Notice of Project Change

The information requested on this form must be completed to begin MEPA Review of a NPC in accordance with the provisions of the Massachusetts Environmental Policy Act and its implementing regulations (see 301 CMR 11.10(1)).

For Office Use Only
Executive Office of Environmental Affairs

MEPA Analyst:
Phone: 617-626-

EEA # 15278			
Project Name: I-90 Allston Multimodal Project			
Street Address: I-90, Cambridge Street and Soldiers Field Road			
Municipality: Boston (Allston)		Watershed: Charles River	
Universal Transverse Mercator Coordinates: **4691660.71 N, 325275.40 E**		Latitude: 43.357593 Longitude: -71.121626	
Estimated commencement date: 2025		Estimated completion date: 2032	
Project Type: Transportation – Roadways/Transit		Status of project design: 15 %complete	
Proponent: Massachusetts Department of Transportation (MassDOT)			
Street Address: 10 Park Plaza			
Municipality: Boston		State: MA	Zip Code: 02116
Name of Contact Person: Mark Fobert			
Firm/Agency: Tetra Tech		Street Address: 100 Nickerson Road	
Municipality: Marlborough		State: MA	Zip Code: 01752
Phone: (508) 786-2306	Fax: (508) 786-2201	E-mail: mark.fobert@tetratech.com	

With this Notice of Project Change, are you requesting:

a Single EIR? (see 301 CMR 11.06(8))	☐Yes ☒No
a Special Review Procedure? (see 301CMR 11.09)	☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11)	☐Yes ☒No
a Phase I Waiver? (see 301 CMR 11.11)	☐Yes ☒No

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?
301 CMR 11.03(1)(a)1 – Direct alteration of 50 or more acres of land.
11.03(3)(b)5 – New non-water dependent use of tidelands.
11.03(6)(b)i.1 – Construction of a new roadway one-quarter or more miles in length.
11.03(6)(b)i.2 – Widening of an existing roadway by four or more feet for one-half or more miles.

Which State Agency Permits will the project require?
Chapter 91 License – Mass DEP
Section 401 Water Quality Certification – Mass DEP
Notification Prior to Construction or Demolition – MassDEP
Review under M.G.L. Chapter 9, Section 26-27C as amended by Chapter 254 of the Acts of 1988 - Massachusetts Historical Commission

State Agency Permits (continued)

Consistency Review – Massachusetts Coastal Zone Management
Construction and Access Permit – Department of Conservation and Recreation
8(m) Permit – Massachusetts Water Resources Authority
Building Permit – Department of Public Safety
Sewer Use Discharge Permit, a Group Permit or a General Permit (To Be Determined) - Massachusetts Water Resources Authority

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres:

Financial Assistance
MassDOT is seeking funds in a multi-year MPDG Mega Grant to support pre-construction and construction activities, comprising 60% of the project cost. The MPDG Mega Grant funds will be matched by Commonwealth of Massachusetts, City of Boston, third party and other contributions, totaling 40% of the total project costs. Should the requested Mega Grant funding not be provided, additional federal funding, as needed, will be sought through a combination of future federal-aid apportionments and Bipartisan Infrastructure Law (BIL) grant opportunity funding to the Commonwealth.

Land Transfer
The Project will require Article 97 approval for any currently proposed build alternative due to the transfer of land from DCR control to MassDOT control. See Table 3.5-1 and Section 2.3.4 for additional information.

PROJECT INFORMATION

In 25 words or less, what is the project change?
The project change involves changes to the project's Purpose & Need and changes to design elements of the project's proposed alternatives.

See full project change description in Sections 1.0 and 2.0 of the Notice of Project Change narrative.

Date of publication of availability of the ENF in the Environmental Monitor: (Date: 11/5/2014)

Was an EIR required? ☐Yes ☒No*; if yes,

*The Environmental Notification Form (ENF) indicated that the project would result in the direct alteration of 50 or more acres of land, a mandatory Environmental Impact Report (EIR) threshold identified at 301 CMR 11.03(1)(a)(1). For the purpose of establishing whether a project is subject to Massachusetts Environmental Policy Act (MEPA) review, land alteration is typically defined as new alteration of undisturbed land. Subsequent to the filing of the ENF, the MEPA office concluded that given the current disturbed and paved condition of the project site, this mandatory EIR threshold did not apply. Regardless, MassDOT agreed to prepare and file an EIR for the project presented in the ENF.

was a Draft EIR filed? ☒Yes (Date: 11/30/2017) ☐No
was a Final EIR filed? ☐Yes (Date:) ☒No
was a Single EIR filed? ☐Yes (Date:) ☒No

Have other NPCs been filed? ☐Yes (Date(s):) ☒No

If this is a NPC solely for lapse of time (see 301 CMR 11.10(2)) proceed directly to Attachments & Signatures.

PERMITS / FINANCIAL ASSISTANCE / LAND TRANSFER

List or describe all new or modified state permits, financial assistance, or land transfers not previously reviewed: **dd w/ list of State Agency Actions (e.g., Agency Project, Financial Assistance, Land Transfer, List of Permits)**

Permits
Proposed project changes do not introduce any new or modified state permits beyond what was described in the DEIR. See Section 3.5 and Table 3.5-1 for a detailed list of applicable Project permits and approvals.

Financial Assistance
As described above, MassDOT is seeking funds in a multi-year MPDG Mega Grant to support pre-construction and construction activities, comprising 60% of the project cost. The MPDG Mega Grant funds will be matched by Commonwealth of Massachusetts, City of Boston, third party and other contributions, totaling 40% of the total project costs. Should the requested Mega Grant funding not be provided, additional federal funding, as needed, will be sought through a combination of future federal-aid apportionments and Bipartisan Infrastructure Law (BIL) grant opportunity funding to the Commonwealth.

