Appendix D
Construction Methods / Construction Staging Report

Construction Staging Report available upon request

Draw One Bridge Replacement

Draft Environmental Assessment

Construction Methods

May 22, 2023

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1.0 INTRODUCTION

The Massachusetts Bay Transportation Authority (MBTA) is seeking funds to be provided through the Federal Transit Administration ("FTA") and the Federal Railroad Administration ("FRA") to demolish and replace the superstructure and substructures of the North Station Draw One Bridge spans and approach spans over the Charles River, as well as the adjoining Signal Tower A, and upgrading the track network, communications and signaling systems. The two remaining operational bridges are rolling lift bridges and each carry two tracks. Portions of two additional bridges that were partially demolished are located to the west of the operational bridges. The Proposed Project includes the replacement of the original four bridges with three vertical lift bridge structures. Each vertical lift bridge will support two tracks (for a total of six tracks) over the Charles River.

This document describes the anticipated construction methods and activities for the Proposed Project; assesses the potential for temporary environmental impacts and identifies recommended mitigation measures. It is not intended to describe the precise construction methods that may ultimately be used, nor is it intended to dictate or confine the construction process. Actual construction methods and materials may vary, depending in part on how the construction contractors choose to implement their work to be most cost effective, within the requirements set forth in bid, contract, and construction documents, as well as to comply with mitigation requirements.

Where a variety of alternative construction methods or techniques could be utilized for the Proposed Project, the EA analysis evaluates the methods that are considered to have the greatest potential for adverse environmental impact.

2.0 CONSTRUCTION SCHEDULE, ACCESS, AND SEQUENCE

2.1 CONSTRUCTION SCHEDULE

MBTA anticipates construction of the Proposed Project to take approximately eight years, with construction beginning in 2026 and being completed in 2034. Construction activities may occur up to 7 days a week. Work shifts would be primarily during the daytime from 7am-3pm. At certain times in the construction, nighttime work may be performed between 3pm-11pm and 11pm-7am. Based on consultation with Federal and state regulatory permitting agencies, time of year (TOY) restrictions for Essential Fish Habitat (EFH) would be implemented for certain in-water construction work. TOY restrictions for in-water work associated with major silt-producing activities (e.g., channel dredging, removing existing caissons, removing existing and temporary piles) would generally be February 15 to July 15, with a requirement to maintain downstream passage September 1 to November 15. The proposed construction schedule accounts for these TOY restrictions, and all in-water work subject to these restrictions would be completed outside of the designated time periods.

2.2 CONSTRUCTION ACCESS

The primary areas of construction within the Project Site are the Draw One Bridges, Tower A, and track and signal upgrades to tie into North Station and the mainline tracks to the north. Access to these primary areas is through the following quadrants (**Figure 2.2-1**):

- The Southwest Quadrant - access near MGH allows access for construction between the North Station Platforms and the bridge and provides access to construct the Draw One Bridges Phases 1 through 3.
- The Northwest Quadrant - access to construct the Draw One Bridges Phases 1 through 3, the west end of the North Bank Bridge, and access to the mainline tracks up through the limits of work.
- The Southeast Quadrant - access to construct the Draw One Bridges Phases 3 through 5.
- The Northeast Quadrant - access to construct the Draw One Bridges Phases 3 through 5, the new Tower A, the east end of the North Bank Bridge, and access to the mainline tracks up through the project limits.

Additional access to the T-Pad laydown site in Somerville, MA is expected to occur throughout the project and can be used for material deliveries that will utilize the tracks to make deliveries to the Project Site.

Truck access to these quadrants is described in **Section 4.2, "Construction Access Routes."**

