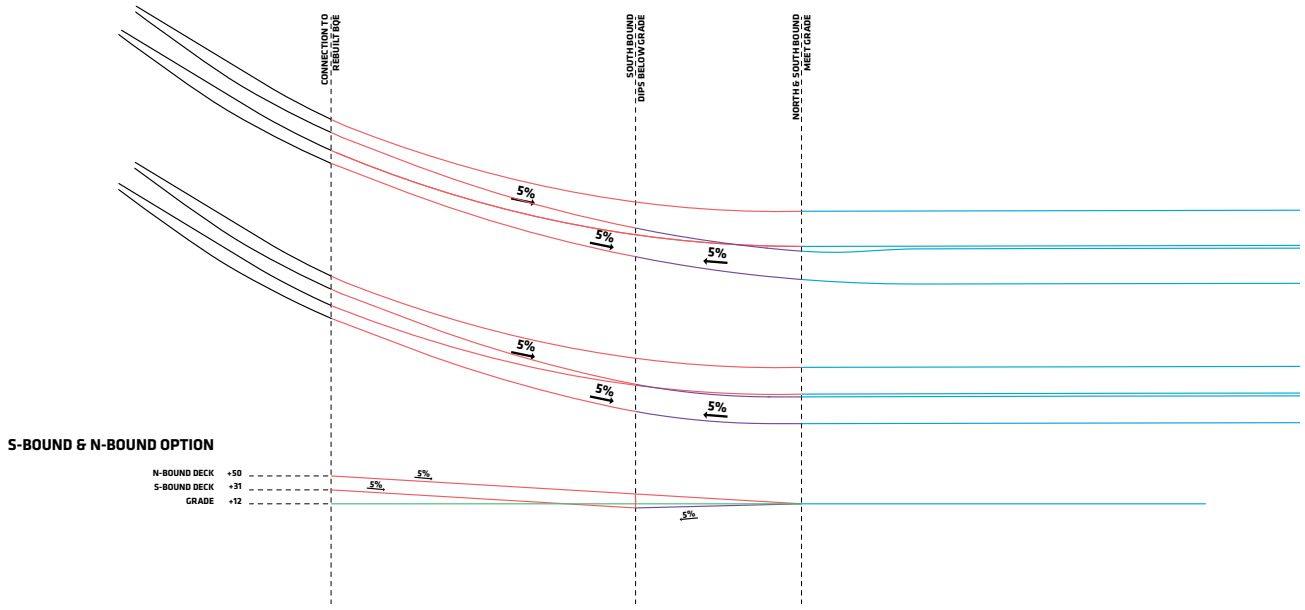
At the northern end of the project area, the BQE runs through the Columbia Heights pinch point. Here, the roadway begins to pick up grade as it rises to pass over Old Fulton Street and under the Brooklyn Bridge. As it does so, it squeezes between an MTA fan plant (for the A/C train) and Brooklyn Heights before passing under the Columbia Heights Bridge. As it moves through the pinch point, the north- and south- bound lanes begin to stack vertically.

The BQE roadway bends to the east as it moves north, allowing the new Furman Street to drop down to existing grade along 130 Furman St.

Given the opportunity to reconstruct the Columbia Heights Bridge, DOT would like to reconfigure the abutments from their current angled alignment into 90-degree abutments. This reconstruction would involve re-grading the embankment and re-siting the diagonal expansion joints with shallow perpendicular beams.

Reconstructing the Columbia Heights Bridge would also open up the potential to increase vehicular clearance by lowering the roadway elevation.

The BQP scheme defers to DOT's lane-by-lane reconstruction method for this area, and accommodates federal standards for clearances and turning radii in roadway geometry to the south of Columbia Heights Bridge, as illustrated below:



Columbia Heights Roadway Geometry

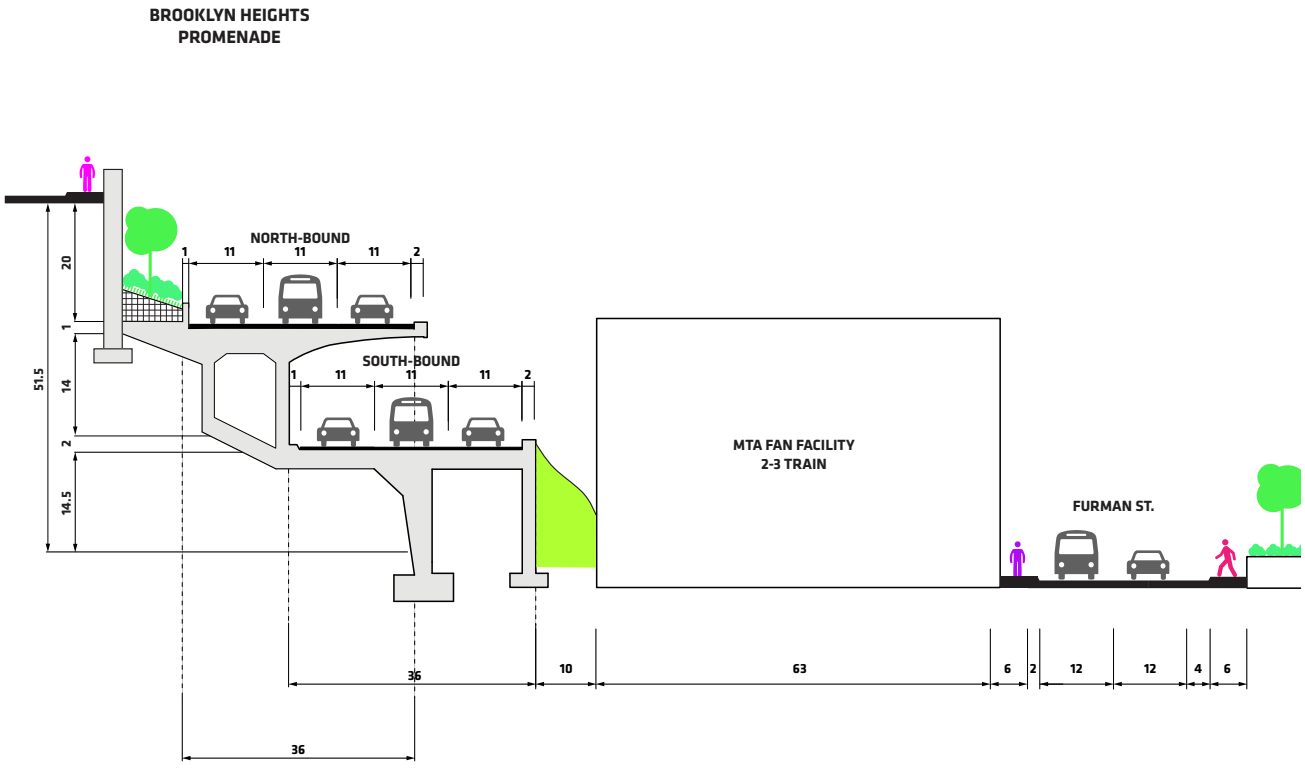
VIEW OF THE COLUMBIA HEIGHTS BRIDGE FROM THE NORTH OF THE PROMENADE


BQP Roadway Cap
Reconstructed Furman Street
KBJ 560

A/C Train Fan Plant

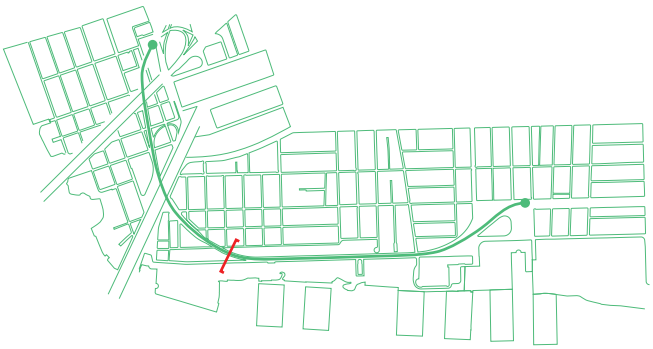
The A/C Train vents to a fan plant (#6332) on the eastern side of Furman Street at Cranberry Street. The building sits on the embankment between the current BQE roadway and Furman Street. The BQP maintains the fan plant in place. Ventilation is currently located on Furman Street, so that grade changes at the eastern edge of the building will not impact the functioning of the fan plant.