Land Transfer
A newly proposed alternative, the SFR Hybrid Option, will modify the amount of Article 97 land transferred to MassDOT, as compared with previously reviewed alternatives in the DEIR, see Section 2.3.4.

Are you requesting a finding that this project change is insignificant?
A change in a Project is ordinarily insignificant if it results solely in an increase in square footage, linear footage, height, depth or other relevant measures of the physical dimensions of the Project of less than 10% over estimates previously reviewed, provided the increase does not meet or exceed any review thresholds. A change in a Project is also ordinarily insignificant if it results solely in an increase in impacts of less than 25% of the level specified in any review threshold, provided that cumulative impacts of the Project do not meet or exceed any review thresholds that were not previously met or exceeded. (see 301 CMR 11.10(6))
☐**Yes** ☒**No; if yes, provide an explanation of this request in the Project Change Description below.**

FOR PROJECTS SUBJECT TO AN EIR

If the project requires the submission of an EIR, are you requesting that a Scope in a previously issued Certificate be rescinded?
☐**Yes** ☒**No; if yes, provide an explanation of this request_____.**

If the project requires the submission of an EIR, are you requesting a change to a Scope in a previously issued Certificate?
☐**Yes** ☒**No; if yes, provide an explanation of this request_____.**

SUMMARY OF PROJECT CHANGE PARAMETERS AND IMPACTS

See Section 2.3 of the attached for a summary of project change parameters and impacts (Tables 2.3.12-1 and 2.3.17-1).

Summary of Project Size & Environmental Impacts – 3L-Modified At-Grade	Previously reviewed	Net Change	Currently Proposed
LAND			
Total site acreage	150 AC	+15 AC	165 AC
Acres of land altered			
Acres of impervious area (acres)	3K-ABC: 73.7	+3.9	3L-Mod. At-Grade: 77.6
Square feet of bordering vegetated wetlands alteration	0	0	0
Square feet of other wetland alteration	3K-ABC: 3,960 sf LUW (T&P) 440 lf Bank (T&P) 2,300 cf BLSF (T&P)	+32,540 sf LUW +1,060 lf Bank -380 cf BLSF	3L-Mod. At-Grade: 36,500 sf LUW (T&P) 28,200 sf LUW (Indirect Shading) 1,500 lf Bank (T&P) 1,920 cf BLSF (T&P)
Acres of non-water dependent use of tidelands or waterways	3K-ABC: 1,100 sf Flowed Tidelands (P) 3,300 sf Flowed Tidelands (T)	+69,100 sf Flowed Tidelands	3L-Mod. At-Grade: 73,500 sf Flowed Tidelands (P)
STRUCTURES			
Gross square footage*	104,120 sq ft.	-7,420 sq ft.	96,700 sq ft.
Number of housing units	0	0	0
Maximum height (in feet)			
TRANSPORTATION			
Vehicle trips per day	2016 ADT: 154,000 Project does not propose to change capacity	-3,000 ADT	2019 ADT: 151,000 Project does not propose to change capacity
Parking spaces	20	0	20
WATER/WASTEWATER			
Gallons/day (GPD) of water use	10,600	0	10,600
GPD water withdrawal			
GPD wastewater generation/ treatment	550	0	550
Length of water/sewer mains (in miles)			

*Gross square footage of “structures” incudes West Station without roadway or bridge elements

Summary of Project Size & Environmental Impacts – 3L-Modified Highway Viaduct	Previously reviewed	Net Change	Currently Proposed
LAND			
Total site acreage	150 AC	+15 AC	165 AC
Acres of land altered			
Acres of impervious area (acres)	3K-HV: 74.8	+2.8	3L-Mod. HV: 77.6
Square feet of bordering vegetated wetlands alteration	0	0	0
Square feet of other wetland alteration	3K-HV: 240 sf LUW (T&P) 90 lf Bank (T&P)	+760 sf LUW -90 lf Bank	3L-Mod. HV: 1,000 sf LUW (T&P)
Acres of non-water dependent use of tidelands or waterways	3K-HV: 60 sf Flowed Tidelands (P) 200 sf Flowed Tidelands (T)	+740 sf Flowed Tidelands	3L-Mod. HV: 1,000 sf Flowed Tidelands (T&P)
STRUCTURES			
Gross square footage*	104,120 sq ft.	-7,420 sq ft.	96,700 sq ft.
Number of housing units	0	0	0
Maximum height (in feet)			
TRANSPORTATION			
Vehicle trips per day	2016 ADT: 154,000 Project does not propose to change capacity	-3,000 ADT	2019 ADT: 151,000 Project does not propose to change capacity
Parking spaces	20	0	20
WATER/WASTEWATER			
Gallons/day (GPD) of water use	10,600	0	10,600
GPD water withdrawal			
GPD wastewater generation/ treatment	550	0	550
Length of water/sewer mains (in miles)			

*Gross square footage of “structures” incudes West Station without roadway or bridge elements

Summary of Project Size & Environmental Impacts – 3L-SFR Hybrid	Previously reviewed	Net Change	Currently Proposed
LAND			
Total site acreage	150 AC	+15 AC	165 AC
Acres of land altered			
Acres of impervious area (acres)	3K-AMP: 72.1	+5.6	3L-SFR: 77.7