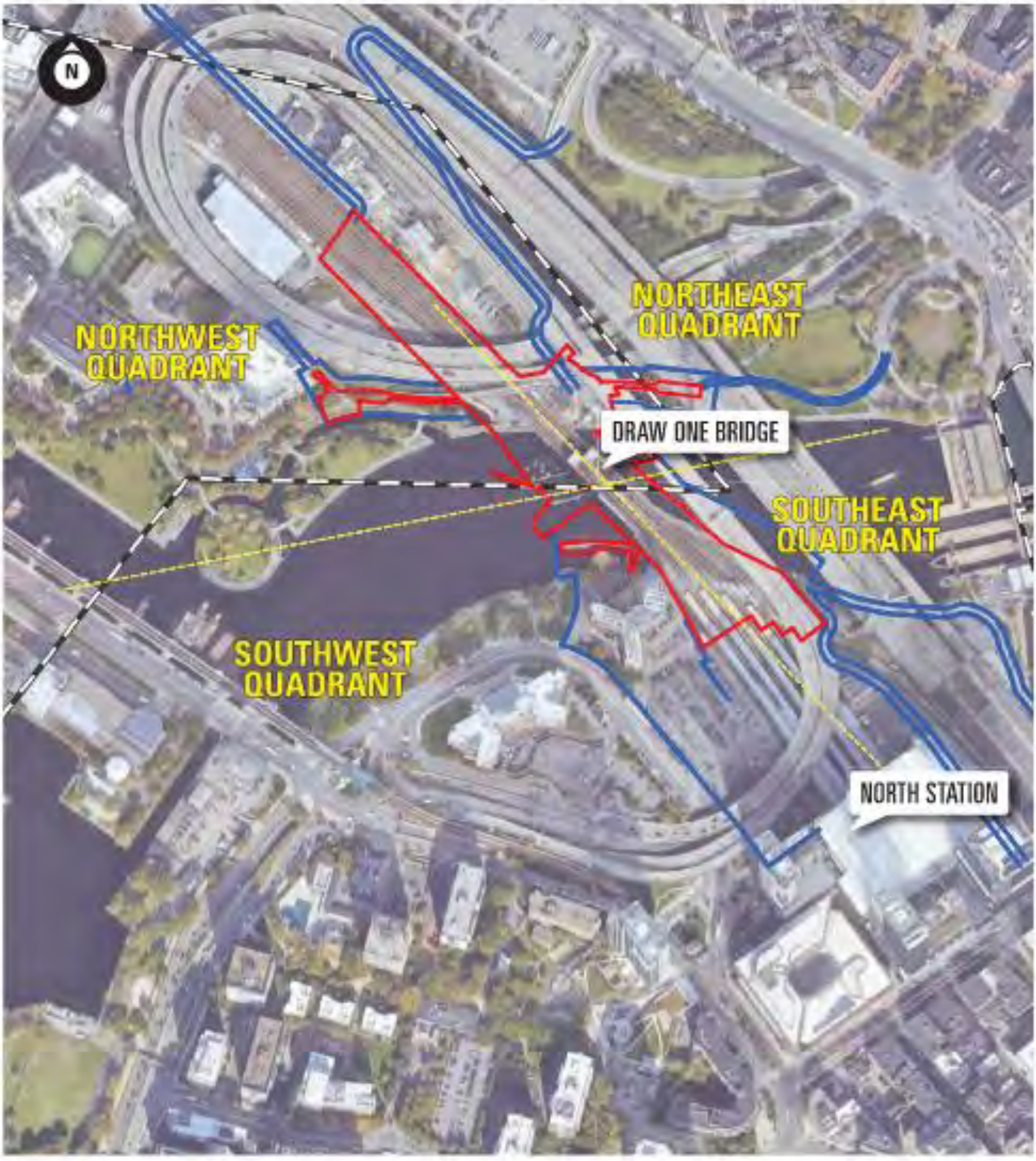

Figure 2.2-1: Project Construction Access - Quadrants

2.3 CONSTRUCTION SEQUENCE

The contractor will be required to follow the sequencing identified within the track construction staging plans which will be provided in the contract documents. The contractor will determine the details of the sequencing activities. Bridge construction will be carried out in five phases as shown in **Table 2.3-1** and on **Figure 2.3-1**. These bridge construction phases would be coordinated with the track construction staging plans. It is anticipated that each vertical lift bridge will take up to two years to construct. Multiple track phases would also be required to access each work zone in between bridge phases. Therefore, the overall duration of construction could be up to eight years due to the complexity of the construction staging required to maintain levels of service at North Station.

Table 2.3-1: Construction Sequence and Duration[1]

Phase	Key Components	Estimated Duration (months)
Site Preparation & Mobilization	Signal duct banks, temporary control tower relocation,[2] demolition of existing bridge foundations, west temporary trestle construction, early Track and Signal work.	4 Months
Bridge Phase 1	Demolition of Existing Tower A, Construction of Proposed Tower A, North Bank Bridge Modification,[3] West approaches and western vertical lift span, Track and Signal work	31 Months
Bridge Phase 2	South approach spans, Track and Signal work	5 Months
Bridge Phase 3	East temporary trestle construction, Center approach spans and center vertical lift span, Track and Signal work	20 Months
Bridge Phase 4	South approach spans, Track and Signal work	9 Months
Bridge Phase 5	East approach spans and eastern vertical lift span, Track and Signal work	27 Months
	Total	**96 Months**

Notes:
[1] This is the same table as referenced in Figure 2.3-1.
[2] The current design assumes that the temporary control tower would be relocated onto the temporary work trestle, though the contractor may consider alternate locations as part of their evaluation of additional construction means and methods.

Source: STV (Jan 2023)

- Phase 1 (31 months)
- Phase 2 (5 months)
- Phase 3 (20 months)
- Phase 4 (9 months)
- Phase 5 (27 months)

1. Southwest Temporary Trestle
2. Northwest Temporary Trestle
3. Southeast Temporary Trestle
4. Northeast Temporary Trestle
5. Draw One Moveable Spans

BRIDGE CONSTRUCTION PHASES
DRAW ONE BRIDGE PROJECT
BOSTON/CAMBRIDGE, MA

FIGURE 2.3-1 | AUGUST 2024

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3.0 CONSTRUCTION OF KEY ELEMENTS

3.1 SUBSTRUCTURE

Construction of the substructures would consist of the installation of a combination of foundation types. The Draw One Bridge would be supported by 12 drilled shafts, 321 concrete filled pipe piles and 39 micropiles, the fender system would consist of 207 composite fiberglass reinforced piles, Tower A will be supported by 65 H-piles, and the North Bank Bridge would require 18 micropiles. The work would also include the demolition of the existing foundations for the Draw One Bridge, Tower A, and two piers of the North Bank Bridge. The work would also include the demolition of the existing foundations for the Draw One Bridge, including 25 piers, 21 caissons, the fender system, and Tower A.