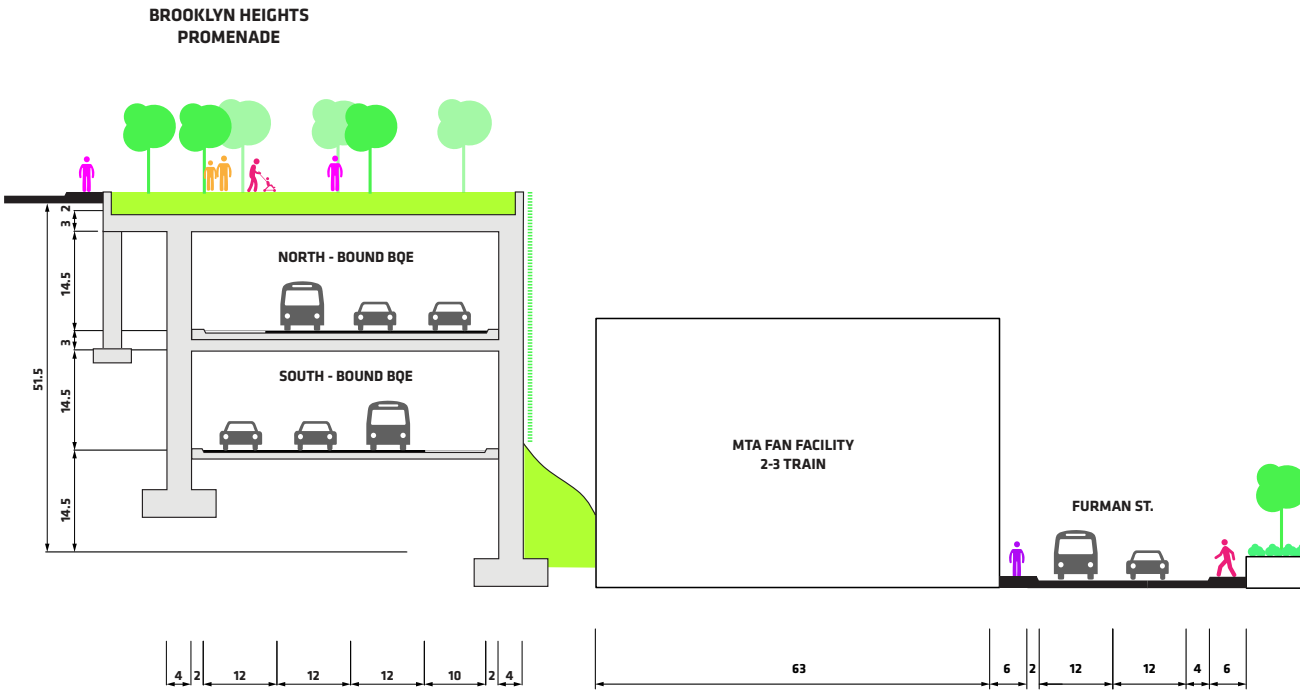
Top A/C Train Fan Plant Seen From Columbia Heights
Bottom Fan Plant Location



Current
Section at MTA A/C Train Fan Facility

The portion of the BQE located between the Columbia Heights bridge and MTA A/C Fan Facility is one of the major pinch-points within the project area.





Proposed
Section at MTA A/C Train Fan Facility

The proposed configuration for the BQE at this location is a double decker structure which allows for the Park to extend north towards the Brooklyn Bridge. The fan facility remains untouched. By enclosing the highway, adjacent air quality and noise levels will be dramatically improved. The new structure negotiates the elevation transition between the roadway elevations at old Fulton street and Furman street.

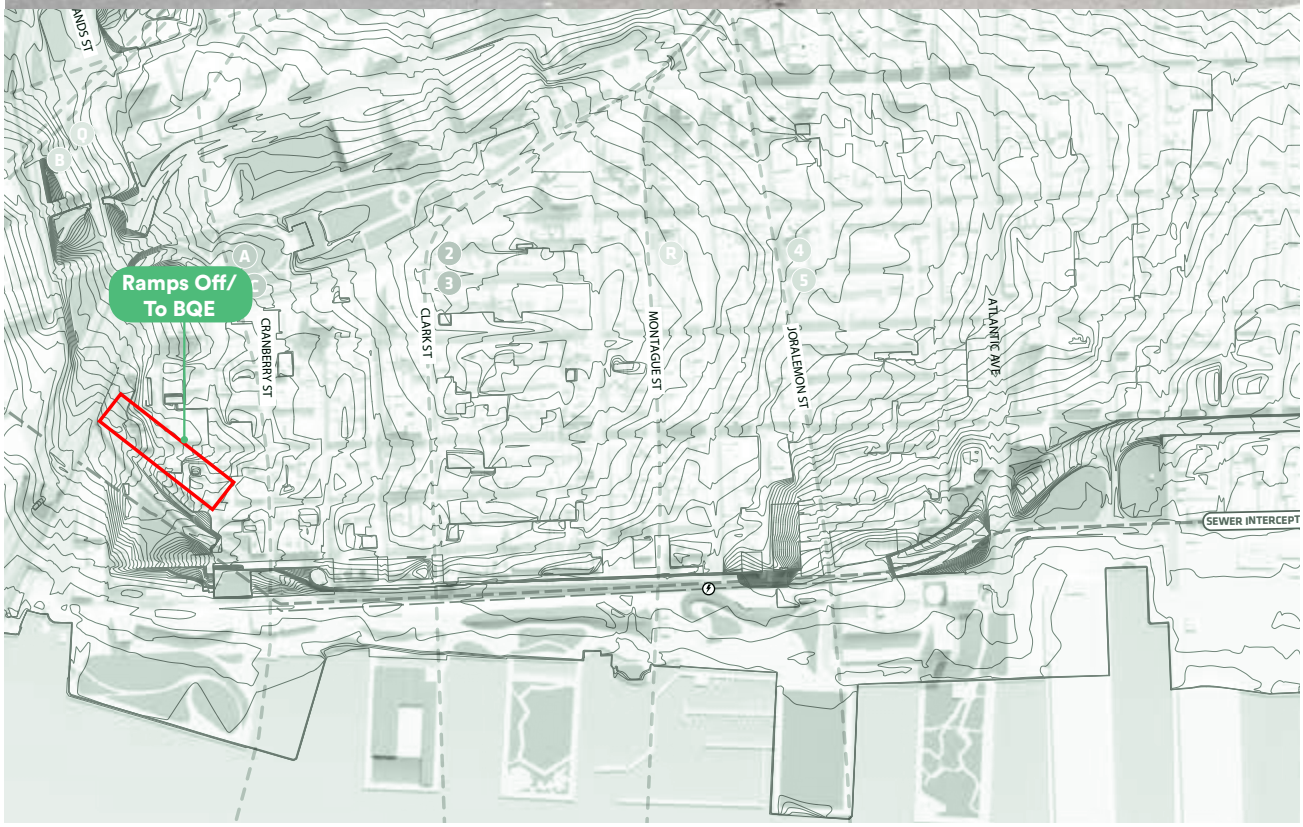
Vine Street and DUMBO

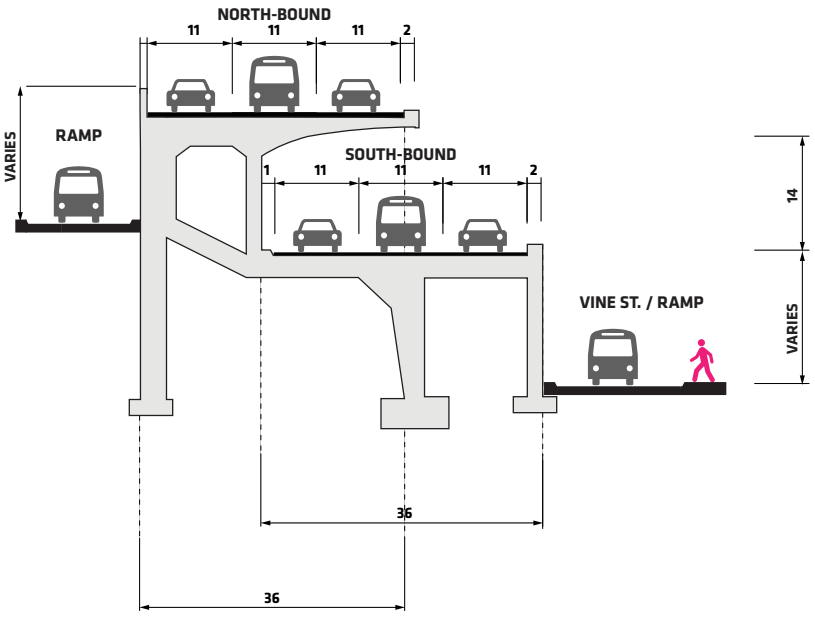
The south-bound BQE roadway currently has an on-ramp parallel to Vine Street north of the Columbia Heights Bridge. The north-bound BQE exits to Old Fulton Street parallel to Vine Street.