Square feet of bordering vegetated wetlands alteration	0	0	0
Square feet of other wetland alteration	3K-AMP: 240 sf LUW (T&P) 90 lf Bank (T&P)	+51,460 sf LUW +1,885 lf Bank +10,600 cf BLSF	3L-SFR Hybrid: 51,700 sf LUW (T&P) 1,975 lf Bank (T&P) 10,600 cf BLSF
Acres of non-water dependent use of tidelands or waterways	3K-AMP: 60 sf Flowed Tidelands (P) 200 sf Flowed Tidelands (T)	+61,440 sf Flowed Tidelands	61,700 sf Flowed Tidelands (T&P)
STRUCTURES			
Gross square footage*	104,120 sq ft.	-7,420 sq ft.	96,700 sq ft.
Number of housing units	0	0	0
Maximum height (in feet)			
TRANSPORTATION			
Vehicle trips per day	2016 ADT: 154,000 Project does not propose to change capacity	-3,000 ADT	2019 ADT: 151,000 Project does not propose to change capacity
Parking spaces	20	0	20
WATER/WASTEWATER			
Gallons/day (GPD) of water use	10,600	0	10,600
GPD water withdrawal			
GPD wastewater generation/ treatment	550	0	550
Length of water/sewer mains (in miles)			

*Gross square footage of “structures” incudes West Station without roadway or bridge elements

Does the project change involve any <u>new or modified</u>:

1. conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97? ☒**Yes** ☐**No See Section 2.3.4.**
2. release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction? ☐**Yes** ☒**No**
3. impacts on Rare Species**?** ☐**Yes** ☒**No See Section 2.3.16.**
4. demolition of all or part of any structure, site or district listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth**?** ☐**Yes** ☒**No See Section 2.3.6.**
5. impact upon an Area of Critical Environmental Concern? ☐**Yes** ☒**No**

If you answered ‘Yes’ to any of these 5 questions, explain below:

1. A newly proposed alternative, the SFR Hybrid Option, will modify the amount of Article 97 land transferred to MassDOT, as compared with previously reviewed alternatives in the DEIR

See Section 2.3.4 of the attached.

2. The Project does not involve the release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction.

3. The Project would have no impacts on federal or state threatened and endangered species as none are present in the Project Area. See Section 2.3.16 of the attached.

4. The proposed Project change does not introduce any additional demolition of structures, sites or districts listed in the State Register of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth beyond what was described in the DEIR. See Section 2.3.6 of the attached.

5. The project will have no impact on any Area of Critical Environmental Concern.

PROJECT CHANGE DESCRIPTION (attach additional pages as necessary). The project change description should include:

(a) a brief description of the project as most recently reviewed
(b) a description of material changes to the project as previously reviewed,
(c) if applicable, the significance of the proposed changes, with specific reference to the factors listed 301 CMR 11.10(6), and
(d) measures that the project is taking to avoid damage to the environment or to minimize and mitigate unavoidable environmental impacts. If the change will involve modification of any previously issued Section 61 Finding, include a draft of the modified Section 61 Finding (or it will be required in a Supplemental EIR).

See attached for a more detailed description of the Project Change Description. A summary is provided below.

(a) Brief description of the project as most recently reviewed. See Section 1.0 – Notice of Project Change narrative in the attached.

The Interstate 90 (I-90) Allston Multimodal Project (the Project) was initiated by MassDOT in response to the age and condition of the I-90 Viaduct (MEPA File EEA No. 15278, I-90 Allston Interchange Project, Boston, MA). The Project would address the structural deficiencies of the bridge and take advantage of All-Electronic Tolling (AET) to reduce the footprint of the interchange. I-90 is a significant part of the regional highway infrastructure, carrying over 150,000 vehicles per day (as of Winter 2019) and connecting Logan Airport, Interstate 93 (I-93) and downtown Boston with areas to the west via Interstate (I-95) and Interstate 495 (I-495). The Allston interchange is a critical interface between the regional highway system and the local street network; over 75,000 vehicles per day use the interchange.
The alternatives analysis process began in 2014 with the development of an Environmental Notification Form (ENF). The ENF provided a review of 16 interchange alternatives. The MEPA Draft Environmental Impact Report (DEIR) further refined and modified alternatives for the layout and design of the interchange, rail layover and West Station, and developed variations under these alternatives for the design of the "Throat Area" of the Project — the relatively narrow existing multi-modal section where the I-90 viaduct is situated between the Charles River and BU. This area has been a major focus of design input from stakeholders due to the limited space available for the desired multimodal infrastructure improvements.

(b) Description of material changes. See Section 2.0 – Notice of Project Change narrative in the attached.

The Purpose and Need of the Project has been updated in response to feedback received from Project stakeholders including regulatory agencies, the Project Task Force and the general public, as well as to better align with the Project Purpose and Need developed during the NEPA process. The following description details the Project's current Purpose and Need which has updated the following items since publication of the DEIR:

- Emphasizes improvements to mobility and transportation access within the Project Area, identifying level of service within the I-90 interchange as well as the need to provide or allow for a connection from BU and the Allston, Brighton and Brookline neighborhoods to the Charles River Reservation
- Specifically identifies an upgrade to the PDW Path to provide a two-way pedestrian and bicycle facility

- Continues to include rail improvements such as construction of a new West Station and infrastructure supporting mid-day commuter rail operation
- Continues to address roadway deficiencies and safety concerns including replacement of the structurally deficient I-90 viaduct
- Clarifies that the separate Bridge Preservation Project does not affect the overall need for the I-90 Allston Multimodal Project.

The Project's No Build Alternative has been revised and now consists of frequent and continuous preservation activities that would be necessary beyond the useful life of the repairs conducted under the Bridge Preservation Project, such as safety and maintenance improvements, to maintain continuing operation of the existing interchange and eventual superstructure replacement.