3.1.1 IN-RIVER STRUCTURES

To support the removal of eleven (11) caissons that supported the former Draw One Bridge piers, two cofferdams may be installed. One cofferdam, approximately 98 feet x 58 feet, would encapsulate the set of eight (8) caissons on the north side of channel, and a second cofferdam approximately 104 feet x 27 feet would encapsulate the "rest pier cap" and the three (3) caissons that support it on the south side of channel (**Figure 3.1-1**). Installation of the cofferdams would be conducted from a barge prior to the construction of the temporary trestle and would take approximately one (1) week for installation. Installation of the cofferdam sheets would be performed by vibratory hammer or impact hammer. The cofferdams would not be dewatered but would be closed to contain debris and disturbed sediment. Cofferdam sheet piles would be removed via vibratory or impact hammer. Silt curtains or other methods of minimizing sediment dispersal would be installed around the cofferdams during their removal as needed. It is anticipated that each cofferdam would be in place for approximately three months during the Site Preparation and Mobilization phase of construction.

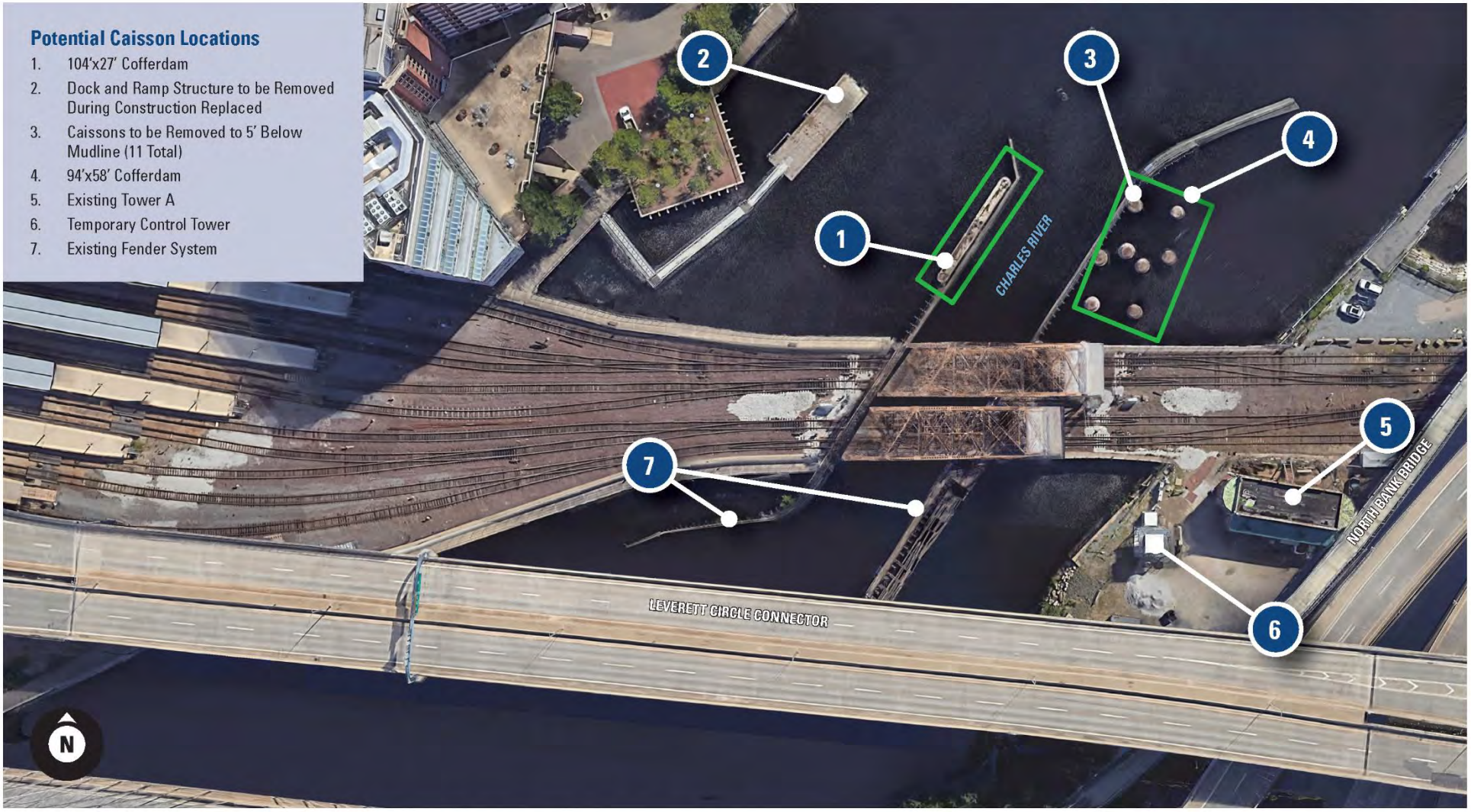
Four temporary work trestles could then be constructed, two on the east side and two on the west side of the proposed bridge alignment (**Figure 3.1-2**).[1] Each trestle could be in place for approximately six years. The trestles enable delivery of materials and access of construction equipment in the Charles River. The temporary work trestles are expected to have an overwater length of up to 1,000 feet with individual lengths ranging from 150 feet to 465 feet and a width of 40 feet as shown on **Figure 3.1-2**.