The BQP concept defers to DOT's lane-by-lane incremental approach for these areas. As the system moves north through DUMBO, additional study should be undertaken to determine opportunities for urban improvements in conjunction with roadway reconstruction.

Top Ramp to South Bound BQE Vine Street
Bottom BQE Ramp Location

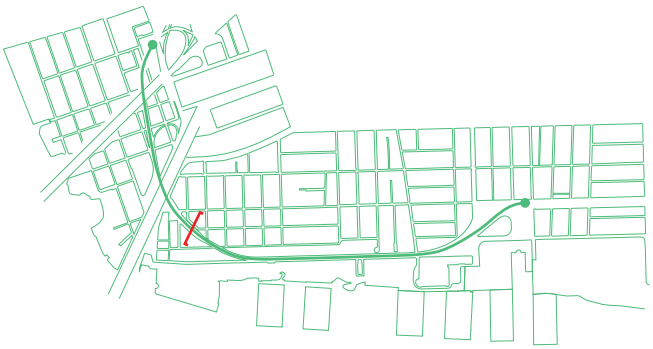
The BQE roadway entrance and exit ramps north of the Columbia Heights Bridge remain in roughly the same location.

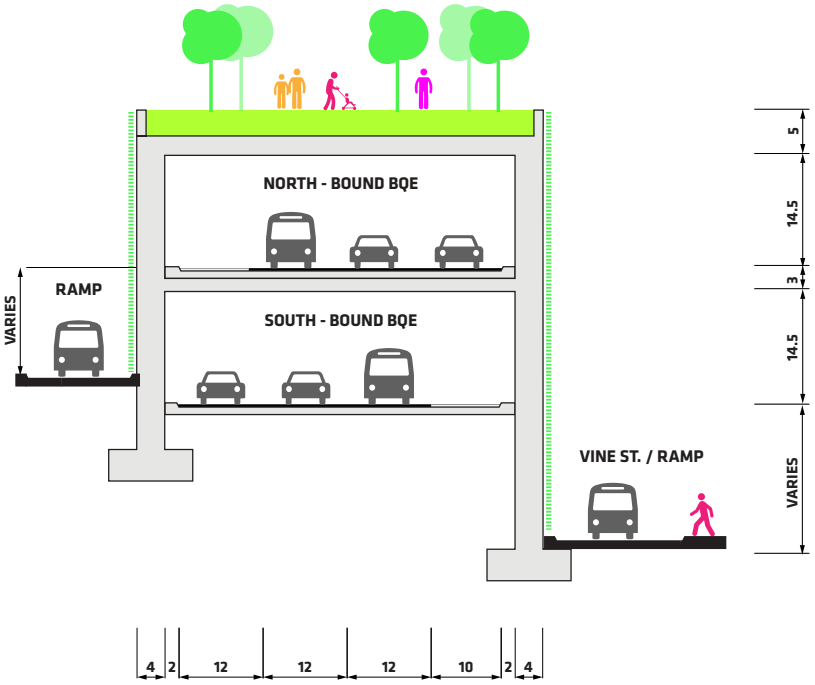




Current Section at Vine Street

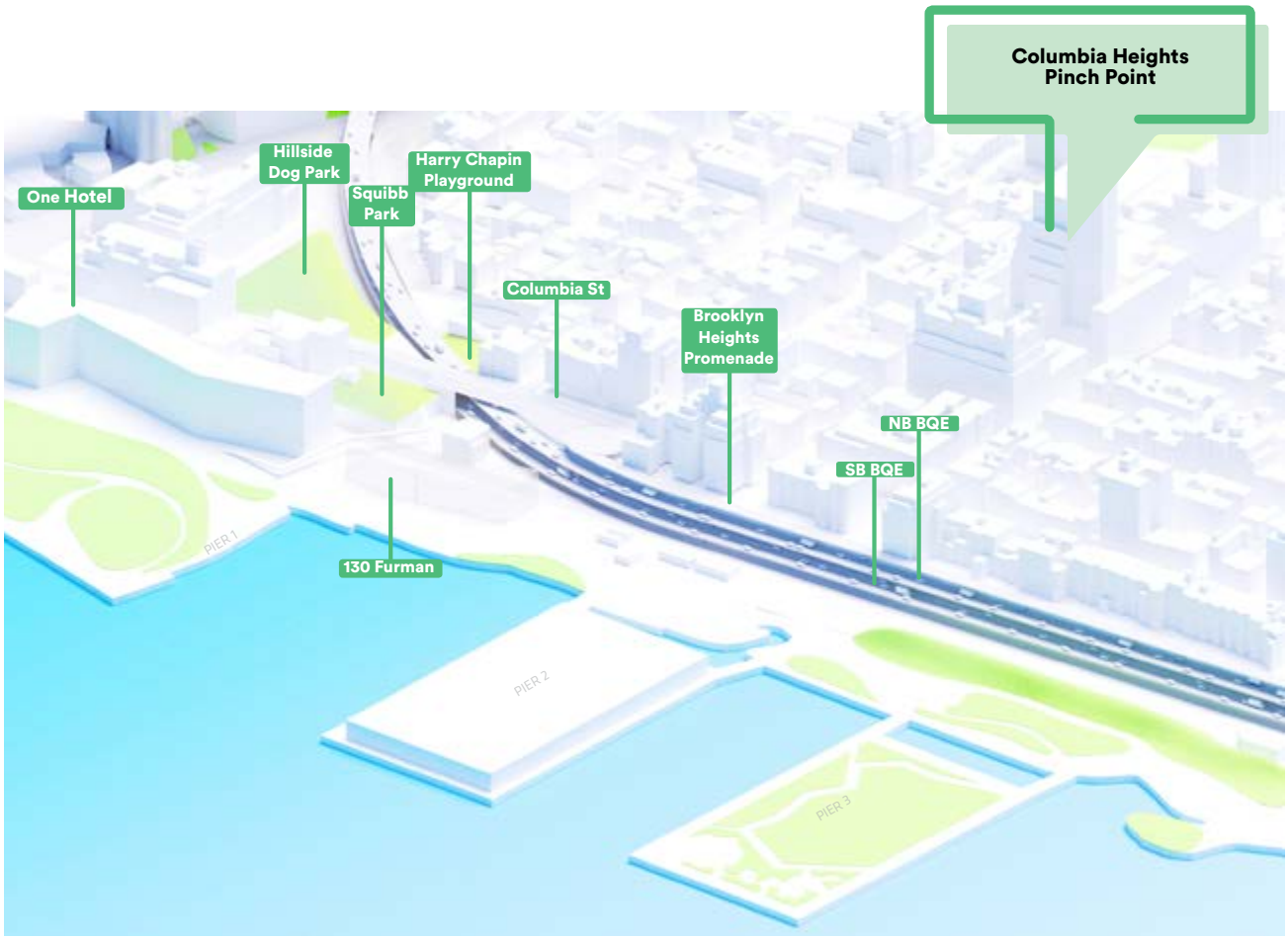
North from the A/C train fan facility, the cantilever structure connects to access and exit ramps for both the North Bound and South Bound BQE.





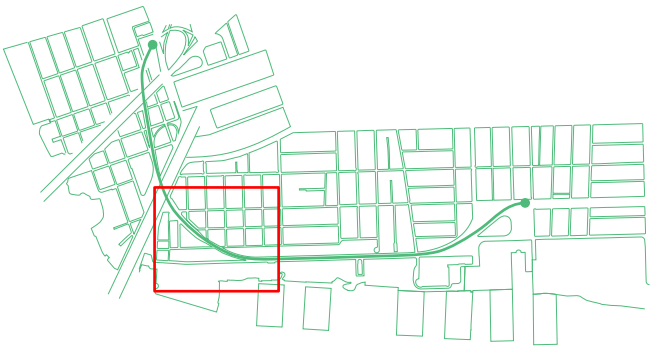
Proposed Section at Vine Street

Through lane-by-lane or other phasing methods, the possibility for a continued linear parkway above the new roadway should be explored, as a link to the Brooklyn Bridge and DUMBO.