The Project's 3K Build Alternative analyzed in the DEIR has been updated to the 3L Re-alignment Alternative. Major Changes to the Build Alternative include:

- The Malvern Street Transitway with enhanced pedestrian/bike connection from West Station to Commonwealth Avenue has been added to the Project
- The SFR westbound off-ramp to Cambridge Street/River Street has been restored, that was a comment the team received on the DEIR quite a bit so that connection has been restored.
- The North Connector Road has been removed and the West Connector has been removed, which reduces the number of signalized intersections on Cambridge Street
- Grade separating Cambridge Street South and the Stadium Way Connector, improving bike and ped connectivity and safety
- The team is also continuing to advance development of a N-S pedestrian/bike connection from Agganis Way to Charles River Reservation.
- The team is also continuing to advance development of a shared use path from the Franklin St. pedestrian bridge to Agganis Way for potential inclusion in the Project's Build Alternative.
- The team is currently reviewing several potential options for the Franklin St. Pedestrian Bridge. Those options are described a bit in the NPC and will be further described and analyzed in the SDEIR.
- The team will also be analyzing a Cambridge Street Bypass Road in the SDEIR for potential inclusion into the project as well. This would include a new two-way roadway departing the Cambridge Street bridge over I-90 and connecting with West Station and Cattle Drive.
- Refinement to the design and layout of West Station.
- Refinement to the design of Throat Area variations, including the introduction of a new Throat Area design called the SFR Hybrid.

(c) Significance of the proposed changes. See Section 3.0 – Notice of Project Change narrative in the attached.

3.1 301 CMR 11.10 (6)(a) Expansion of the Project

While the scope of the Project has not changed, as Project design has continued to develop since publication of the DEIR, the Project Area has been expanded to approximately 165 acres and now includes the Malvern Street Transitway to the south and the construction staging area for the SFR Hybrid Throat Area option (See Figure 1.1-2 of the attached). Therefore, the Project Area now includes an extension south of the BPY along Malvern Street and a portion of the Charles River, just north of the PDW Path within the Throat Area.

3.2 301 CMR 11.10 (6)(b) Generation of Further Impacts
See Section 2.3 of the attached. Modifications to two Throat Area options, as well as the addition of a new Throat Area option, may result in the generation of additional impacts than those impacts described in the DEIR for these alternatives. The SDEIR will further analyze and describe impacts of each alternative under consideration.

3.3 301 CMR 11.10 (6)(c) Change in Expected Date for Commencement of the Project
It is MassDOT's goal to substantially complete the state and federal environmental review processes by Summer of 2024 with all federal and state-dependent authorization decisions acquired for the Project by Spring 2025. Commencement of construction activities is anticipated to begin in 2025.
In addition, MassDOT is no longer relying on the phasing plan described in the DEIR. The Project will be built under a single phasing scenario. A constructability analysis, including details regarding phasing and construction, of West Station as well as the entire Project will be prepared and presented in the SDEIR.

3.4 301 CMR 11.10 (6)(d) Change of the Project Site
N/A

3.5 301 CMR 11.10 (6)(e) New Application for a Permit or New Request for Financial Assistance or a Land Transfer
See Table 3.5-1 of the attached for an updated list of applicable permits and approvals needed for the Project.

3.6 301 CMR 11.10 (6)(f) Any Change that Prevents or Materially Delays Realization of Such Benefits
N/A

3.7 301 CMR 11.10 (6)(g) For a Project involving a Lapse of Time, Changes in the Ambient Environment
N/A

(d) Measures the project is taking to avoid damage to the environment. See Section 4.0 – Notice of Project Change narrative in the attached.

The alternatives described in this NPC have been developed, to the greatest extent practicable, to minimize environmental impacts. MassDOT continues to explore potential mitigation measures for unavoidable adverse environmental impacts and construction period impacts. To date, the public has provided many suggestions for minimization and mitigation measures which will be reviewed for practicability and feasibility during preparation of the SDEIR and FEIR.

ATTACHMENTS & SIGNATURES

Attachments:

1. Secretary's most recent Certificate on this project **Appendix A**
2. Plan showing most recent previously-reviewed proposed build condition **Figure 1.2.2-1**
3. Plan showing currently proposed build condition **Figures 2.2.2-1 thru 2.2.2-8**
4. Original U.S.G.S. map or good quality color copy (8-1/2 x 11 inches or larger) indicating the project location and boundaries **Figure 1.1-1**
5. List of all agencies and persons to whom the proponent circulated the NPC, in accordance with 301 CMR 11.10(7) **Appendix G**

Signatures:

7/25/22	Jessica Kenny	7/25/2022	Mark Fobert
Date	Signature of Responsible Officer or Proponent	Date	Signature of person preparing NPC (if different from above)

Jessica Kenny	Mark Fobert
Name (print or type)	Name (print or type)
MassDOT, Highway Division	Tetra Tech
Firm/Agency	Firm/Agency
10 Park Plaza	100 Nickerson Road
Street	Street
Boston, MA 02116	Marlborough, MA 01752
Municipality/State/Zip	Municipality/State/Zip
857-368-9400	508-786-2306
Phone	Phone

massDOT
Massachusetts Department of Transportation
Highway Division

I-90 Allston Multimodal Project, Boston, MA

Notice of Project Change

INTERSTATE 90
ALLSTON
INTERCHANGE

July 2022 | EOEEA No. 15278

CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

Acronyms

Acronym	Meaning
AASHTO	American Association of State Highway & Transportation Officials
AET	all electronic tolling
APE	Area of Potential Effect
BMP	Best Management Practice
BPY	Beacon Park Yard
BTD	Boston Transportation Department
BU	Boston University
BUAR	Board of Underwater Archaeological Resources
BWSC	Boston Water and Sewer Commission
CAA	Clean Air Act
CO	carbon monoxide
CPM	Crash Prediction Module
CTPS	Central Transportation Planning Staff
DCR	Massachusetts Department of Conservation and Recreation
DDHV	Directional Design Hourly Volume
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Statement
EDA	Economic Development Area
EIR	Environmental Impact Report
ENF	Environmental Notification Form
EOEEA	Executive Office of Energy and Environmental Affairs
EJ	Environmental Justice
ERC	Enterprise Research Campus
FEIR	Final Environmental Impact Report
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GHG	greenhouse gas
GJR	Grand Junction Railroad
HBW	home-based work
HSM	Highway Safety Manual
IRT	Independent Review Team
LOS	Level of Service