Construction work activities would begin simultaneously at multiple locations, starting with the construction of work trestles to drive piles using barge-mounted equipment. Drilled shaft construction for lift span piers could begin concurrently and be performed using barge-mounted equipment or trestle

[1] In coordination with Massachusetts General Hospital (MGH), an MGH-owned floating dock and approach ramp on the south bank of the Charles River would be temporarily removed during construction of the Proposed Project to facilitate access to the Draw One Bridge from the proposed southwest temporary work trestle. The floating dock and approach ramp formerly served the prior owner (Spaulding Rehabilitation). As part of the Proposed Project, MBTA would reinstall the MGH floating dock and approach ramp in coordination with MGH when the area is no longer required for construction access.

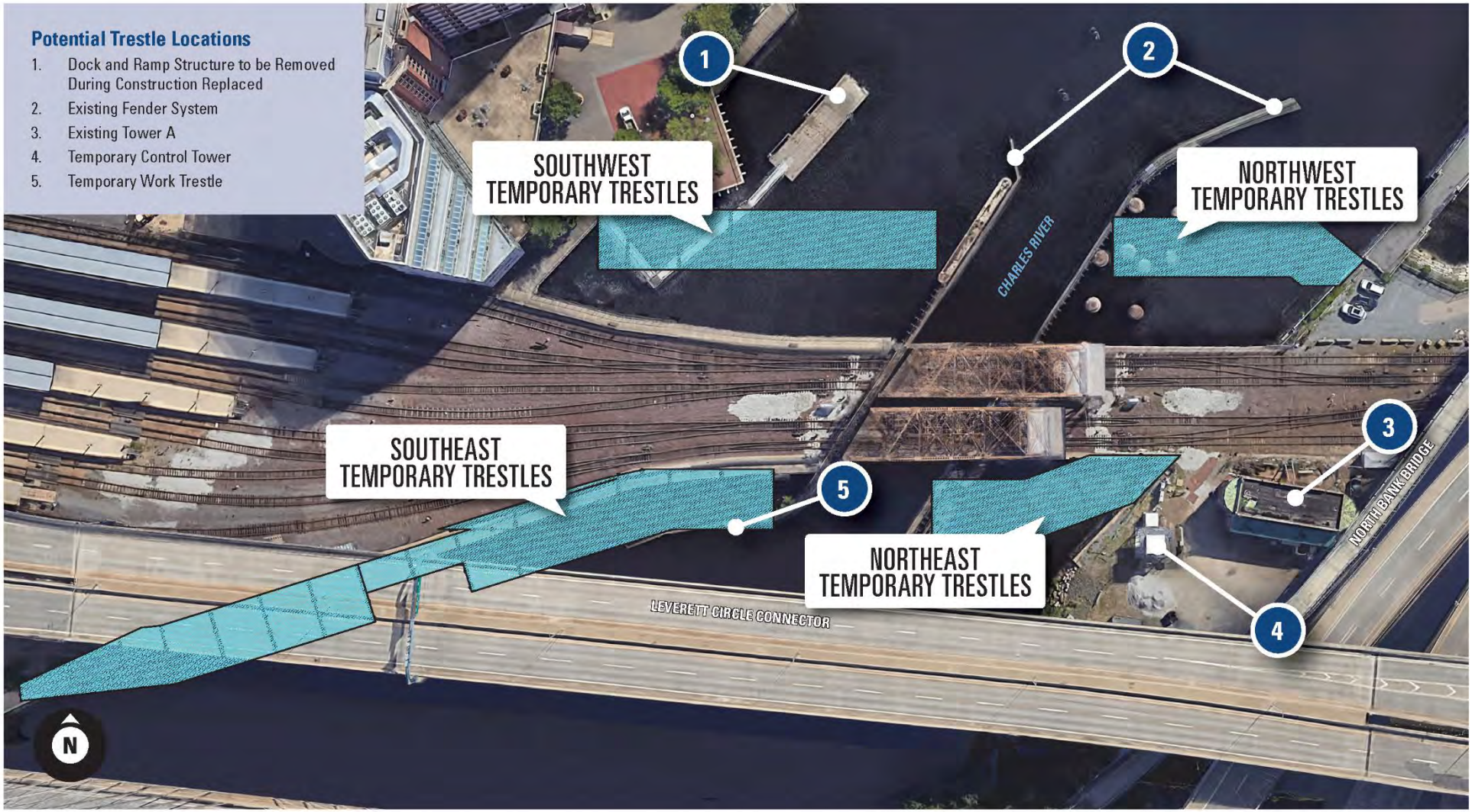
supported equipment. The abutments and approach pier piles would be constructed using equipment mounted on the work trestles or located on constructed portions of the proposed Draw One Bridge structure.

The use of several barges is anticipated for the construction of the temporary trestles, drilled shafts, caps and piers (**Figure 3.1-3**).