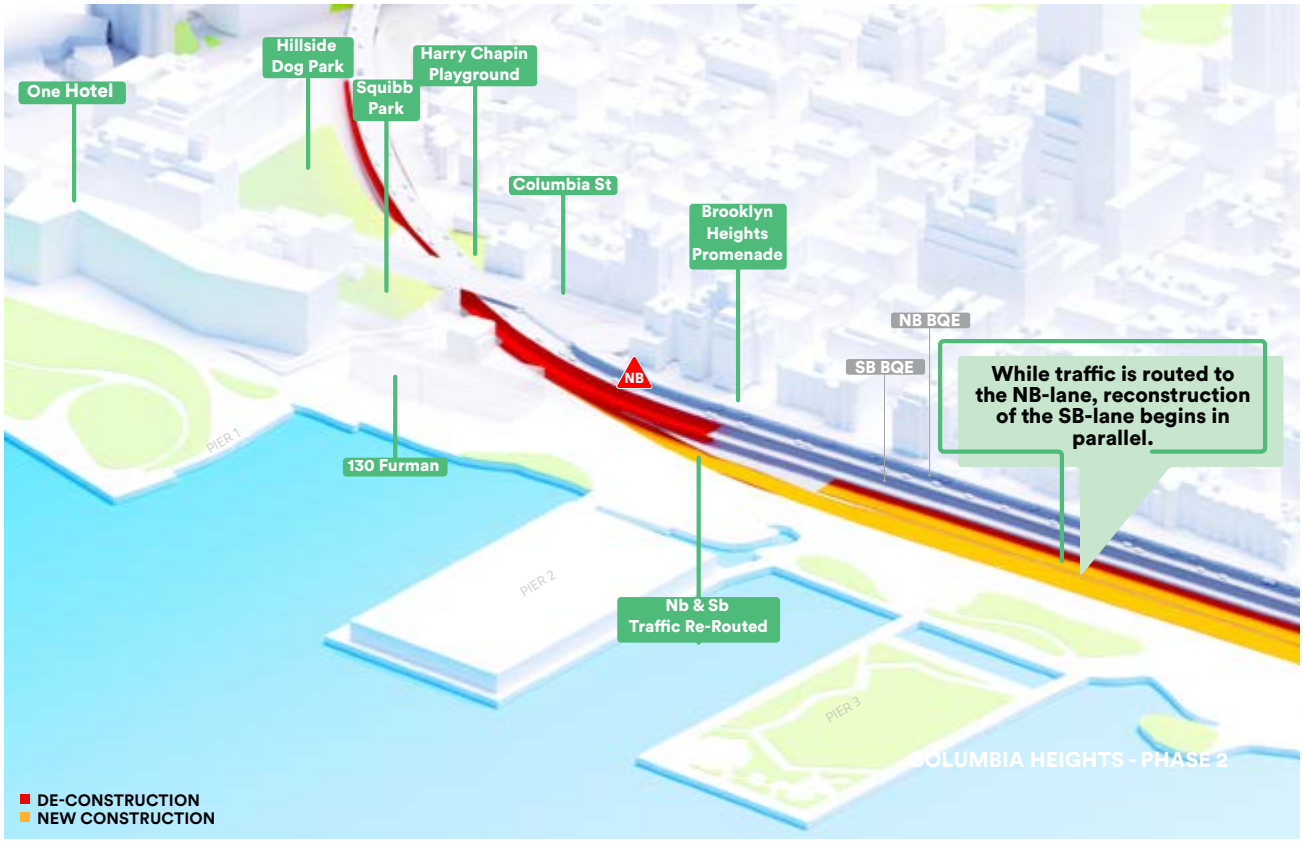
Existing Condition
Columbia Heights

At the northern end of the project area, the BQE roadway begins to pick up grade. It passes under the Columbia Heights Bridge as it makes its way to the Brooklyn Bridge.



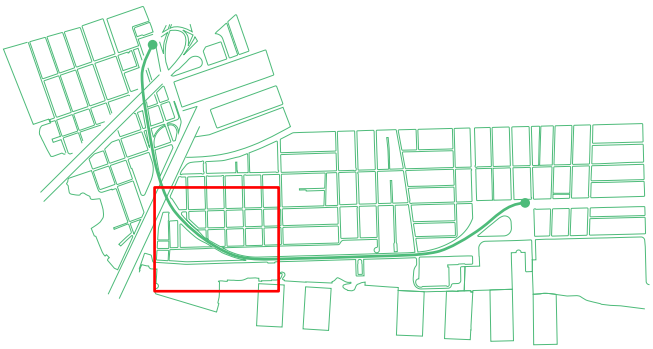
Phase 1
Columbia Heights

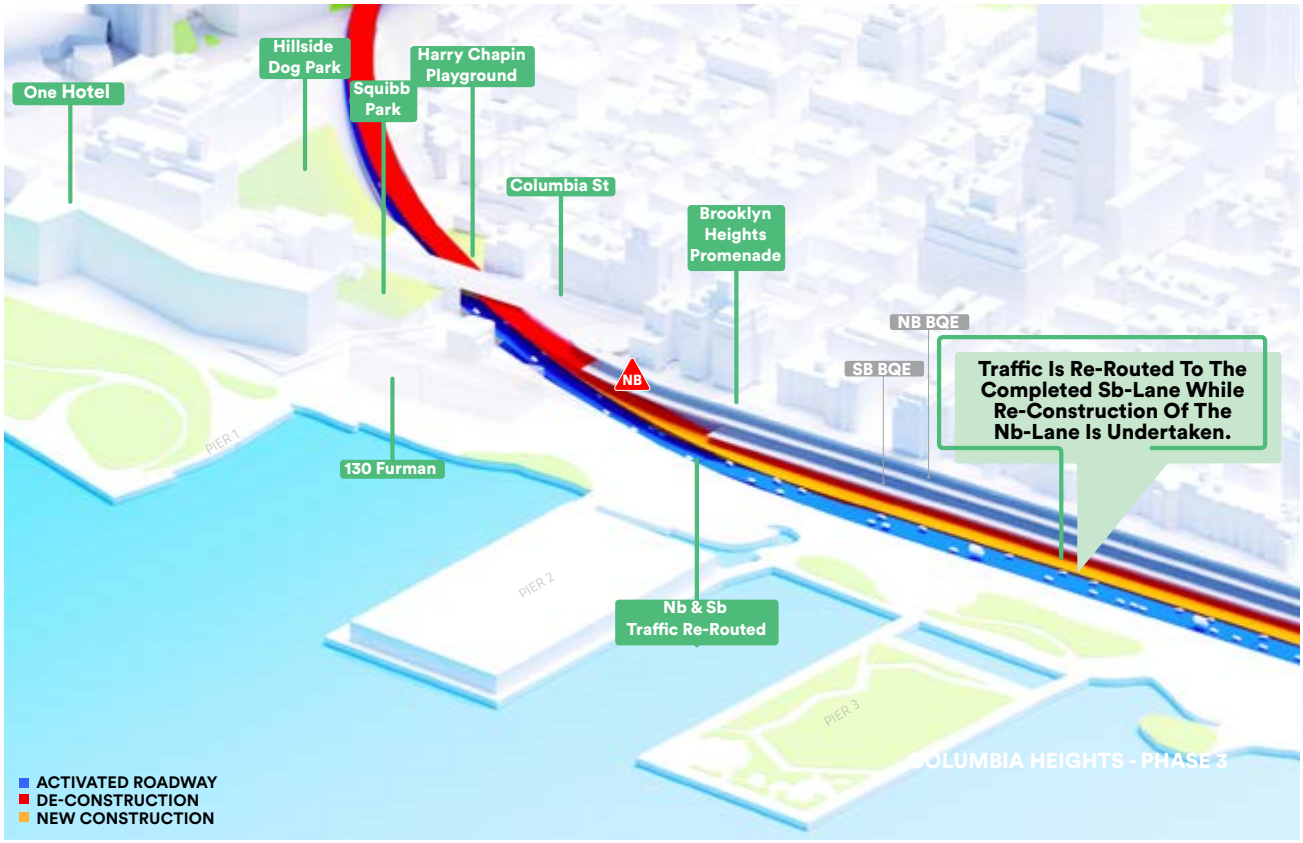
In the first phase of construction, Furman Street is decommissioned and construction begins of the at-grade roadway in both directions until Clark Street. BQE traffic continues on the cantilever in both directions. The south-bound lane trench and grade rise is then built.



Phase 2
Columbia Heights

Both directions of traffic are then consolidated to 3 lanes in total and routed to the upper cantilever level while the lower cantilever is deconstructed from Pineapple Street and north. Where the cantilever is preserved, it is reinforced. Following south-bound deconstruction, the south-bound lane is reconstructed to meet the existing lower level.