Acronym	Meaning
MAAQS	Massachusetts Ambient Air Quality Standards
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MBTA	Massachusetts Bay Transportation Authority
MEPA	Massachusetts Environmental Policy Act
MHC	Massachusetts Historical Commission
MPO	Boston Region Metropolitan Planning Organization
MWRA	Massachusetts Water Resources Authority
MVMT	million vehicles miles traveled
NAAQS	National Ambient Air Quality Standards
NAC	MassDOT Noise Abatement Criteria
NEPA	National Environmental Policy Act
NOx	nitrogen oxides
NPC	Notice of Project Change
NPDES	National Pollutant Discharge Elimination System
OHM	oil and hazardous materials
PDW Path	Dr. Paul Dudley White Bike Path
PM10	coarse particulate matter
PM2.5	fine particulate matter
REC	recognized environmental condition
ROW	right-of-way
SDEIR	Supplemental Draft Environmental Impact Report
sf	square feet
SFR	Soldiers Field Road
SHPO	State Historic Preservation Office/Officer
SO2	sulfur dioxide
SSX	South Station Expansion
SWPPP	Storm Water Pollution Prevention Plan
U.S. EPA	United States Environmental Protection Agency
WML	Worcester Main Line
WPA	Massachusetts Wetlands Protection Act
VOCs	volatile organic compounds
vph	vehicles per hour

Executive Summary

The I-90 Allston Multimodal Project (the Project) located in Boston, Massachusetts, and proposed by the Massachusetts Department of Transportation (MassDOT), proposes to replace the existing highway interchange with a new multimodal urban interchange while accommodating mixed-use development (MEPA File EEA No. 15278, I-90 Allston Interchange Project, Boston, MA). The location of the Project is the area of the former Beacon Park Yard (BPY), historically a rail yard, a portion of which was partially utilized to construct the Massachusetts Turnpike and the original Allston interchange and toll plaza.

Aerial view of Project locus looking East

An Environmental Notification Form (ENF) for the Project was filed on October 31, 2014 and published in the Environmental Monitor on November 5, 2014, Executive Office of Energy and Environmental Affairs (EOEEA) File Number 15278. On December 24, 2014, the Secretary of the EOEEA issued a Certificate on the Project requiring MassDOT to prepare an Environmental Impact Report (EIR). The Massachusetts Environmental Policy Act (MEPA) Office published the Notice of Availability for the Draft Environmental Impact Report (DEIR) on December 6, 2017, providing a 45-day comment period for the public which concluded on January 19, 2018.

The DEIR described an assessment of impacts for the Project's No Build Alternative as well as the "3K" Alternative which included a new interchange design, a new West Station commuter rail station and three Throat Area variations, now referred to as Throat Area "options." The Throat Area refers to the relatively narrow existing multimodal section where the I-90 viaduct is situated between the Charles River and Boston University (BU). It extends from where I-90 passes under the Commonwealth Avenue bridge to an approximate location about 2,500 feet to the west where the existing I-90 viaduct ends. All Throat Area options function within the overall interchange design. The DEIR identified the 3K interchange as MassDOT's Preferred Alternative for the Project. The public submitted over 575 comment letters on the DEIR. The Secretary's Certificate identified several key elements for MassDOT to evaluate further during development of the Final Environmental Impact Report (FEIR).

Such elements include but are not limited to:

- West Station and multimodal connections including ridership demand and modifications to commuter rail services;
- Construction including Project costs, construction staging and construction-period impacts;
- Parkland enhancement including additional bicycle and pedestrian access and connections as well as enhancing and widening the buffer between Soldiers Field Road (SFR) and the Charles River Reservation; and
- A Preferred Alternative option for the Throat Area. The Secretary's Certificate encouraged MassDOT to incorporate desirable elements of all Throat Area options into the design of the Throat Area Preferred Alternative.

Responses to comments from the Secretary's Certificate on the DEIR can be found in Appendix A of this Notice of Project Change (NPC). A list of frequently received comments and responses as well as the full list of individual comments received from the public and corresponding responses are provided in Appendix B and Appendix C, respectively.

This NPC is being filed to update the public and MEPA Office on the current status of the Project, including enhancements made to planning and infrastructure details associated with the Project since publication of the DEIR in 2017. Since publication of the DEIR, MassDOT and the Federal Highway Administration (FHWA) initiated the federal environmental review process for the Project on October 18, 2019, with the publication of a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA). Following publication of the NOI, MassDOT and FHWA released a Scoping Report in November 2019 to provide the public the opportunity to comment on the Project's proposed Purpose and Need and Project alternatives, further refined since publication of the MEPA DEIR. The Scoping Report also provided the public the opportunity to comment on the proposed methodology to be used to evaluate alternatives in the NEPA Draft Environmental Impact Statement (DEIS) and proposed public involvement during the NEPA process.

The Project team received more than 800 comment letters during the NEPA Scoping public comment period. Comments were received from local, state and federal agencies; elected officials; non-governmental organizations; and members of the general public. The most frequently received comments were related to the Project's proposed Purpose and Need, alternatives and scope, construction and analysis methodologies. The Project team summarized the NEPA scoping process for the Project and responded to individual substantive comments received on the Scoping Report in a Scoping Summary Report published in August of 2020. The Scoping Summary Report also further refined design of the Project's proposed alternatives including the No Build Alternative and design of the Throat Area options under the 3L Re-alignment Alternative. Comments resulting from both the MEPA and NEPA review processes, ongoing extensive public outreach and participation, and coordination with Federal, Commonwealth and local agencies are reflected in the changes documented in this NPC.