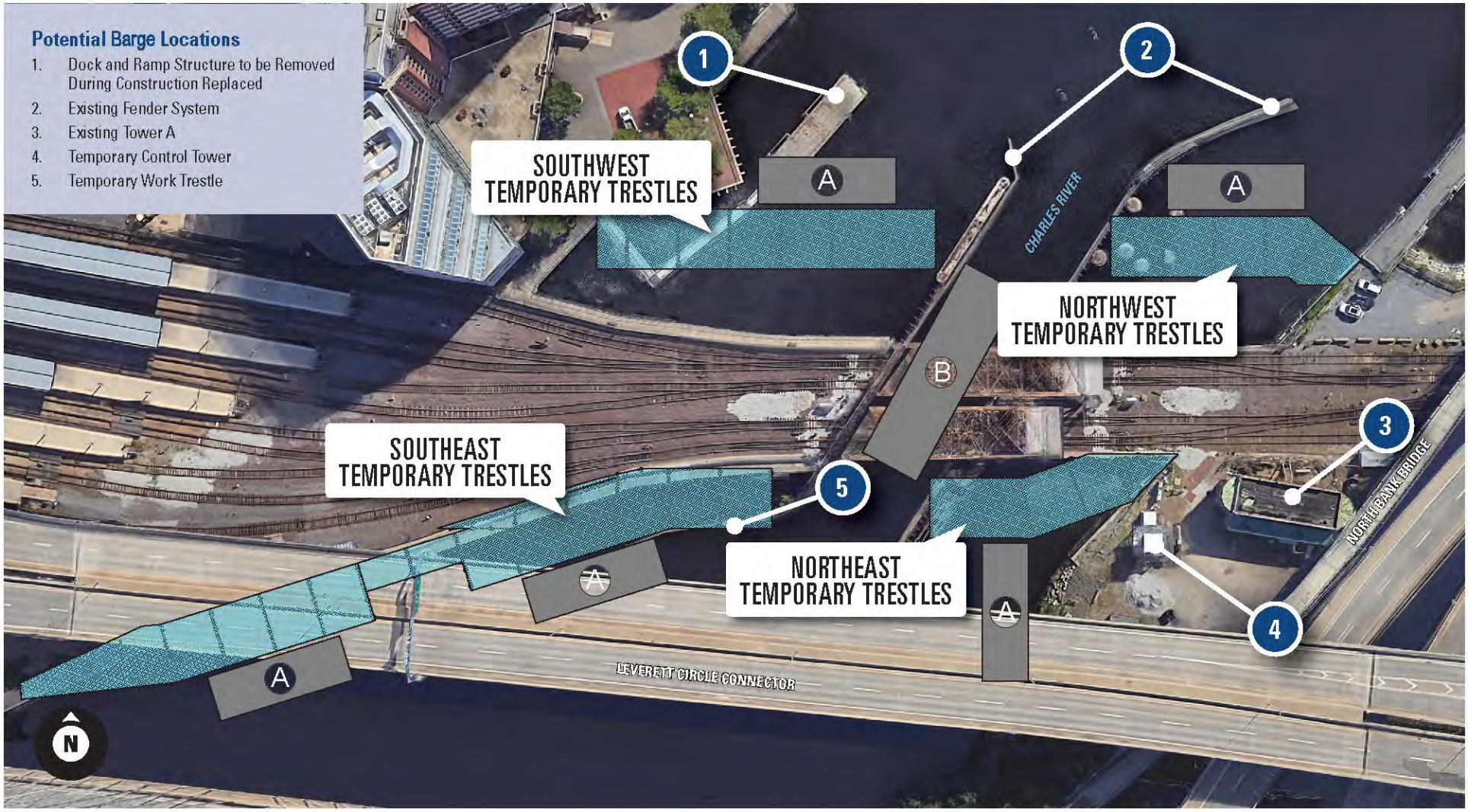
Note: Contractor may elect to use Cofferdams as shown to assist in the demolition of remaining caissons and pier.

Figure 3.1-1: Potential Cofferdam



Note: Contractor may elect to use temporary trestles and barges during construction. All of the barges and temporary trestles shown are underneath the elevated overhead structures.

Figure 3.1-2: Temporary Trestles without Barges



A Barge for Material Delivery and Storage

B Barge for Float-out of Existing Spans (Temporary Channel Closure)

Note: Contractor may elect to use temporary trestles and barges during construction. All of the barges and temporary trestles shown are underneath the elevated overhead structures.