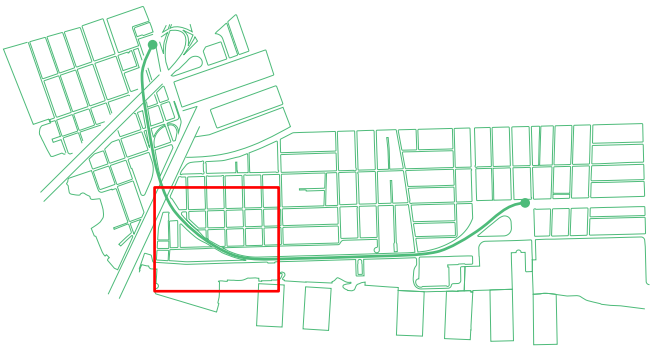


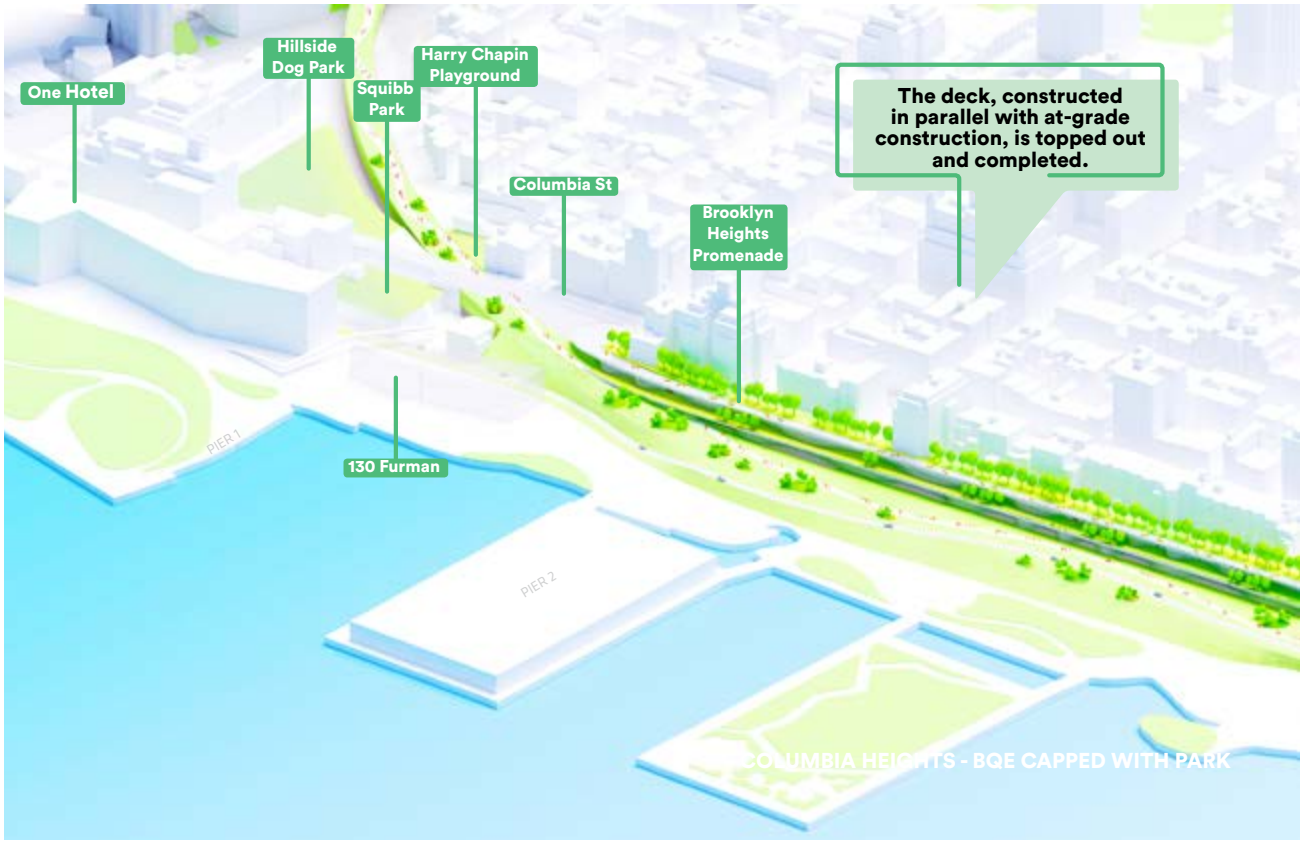
Phase 3
Columbia Heights

When the south-bound lane is complete, traffic in both directions is consolidated to 3 lanes routed to the newly constructed roadway. The north-bound lane is deconstructed and construction of the north-bound at-grade roadway begins.

Phase 4
Columbia Heights

When construction is completed on the north-bound roadway, traffic resumes in 3-lanes in both directions.





Proposed Columbia Heights

The park cap is completed and creates a new point of entry to the waterfront at the Columbia Heights Bridge. A continued connection north to the Brooklyn Bridge, above the stacked roadways can be explored.

Roadway Design

Roadway design assumes current DOT assumptions for 6 lanes of traffic (3 in either direction) with breakdown shoulders in each direction along the majority of roadway length. At the pinch-points, the roadway can accommodate 6 lanes with no breakdown shoulders, or 4 lanes with shoulders.

Design assumes maximum slopes of 5% and 1060' minimum radius, adhering to federal standards. The relocated Furman Street has a maximum slope of 5% and minimum radius of 263', adhering to New York State DOT design criteria for non-NHS urban arterial roadways.

The study accounts for accommodating 6 travel lanes, however reducing lanes from 6 to 4, as recommended by RPA and under study by Expert Panel, would reduce cost and physical impacts of the scheme further and is recommended by the BQP team.

BBP CONSTRUCTION VIEW FROM THE PROMENADE

Tunnel Parameters

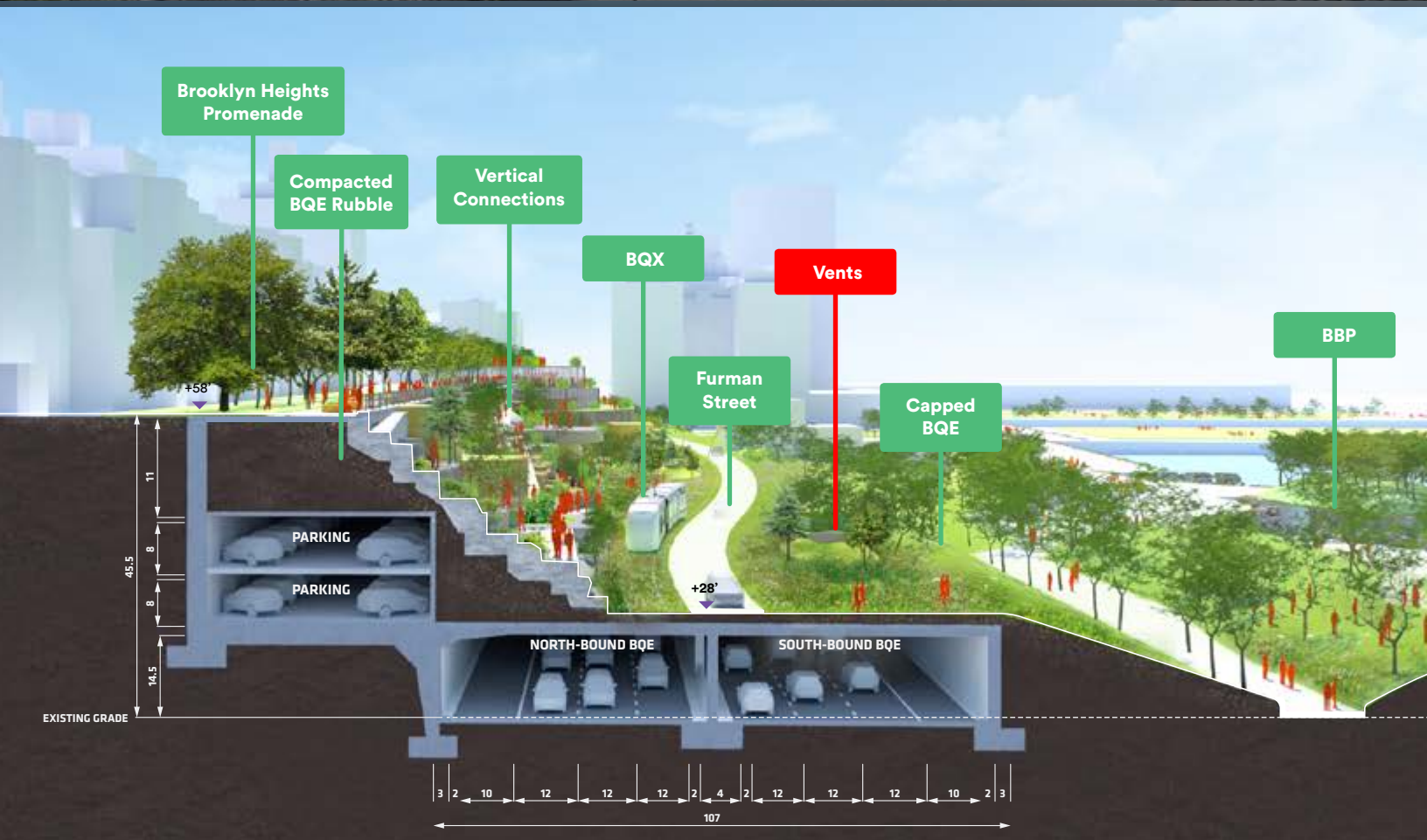
Capping the BQE roadway necessitates venting the highway. These are accommodated by straightforward vents approximately 200 square feet in area. Highway vents are typically spaced every 500', with 6-8 along the length of Brooklyn Bridge Park.