Improved mobility, including extensive pedestrian and bicycle improvements, is an important component of this Project.

This NPC updates the Project's Purpose and Need to better align with the refined Purpose and Need developed during the NEPA scoping process as well as stakeholder and public comments received. The updated purpose of the Project includes a greater emphasis on improving multimodal mobility and transportation access within the Project Area, addressing level of service issues within the I-90 interchange area, and the need to provide or allow for a connection from BU and the Allston, Brighton and Brookline neighborhoods to the Charles River Reservation. The updated purpose of the Project also specifically identifies an upgrade to the Dr. Paul Dudley White Path (PDW Path) to provide a two-way pedestrian and bicycle facility. The updated purpose of the Project continues to include rail improvements such as construction of a new West Station and infrastructure supporting mid-day commuter rail operation, as well as the need to address roadway deficiencies and safety concerns including replacement of the structurally deficient I-90 viaduct.

This NPC also updates the design of the No Build Alternative and the Build Alternative "3K" described in the 2017 DEIR. The 3K interchange alternative has been refined further and is now referred to as the 3L Re-alignment Alternative. The 3L Re-alignment Alternative includes modification to the design of the interchange, the rail layout and Throat Area options. As with the precedent interchange design, all revised Throat Area options function within the overall 3L Re-alignment Alternative interchange design.

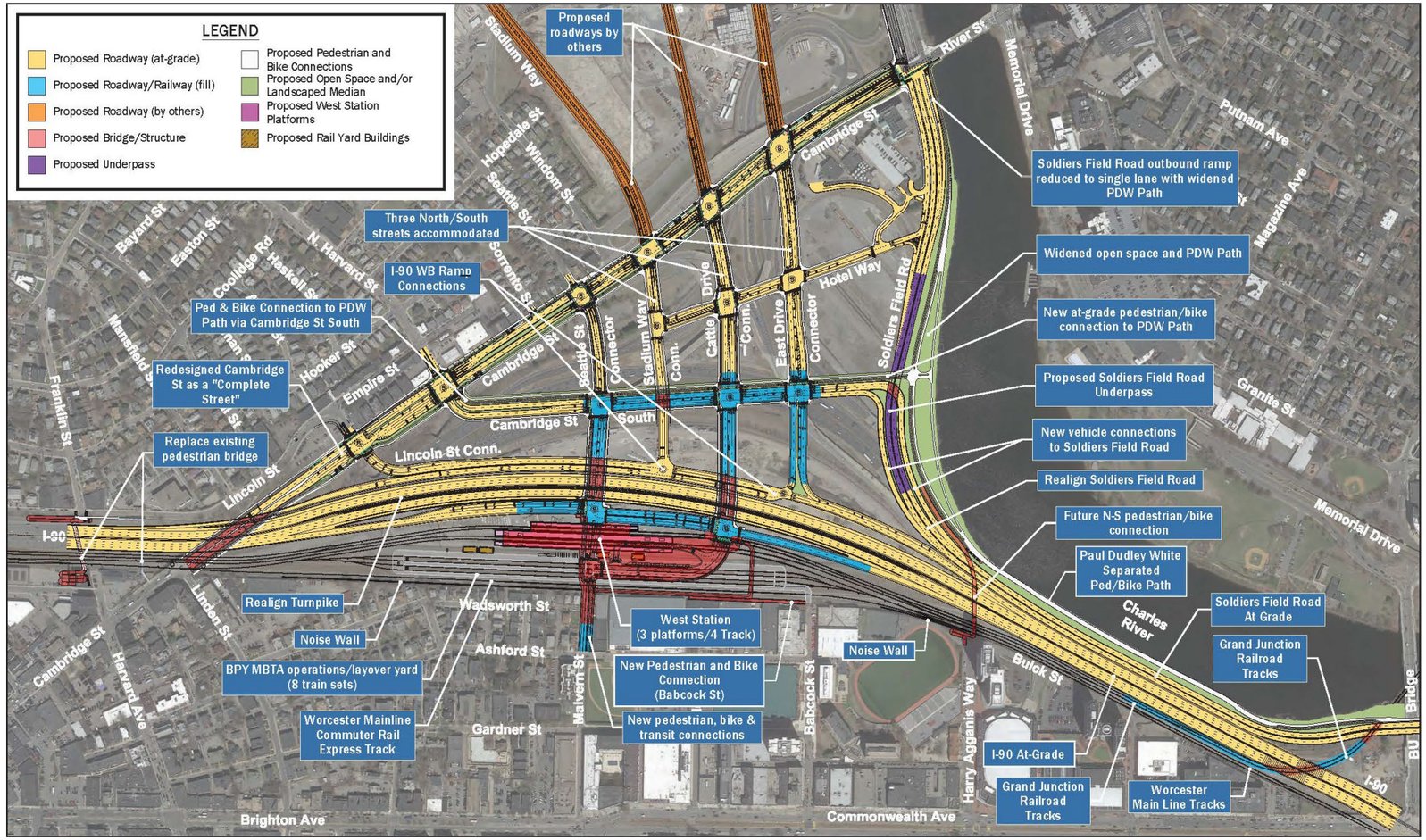
Within the interchange area, the noteworthy changes that have been proposed since the development of the 3K Alternative in the DEIR include the following:

- Enhancing the proposed bicycle/pedestrian connection from West Station to Commonwealth Avenue via Malvern Street by enlarging the proposed structure to accommodate transit bus use.