Figure 3.1-3: Temporary Trestles with Barges

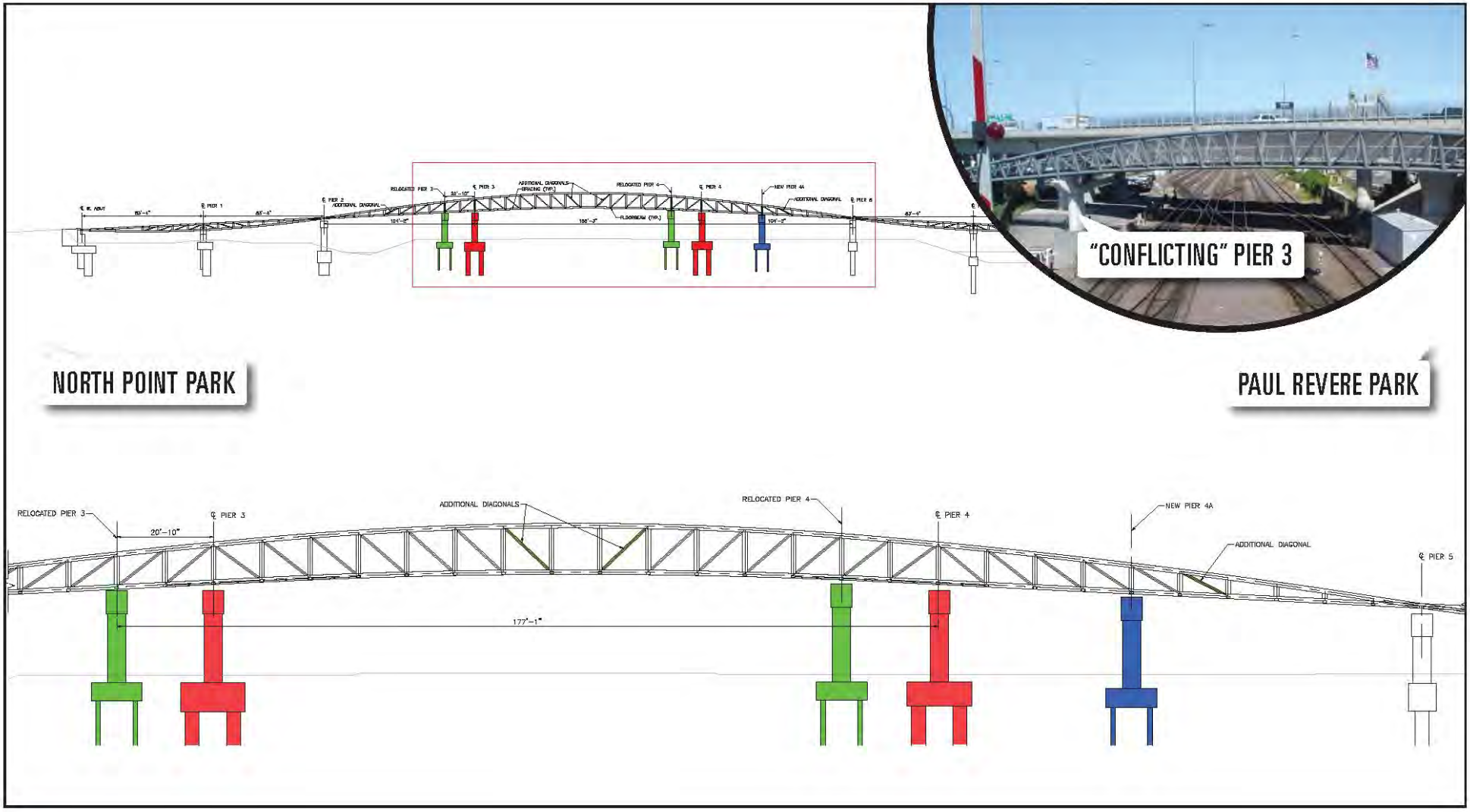
Barges may also be used for mounted cranes, material storage, and material delivery. Precast concrete, steel reinforcement bars, structural steel members, and machinery components may be transported to the Project Site by barge.

The work trestles, supported on piles, may be used for access, material storage, and construction. Dredging is proposed for areas outside of the proposed fender system that now may be in the assumed travel path for vessels traversing the channel and are no longer protected by the existing fender. For pile caps that are partially submerged in the final condition, float-in forms may be utilized to minimize on-site construction and to function as formwork for the caps.

3.1.2 LAND-SIDE STRUCTURES

Construction of Tower A is assumed to start as part of the Bridge Phase 1 work activities (**Table 2.3-1**). Work would consist of relocating the existing temporary control tower onto a temporary trestle structure which will be installed in the river adjacent to the existing north bank seawall. Foundation work would consist of the construction of test pits to determine the extent of the existing seawall and the installation of driven piles from equipment located on the land. Additional work would include the installation of a water detention system below the proposed parking lot at the new Tower A site and installation of a new waterline utility using jack and bore methods beneath the MBTA tracks adjacent to the Tower A site.

Modification of the North Bank Bridge is assumed to be completed during Bridge Phase 1 of construction. New foundations for Piers 3, 4, and 4A would consist of the installation of micropiles from ground supported equipment. The North Bank Bridge superstructure would be permanently raised approximately 1 foot in height to allow for the reconfigured track to be constructed under this bridge. Additional work would consist of regrading the approach pathways at each end of the North Bank Bridge after it is raised and adjusting the drainage structures (**Figure 3.1-4**). This work would require multiple closures of the pedestrian bridge of up to two weeks, totaling one month over a six-month period. Further, modification of the bridge would require multiple temporary closures of three walkways (100 feet) within Paul Revere Park and three walkways (140 feet) within North Point Park for up to two weeks at a time, totaling one month; these closures would take place over a six-month period. A detour from North Point Park to access Paul Revere Park would be developed in coordination with DCR.