Highway vents such as these are present in other parks of New York City, such as those venting the Brooklyn Battery Tunnel in Battery Park.

The vents are an opportunity to explore carbon and particulate recapture. Design opportunities to shield them with vegetation to minimize their aesthetic impact can also be explored.

Hazardous materials will likely require surface routing from Atlantic Ave. to terminus of covered roadway. Current volume of Haz-Mat traffic should be determined, and is likely a small % of trips. Heavy trucks will be able to continue through system (e.g. Baltimore Inner Harbor, Pittsburgh Squirrel Hill, Boston Ted Williams and Tip O'Neill Tunnels).

BROOKLYN BATTERY TUNNEL VENTS, BATTERY PARK, NYC



PROPOSED SECTION, SCENARIO 2

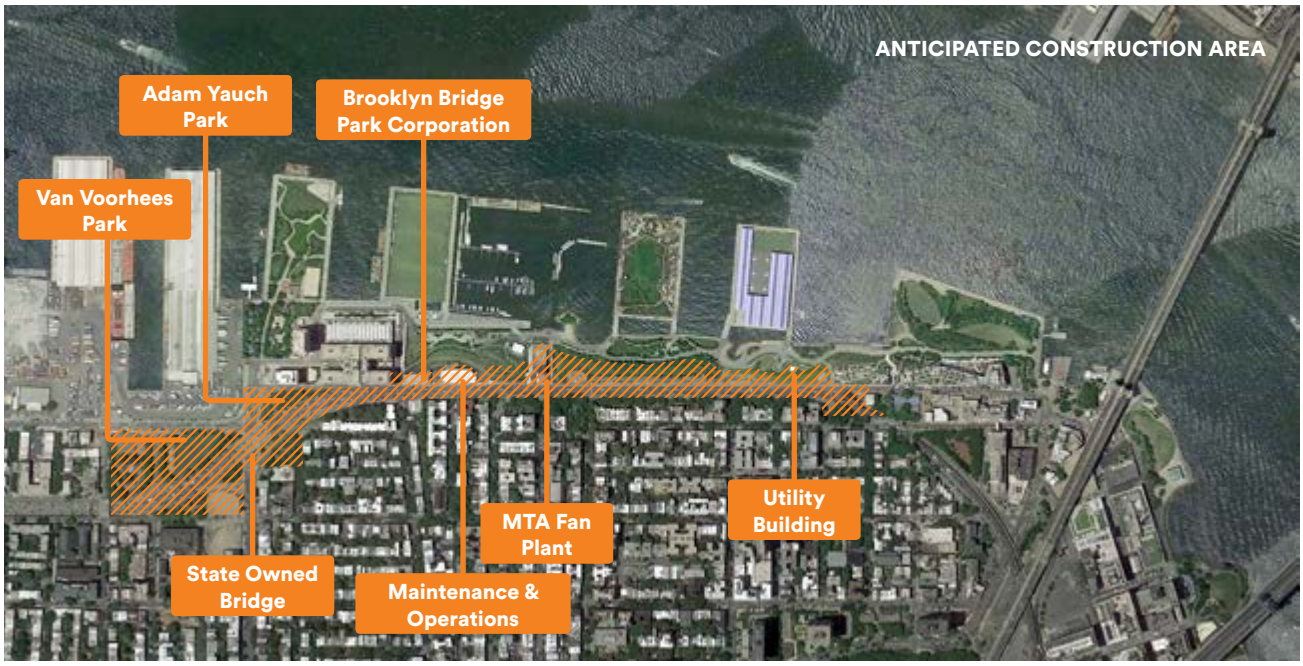
Constructability & Cost

Aside from providing transformational benefits to the waterfront, the BQP scheme carries with it favorable feasibility and cost implications:

- De-conflicts construction from community and active traffic.
- Minimizes or eliminates temporary roadway elements.
- Avoids sensitive historical areas completely.
- Minimizes parkland alienation
- Reduced roadway construction costs – build it once, not twice.
- Reduced cost of structural system – at-grade, simple deck.
- Opportunities for diversified funding.

From a Program Risk perspective, as outlined on the opposite page, the BQP scheme exhibits less schedule and cost overrun risk than other alternatives available, while requiring more careful coordination for site acquisition.

An order-of-magnitude cost estimate has been prepared for several scenarios and is detailed on the page 164-165. Findings support the assumption that the BQP scheme can be built at similar or significantly less cost than DOT baseline alternatives, and show reductions of up to 30% as compared to the $3.6 Billion DOT Innovative Plan.



Alignment Options

High-Level Risks to Program Success

	DOT #1 Temporary Elevated Road Cost - $3.6B Duration - 72 Mo.			DOT #2 Incremental Replacement Cost - $4.0B Duration - 96 Mo.			BHA - Alt. Temporary Elevated Road Cost - $3.6B Duration - 72 Mo.			BQP Option Covered At Grade Road Cost - < $3.6B Duration -< 72 Mo.		
	Likelihood	Severity	Total	Likelihood	Severity	Total	Likelihood	Severity	Total	Likelihood	Severity	Total
Original Project Cost	50	50	2,500	50	100	5,000	50	50	2,500	5,000	5,000	0
Limiting Cost Overruns	100	50	5,000	100	100	10,000	100	50	5,000	10,000	10,000	2,500
Project Duration	100	50	5,000	100	100	10,000	100	25	2,500	10,000	10,000	0
Limiting Time Overruns	100	50	5,000	100	100	10,000	100	50	5,000	10,000	10,000	2,500
Procurement - Approvals from Other Agencies	10	10	100	50	50	2,500	10	10	100	2,500	2,500	10,000
Procurement - Suitability to Design-Build Delivery	50	100	5,000	50	50	2,500	50	50	-5,000	2,500	2,500	-100
Procurement - Requires Site Acquisition	10	50	500	10	10	100	10	10	5,000	100	100	2,500
Procurement - Opportunity for Mitigating Revenue	10	-100	-1,000	10	100	1,000	50	-100	2,500	1,000	1,000	-10,000
Changes - Unforeseen Conditions	100	50	5,000	100	100	10,000	100	50	5,000	10,000	10,000	5,000
Changes - Unpredictable Construction Delays	50	50	2,500	100	100	10,000	50	50	500	10,000	10,000	2,500
Traffic - Impacts on Other Roads/Bridges/Tunnels	100	100	10,000	100	50	5,000	100	50	5,000	5,000	5,000	2,500
Residents - Access to Promenade	100	100	10,000	10	50	500	10	50	500	500	500	-10,000
Residents - Impact to Open Space	100	100	10,000	50	100	5,000	50	50	2,500	5,000	5,000	-10,000
Residents - Temporary Loss of Facilities	100	50	5,000	100	10	1,000	50	10	500	1,000	1,000	100
Environmental - Impact	100	100	10,000	10	50	500	10	40	400	500	500	-1,000
Environmental - Tunnel Preference (Conceal Traffic)	100	100	10,000	100	100	10,000	100	100	10,000	10,000	10,000	100
Safety - Working over Active Traffic	100	100	10,000	50	50	2,500	100	50	5,000	25	25	625
Cummulative Risk Exposure	**17 Risks**		**94,600**			**85,600**			**44,100**			**-2,775**
Relative Scoring (New Options as Benchmark)	**-3409%**			**-3085%**			**-1589%**			**100%**		
Options are:	**(34.1)**			**(30.8)**			**(15.9)**			times as likely to incur risk as BQP Option.		
Recommendation Based on Minimum Risk Exposure	**3**			**4**			**2**			**1**		

Risk Likelihood
0 - No Risk to +100 - Certainly

Severity Range
0 - No Consequence to +100 - Severe Consequence

Opportunity Exploitation
0 - None to -100 - Strong

Negative | Neutral | Positive

ARCADIS

Risk Overview

DRAFT

Scenario 1 - Repair (6 Lanes)

Columbia Heights through Atlantic Avenue
- $1.6 Billion (Inclusive Services, Markups)

Sands Street through Columbia Heights
- $1.4 Billion (Projected, at $447,000 / Linear Foot)

Draft Total
- **$3.0 Billion** (16.5% Reduction from DOT Innovative Plan)

Scenario 1 - Repair (4 Lanes)

Columbia Heights through Atlantic Avenue
- $1.4 Billion (Inclusive Services, Markups)

Sands Street through Columbia Heights
- $1.2 Billion (Projected, at $395,000 / Linear Foot)

Draft Total
- **$2.6 Billion** (27.5% Reduction from DOT Innovative Plan)

Basis of Estimate

The order-of-magnitude cost estimate is based on the limits of the project from Columbia heights through Atlantic Avenue. NYCDOT estimated costs per linear foot are projected for Sands Street through Columbia Heights.