- Restoring the SFR westbound off-ramp to Cambridge Street/River Street to provide a single lane ramp that will primarily serve the right turn movement to Cambridge (left turns will be prohibited).
- Removing the North Connector Road (SFR to Stadium Way), which will shift traffic destined for the I-90 ramps from the development area north of Cambridge Street to Cambridge Street and a new roadway within the BPY to be constructed by MassDOT (Hotel Way) that is closer to the I-90 ramps.
- Removing the West Connector, reducing the number of signalized intersections on Cambridge Street to six and maintaining the number of signalized intersections on the northerly collector distributor ramps to two.
- Grade separating Cambridge Street South and Stadium Way Connector (Stadium Way Connector will pass under Cambridge Street South). Grade separation will improve bicycle/pedestrian connectivity and safety between the community and the Charles River Reservation (by eliminating traffic signal delays and vehicular conflicts) and improve traffic flow along the Cambridge Street South corridor (elimination of potential congestion associated with “short blocks”).
- Refining design of West Station to optimize and balance goals of both the landowner (Harvard University) and the operator (MBTA), resulting in a West Station layout called the “Modified Flip.”

Since publication of the DEIR, Harvard University conceived a design concept for West Station known as the “Flip” that would relocate the proposed West Station platforms from south of the BPY to the north, adjust the layover yard to the south, and provide a transit way connecting to the south via Malvern Street. The intent of the Flip was to provide for better urban rail operations and improve bus access to West Station while also providing more space for air-rights development south of the station which could serve to better knit together the neighborhoods north and south of the BPY. The concept also included the development of a road connecting to West Station on the south side of the BPY (the so-called Cambridge Street Bypass). The Cambridge Street Bypass will be analyzed in the SDEIR as a potential refinement to the 3L Realignment that may be constructed, subject to its environmental consequences and technical and financial feasibility.

The Project team further analyzed Harvard’s proposed “Flip” West Station and rail layout. The Flip would provide for future Grand Junction Railroad (GJR) service but would reduce operating speeds and increase travel time for many Worcester Main Line (WML) riders originating from Worcester. It would also limit operational flexibility among the WML, layover and GJR because the geometric constraints presented by the Flip prevent some crossover moves contained in the DEIR layout. This layout also requires the limited freight movements along this line to cross over mainline tracks on each side of the yard, introducing freight/commuter rail conflicts. Therefore, the Flip design as proposed by Harvard University was further refined to optimize and balance goals of both the landowner (Harvard University) and the operator (MBTA), resulting in a West Station layout called the “Modified Flip.” The Modified Flip would include the WML rail operational infrastructure of the DEIR layout, while incorporating key elements of the Flip. Like the original Flip, the Modified Flip locates West Station to the north side of BPY, with bus access available from the new interchange and points north as well as from the prospective Cambridge Street Bypass Road. The Modified Flip would provide four station tracks and three platforms serving both WML and potential GJR passenger service. This West Station layout is supportive of aspirational future service goals and would include one ‘express’ track along the existing WML alignment, which would allow commuter rail and Amtrak trains to bypass West Station for express service and offer operational flexibility to bypass a stalled train.



The 3L Re-alignment Alternative responds to stakeholder comments from the MEPA process and remains MassDOT’s Preferred Interchange Alternative.

After publication of the DEIR and at the request of the Secretary of Transportation, an Independent Review Team (IRT) further evaluated the Throat Area options described in the DEIR and documented their findings in an October 2018 technical report. Further refinements were suggested to the highway viaduct option as well as an all at-grade option (formerly known as the “ABC” variation in the DEIR). In addition, the IRT suggested replacing the Amateur Planner (AMP) Throat Area option with a design that elevated SFR above I-90, referred to as the “SFR Hybrid” option. These three options – Highway Viaduct, At-Grade and SFR Hybrid – have been further developed and refined during the NEPA scoping process. This NPC details the design refinements associated with the Highway Viaduct and At-Grade options and introduces a new option, the SFR Hybrid, to the MEPA process. All options will be further analyzed in the Supplemental Draft Environmental Impact Report (SDEIR) to determine a Preferred Option for the Throat Area.

The preferred Throat Area option will reflect the combined public, institutional and regulatory vision for this important multimodal transportation, recreational and historic riverfront corridor. The refinement of the Throat Area preferred option will reflect the ongoing intensive public cooperation and commentary, and the selection process of a preferred option will provide balanced accounting of benefits and impacts in comparison to other options explored during the process. MassDOT has publicly announced it will focus on advancing the Modified At-Grade design for the I-90 Allston Multimodal Project which comes after significant stakeholder engagement as well as input and support from elected officials and the Project Task Force. MassDOT will continue to assess each alternative considered in detail in future environmental review filings so readers can evaluate their comparative merits.

This 3L Re-alignment Alternative represents the alternative that responds to the stakeholder comments from the MEPA process to date and addresses the Secretary’s Certificate comments on the DEIR, as advanced from DEIR Alternative 3K. This urban interchange alternative, the 3L Re-alignment Alternative, remains MassDOT’s Preferred Alternative.

It is the intent and expectation of the Project sponsor, MassDOT, to follow filing and publication of this NPC with the filing and publication of an SDEIR for public review and comment. While this NPC provides an abbreviated overview of the analysis of environmental impacts associated with the updated Project Build Alternative and options, the SDEIR will provide a complete analysis of impacts associated with the updated No Build and 3L Re-alignment Alternatives including impacts associated with the interchange, updated West Station design, updated Throat Area options and the Cambridge Street Bypass Road as well as other elements that meet the Purpose and Need of the Project. The SDEIR will also expand on the analysis of Project costs, phasing and mitigation efforts anticipated for unavoidable adverse impacts associated with proposed alternatives.