Existing Pier Location to be Demolished

Proposed Pier Location and New Diagonals

Newly Constructed Additional Pier

Figure 3.1-4: North Bank Bridge – Modifications

3.2 SUPERSTRUCTURE

The bridge superstructure would be erected from the temporary work trestles for Phases 1, 2, 4, and 5. Phase 3 would be constructed from a combination of the constructed structure and the temporary work trestles. Material delivery would primarily be by barge or by rail and material storage would be on barges or on the trestle system.

3.2.1 DEMOLITION OF REMAINING MOVABLE SPAN STRUCTURES AND TOWER A

Demolition of the remaining operational Draw One Bridge movable span structures would likely consist of removing the counterweight and machinery room and transporting it to the existing Tower A site for demolition using SPMTs (self-propelled modular transporters), which are multi-axle trailers designed for the transportation of large and heavy cargoes. The existing trusses would be cut apart and portions removed by crane and remaining portions floated out on a barge.[2]

Existing caissons outside of the navigable channel would be demolished down to the mudline. Caissons that would lie within the proposed channel would be demolished down to 5' below the proposed channel elevation. Caisson demolition is anticipated to be performed by wire-saw cutting and removing sections of each caisson. Alternate methods could include the use of silt curtains and demolition hammers.

South trestle demolition would consist of cutting the existing deck precast panels at the original construction joints and removing sections of the deck. Pier caps would have areas of local demolition so sections of the caps could be removed. Where original timber piles were grouted into the pier caps, the tops of piles would be cut to facilitate pile cap removal. Timber piles would be cut off at the mudline except at locations where they will conflict with the proposed foundations, in which case they would be extracted. Approximately 1,380 timber piles would be cutoff at the mudline and 20 piles would be extracted at the south trestle.

North trestle and fender demolition would consist of removal of deck timber and timber pile caps prior to cutting off timber piles at the mudline. Where timber piles conflict with the proposed foundations, the piles would be extracted. Where piles would be located in the proposed channel, the piles would be cut off 3 feet below the mudline. Approximately 580 piles would be cutoff at or below the mudline and 50 piles would be extracted at the north trestle and existing fender system.

Tower A demolition will consist of abatement of existing hazardous materials and relocation of all electrical and bridge operation related services out of Tower A so existing equipment can be decommissioned. Selective demolition will be used to remove the existing Boston and Maine cast stone sign from the façade of the building, along with any other elements that may be required as part of agreed upon mitigations. Shielding will be erected to provide protection to the tracks, existing signal equipment, and the North Bank Bridge. Traditional demolition methods would then be used to demolish the building

[2] Crane boom heights (approximately 300 feet) would not exceed the heights of nearby high-rise buildings or the Leonard P. Zakim Bunker Hill Memorial Bridge towers. The contractor would follow the requirements outlined in the Federal Aviation Administration (FAA) guidelines, as applicable.

and foundation, which may include excavators, demolition hammers, and steel shears. A description of hazardous materials within the existing Tower A building is provided in EA **Section 3.2.11, "Hazardous and Contaminated Materials**."

3.2.2 TRACK AND SIGNAL

Track and Signal work will extend throughout the entire limits of the project. New signal duct banks and troughs will be installed to facilitate construction phasing and final construction. In areas of existing tracks, tracks will be realigned to provide consistent spacing and new special track work and signals will be installed to facilitate the track phasing required to allow the three lift bridges to be constructed while maintaining connectivity between the station tracks and all of the commuter rail lines. Existing track will have new ballast, ties, and rails installed as part of the project. Where new portions of track are being added or where track is constructed along a new alignment, new subgrade, drainage, ballast and track work and signals will be constructed.

4.0 CONSTRUCTION STAGING AREAS AND ACCESS ROUTES

4.1 CONSTRUCTION STAGING AREAS

Construction staging areas, also referred to as "laydown areas," are sites that are used for storage of materials or equipment, assembly, or other temporary construction-related activities. Staging areas are typically fenced for security and to protect the public, have gates to allow vehicle access, deliveries, and are often lighted for security. Staging areas of adequate size and proximity to the work activities are essential to support construction activities.

A potential construction staging area is located at an existing MBTA commuter rail material storage yard and construction staging area, referred to as the T-Pad. The T-Pad is located at 28 Inner Belt Road, Somerville, MA, which is approximately 5,000 feet on rail to the center of the Charles River (**Figure 4.1-1**).

The T-Pad site currently houses a bridge and buildings shop as well as track material storage and laydown areas to support maintenance activities throughout the MBTA Commuter Rail network. The yard has a direct connection into the existing track network throughout the Project Site. The site's rail proximity would allow for hi-rail equipment to get on and off rail on uncontrolled track, thereby not delaying MBTA Commuter Rail operations. This proximity also enables ballast cars and flat cars to be loaded to move track materials from the laydown area to the project construction sites.

Additional laydown areas would be located in construction zones based on the track phasing. During the construction of the movable spans, the two tracks that connect to the bridge under construction, immediately north of the bridges would be out of service and can be used for laydown areas during each phase. There are similar situations along the length of the project where extended lengths of adjacent tracks would be inactive during a specific construction phase and will provide temporary laydown areas for storage or other construction activities.

If the construction contractors choose to use staging areas that differ from those identified and analyzed in this EA, they will be required to obtain all the necessary permits and approvals from federal, state and local regulatory agencies. This would include any remote staging areas for loading barges with material and equipment, or for partial preassembly.