DOT Estimates
Innovative Plan (Tempway): $3.2-3.6 Billion
Traditional Method (Lane-by-Lane): $3.4-4.0 Billion

Approach towards Quantities and Unit Prices

Quantities are developed assuming total sectional width of project elements per linear foot. The unit prices are developed assuming the appropriate labor crew composition, equipment and material costs with consideration of partial night work accounting labor differential cost, staging cost, and construction complexity factors.

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Scenario 2 - Replace (6 Lanes)

Columbia Heights through Atlantic Avenue
- $1.8 Billion (Inclusive Services, Markups)

Sands Street through Columbia Heights
- $1.4 Billion (Projected, at $447,000 / Linear Foot)

Draft Total
- **$3.2 Billion** (11% Reduction from DOT Innovative Plan)

Scenario 2 - Replace (4 Lanes)

Columbia Heights through Atlantic Avenue
- $1.6 Billion (Inclusive Services, Markups)

Sands Street through Columbia Heights
- $1.2 Billion (Projected, at $395,000 / Linear Foot)

Draft Total
- **$2.8 Billion** (22.5% Reduction from DOT Innovative Plan)

Allowances Considered

Allowances are considered as a percentage of the direct construction cost for the items that are not quantifiable at the time of cost estimate preparation.

All Estimates Include

Total Project Costs (Incl. Services and Markups)

Clark St. 2/3 Egress Modifications ($5 Million)
MTA Sub-Station Reconstruction ($100 Million)
BBP HQ, M+O Reconstruction ($25 Million)

Optional:

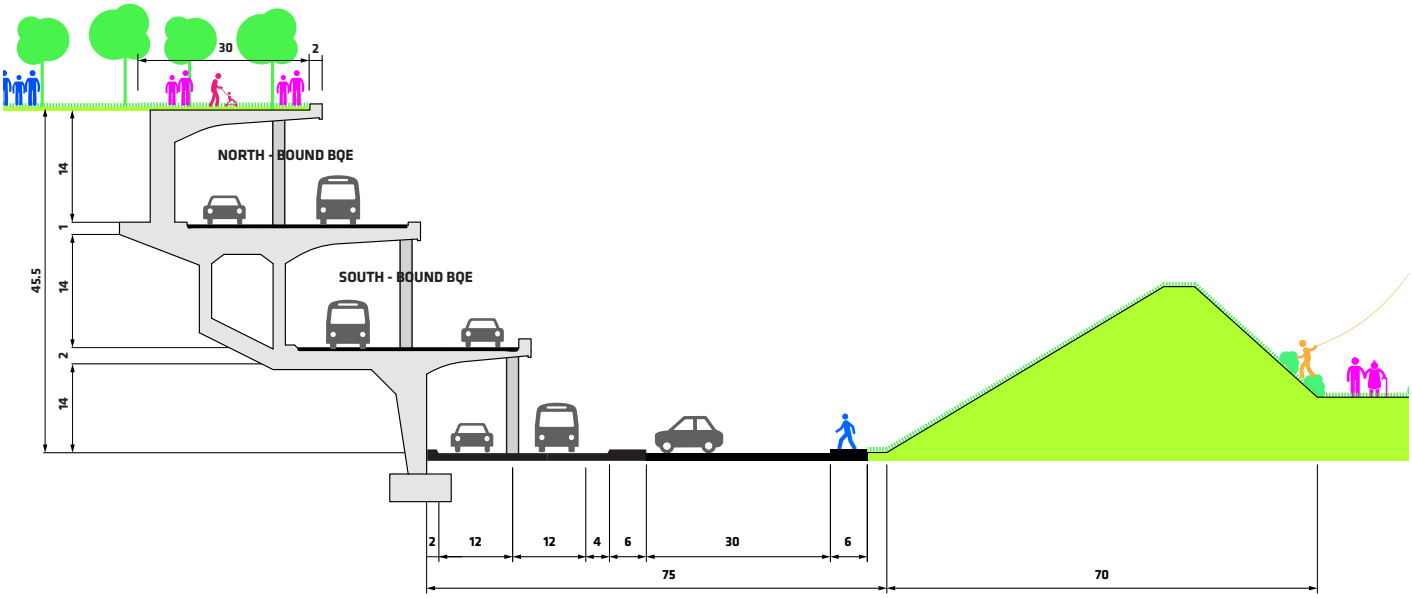
DEP Sewer Interceptor Reconstruction (Est. $100 Million)
Franchised Utility Reconstruction (Est. $100 Million)

Rehabilitation Concepts

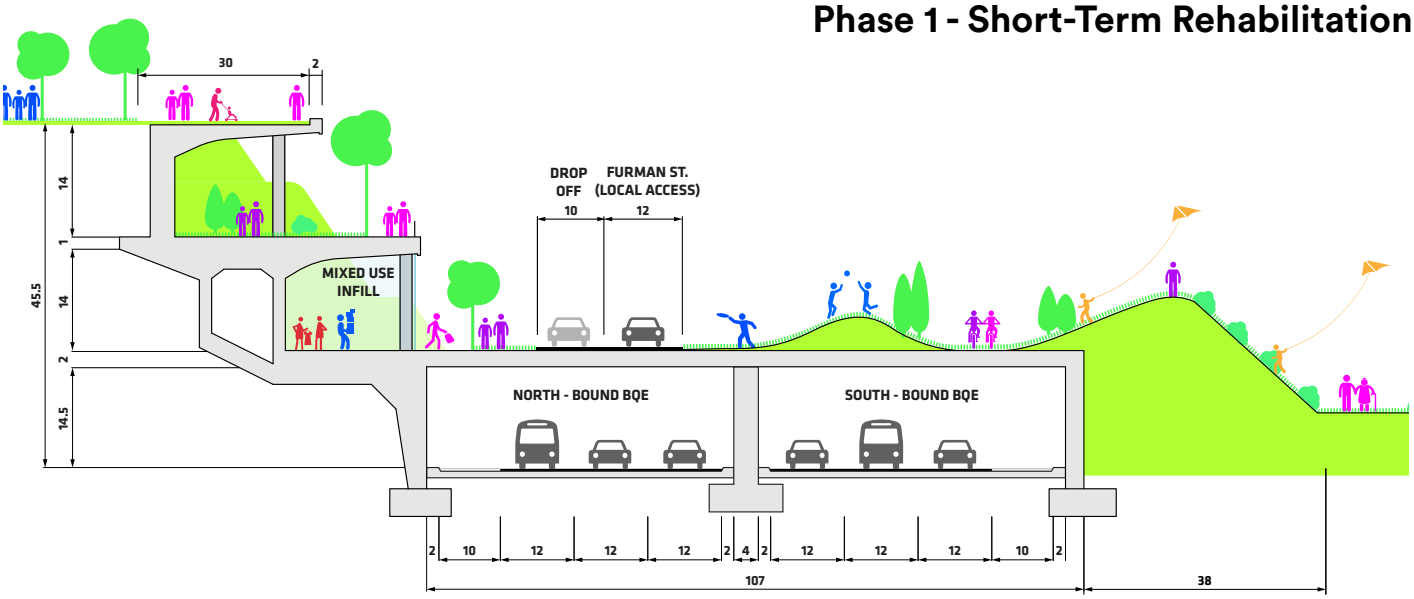
If a short-term rehabilitation project is undertaken to address critical structural conditions, those improvements can build toward the medium and long-term solution by calibrating reinforcement to support park and pedestrian use of the structure, per BQP Scenario 1 - Repair. This would save on future costs and preserve the heritage of the iconic triple cantilever in the park design, which would be positive outcomes. Planning and design work on the medium- and long-term solution of a Furman St. alignment should begin concurrently if rehabilitation is pursued, so that these efforts can be coordinated.

Should DOT decide to take a long-term rehabilitation strategy, the fundamentals of the BQP proposal could also be accommodated. Reduction of the new roadway width from 6 to 4 lanes total could be accomodated on an extended south-bound shelf, with park and amenities above, and Furman St. below. While less transformative in the northern and southern ends of project area, such an approach would enclose the existing roadway, freeing adjacent areas of air and sound pollution, and allow those areas to be re-thought and made more usable.

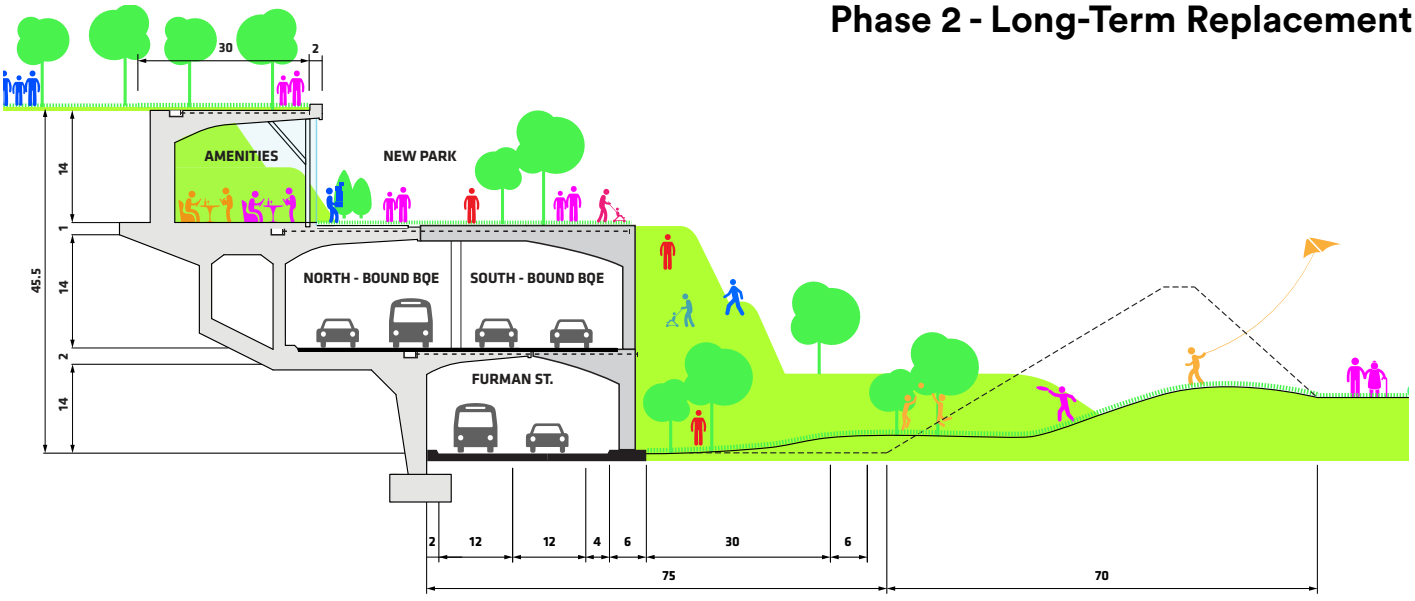
Rather than a fixed solution, the BQP idea is a flexible approach which should link open space and access improvements with repair or replacement of this aging highway, in any scenario.



Phase 1 - Short-Term Rehabilitation



Phase 2 - Long-Term Replacement



Long-Term Rehabilitation Alternative

Credits

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BIG / Bjarke Ingels Group is a DUMBO-based design firm of architects, designers, urbanists, landscape professionals, researchers, and inventors with offices in New York City, Copenhagen, London, and Barcelona.
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Arcadis is a global design, infrastructure, and engineering consultancy based in the U.S. and the Netherlands.
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Sherwood Design Engineers is a civil engineering firm committed to the integration of infrastructure, design, and the environment, with offices in New York City, San Francisco, Los Angeles, Houston, and Atlanta.
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Michael Van Valkenburgh Associates is a Brooklyn-based landscape architecture studio. Among other projects, it has been designing and building Brooklyn Bridge Park since 2003.
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NR2154 is a New York and Copenhagen based creative studio working strategically across identity and graphic design.
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Thanks to...

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NYC Department of Environmental Protection

Metropolitan Transit Authority

Mayor's BQE Expert Panel

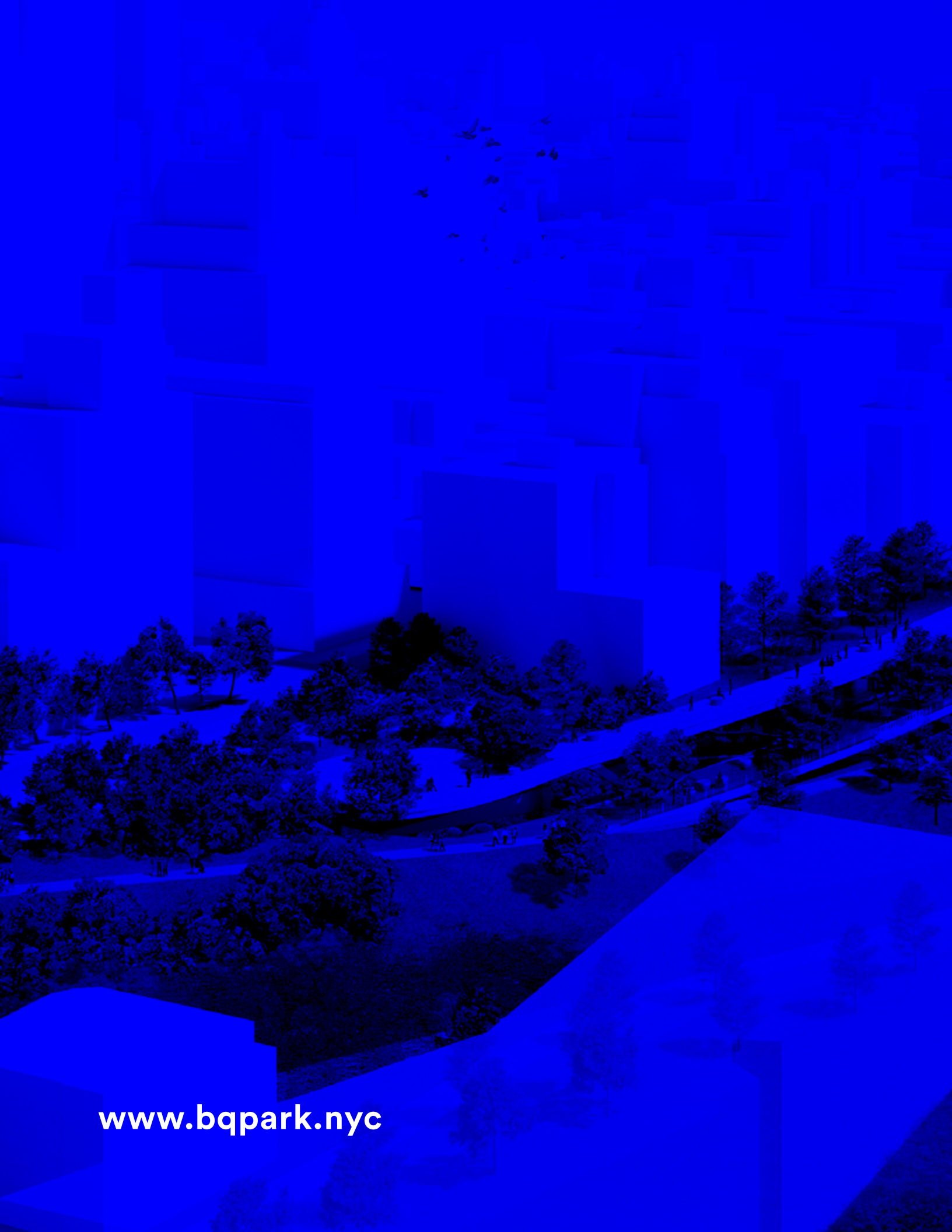
Brooklyn Borough President Eric L. Adams
City Council Speaker Corey Johnson
City Councilmember Stephen T. Levin
City Comptroller Scott M. Stringer
Office of State Senator Brian Kavanaugh
Office of State Assemblywoman Jo Anne Simon
Office of US Congresswoman Nydia Velazquez

A Better Way
Brooklyn Heights Association
Cobble Hill Association
Mark Baker
Marc Wouters Studios
Montague Street BID
Downtown Brooklyn Partnership
DUMBO Improvement District
360 Furman St. Board
360 Furman St. Residents
Cadman Towers

Brooklyn Bridge Park Corporation
Brooklyn Bridge Park Conservancy Board
Brooklyn Bridge Park Development Corporation

Regional Plan Association
American Institute of Architects
Real Estate Board of New York
NY Landmarks Conservancy
Historic Districts Council
Brooklyn Community Foundation
Municipal Arts Society

...and the people of BK Heights, DUMBO, Cobble Hill, and Brooklyn!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