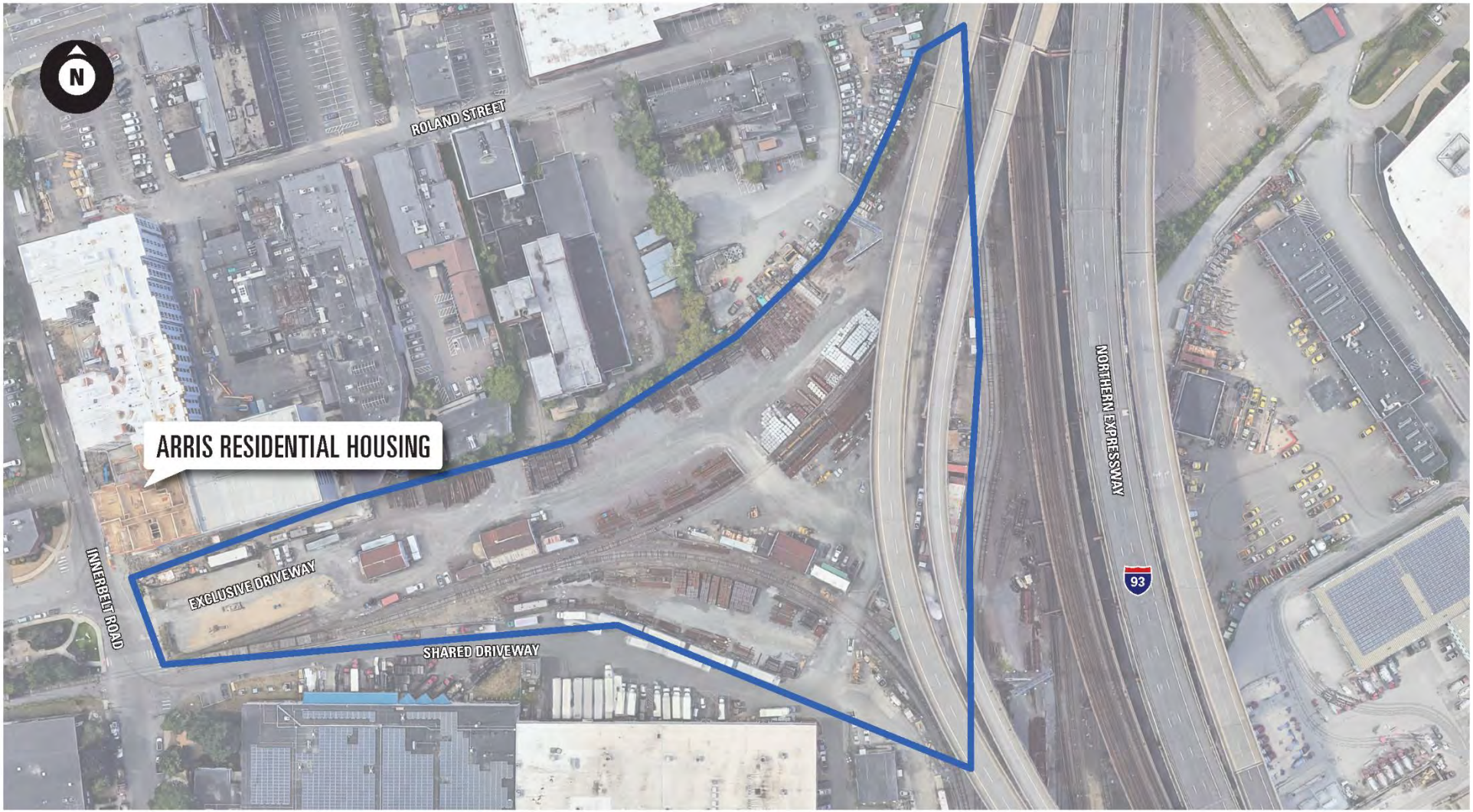


Figure 4.1-1: Construction Laydown Area – T-Pad

4.2 CONSTRUCTION ACCESS ROUTES

Construction access and material delivery would be provided by barge and rail throughout the approximately eight (8) year project construction duration. The Contractor would remove most of the construction and demolition debris by barge. The contractor would dismantle and remove the existing Draw One Bridge structures by barge. Some debris would be removed by truck.

Truck routes to access the project construction areas falls into two categories. Typical truck traffic that can travel without restrictions and hazardous cargo truck traffic that is restricted from using tunnels (e.g., O'Neill Tunnel, Sumner Tunnel, Ted Williams Tunnel, Callahan Tunnel). Trucks that may be required to access the construction site that fall into this hazardous cargo category include fuel deliveries for equipment such as gasoline or diesel, and flammable gas and compressed gas that may be used for welding or torches.

It is anticipated that access to the Project Site would be via I-93 and the Leverett Circle Connector and local roads in the Cities of Boston and Cambridge. Additional access on the North side of the project may be via Sullivan Square and New Rutherford Avenue. Access to the T-Pad is expected to be via I-93 and Cambridge Street to Inner Belt Road. Trucks carrying hazardous cargo would follow standard hazardous routes through the various cities (Boston, Cambridge, Somerville) to access the project.

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