1.0 Brief Description of the Project as Most Recently Reviewed

1.1 Project Area

The Interstate 90 (I-90) Allston Multimodal Project (the Project) was initiated by MassDOT in response to the age and condition of the I-90 Viaduct (MEPA File EEA No. 15278, I-90 Allston Interchange Project, Boston, MA). The Project would address the structural deficiencies of the bridge and take advantage of All-Electronic Tolling (AET) to reduce the footprint of the interchange. I-90 is a significant part of the regional highway infrastructure, carrying over 150,000 vehicles per day (as of Winter 2019) and connecting Logan Airport, Interstate 93 (I-93) and downtown Boston with areas to the west via Interstate (I-95) and Interstate 495 (I-495). The Allston interchange is a critical interface between the regional highway system and the local street network; over 75,000 vehicles per day use the interchange.

The Project is located in Boston, Massachusetts, specifically in the Allston neighborhood and bordering on the Charles River. MassDOT, as the Project sponsor, proposes to replace the existing highway interchange at I-90 exit 131 (formerly exits 18, 19 and 20), with a new multimodal urban interchange that will meet the needs of motorists, pedestrians, bicyclists and mass transit (commuter rail, bus and shuttle) users while accommodating mixed-use development within the Project limits.

The government agencies guiding the Project are those with transportation infrastructure located within the Project Area. That transportation infrastructure includes I-90, the Massachusetts Bay Transportation Authority (MBTA) Worcester Main Line commuter rail, the Grand Junction rail line, the Department of Conservation and Recreation's (DCR) Soldiers Field Road and City of Boston streets. Accordingly, MassDOT Highway Division and MBTA are leading the Project. DCR, as a landowner within the Project Area, is providing assistance for the design of Project elements within DCR property.

The Project Area (See Figures 1.1-1 and 1.1-2) is located within the Allston neighborhood of the City of Boston and includes the area encompassed by the former Beacon Park Yard (BPY) rail yard. The Project Area is bounded by Ashford Street to the south, the Commonwealth Avenue bridge and the Charles River to the east, Cambridge Street to the north, and Cambridge Street and the Franklin Street pedestrian bridge over I-90 to the west. The Project Area also includes Soldiers Field Road (SFR), a parkway, and the adjacent Dr. Paul Dudley White (PDW) Path, a shared-use path along the banks of the Charles River. Both SFR and the PDW Path are part of the Charles River Reservation under the care, custody and control of the DCR, and within the bounds of the Charles River Basin Historic District, which is listed in the National Register of Historic Places (NRHP). SFR is a major crosstown parkway and is an important component of the region's transportation infrastructure. SFR also has a 10-foot height limit, restricting most commercial and oversized vehicles from using the parkway. Most of the remainder of the land within the Project Area is presently owned by Harvard University, with the existing I-90 Interchange and railroad facilities operated by MassDOT via land easements or operating agreements.

The Worcester Main Line (WML) tracks and Grand Junction Railroad (GJR) run though the Project Area and serve as critical infrastructure for Amtrak and MBTA commuter rail operations. The two-track WML runs through the southern part of the Project Area. From west to east, the WML is located south of I-90, passes under the Cambridge Street Bridge, continues straight between the rail yard and developed land to the south, and curves south to continue underneath the I-90 viaduct at the eastern extent of the Project Area. The WML serves MBTA commuter rail, Amtrak and CSXT Freight Service. The Boston to Springfield rail line is also used by Amtrak intercity rail passenger service and was designated by Congress as a High-Speed Intercity Rail Corridor. The Federal Railroad Administration (FRA) is currently working with all involved parties to increase intercity rail passenger service over this route. Additionally, the GJR line runs beneath the I-90 viaduct, over SFR on a two-span bridge, and over the Charles River on a multi-span bridge that passes beneath the Boston University (BU) Bridge over the Charles River. The Project will connect logical termini, have independent utility or independent significance, and will not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

1.2 Project as Most Recently Reviewed in Draft EIR

1.2.1 Project History

The alternatives analysis process began in 2014 with the development of an Environmental Notification Form (ENF) during the Massachusetts Environmental Policy Act (MEPA) review process for the Project. The ENF provided a review of 16 interchange alternatives. MassDOT worked with the Project Task Force and the public at large to develop the conceptual alternatives. Eight Project Task Force meetings and two public information meetings were held throughout 2014 to present information and potential conceptual alternatives to the Project Task Force and the public. Input from the public during this process led MassDOT to broaden the Project purpose to address the community need for improved multimodal infrastructure and connectivity, and ultimately led to the inclusion of a new West Station as part of the alternatives analysis. Evaluation criteria were developed to aid in the evaluation of each conceptual alternative. This iterative process tested a variety of interchange components and alignments. The ENF identified Concept 3J as the Preferred Interchange Alignment Alternative. Attachment 9 in the ENF described the entire process of developing alternatives leading up to Concept 3J. Notice of Availability for the ENF was published in November 2014 for public review. The Secretary of the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) issued a Certificate on the ENF requiring MassDOT to prepare an Environmental Impact Report (EIR) on December 24, 2014.

Since publication of the ENF, MassDOT has continued to collaborate with a broad range of stakeholders to work through many details associated with the Project. These stakeholders have included the Project Task Force; the Cities of Boston and Cambridge and the Town of Brookline; Harvard University (Harvard), an abutter and the owner of the land underlying much of the Project Area; Boston University (BU), an abutter; and other abutters and public groups. The Project Task Force is comprised of state and local elected officials, representatives of key institutional stakeholders such as Harvard and BU, members of the Allston business community, and local residents and advocates. This collaborative effort is ongoing and will continue throughout the state and federal environmental review processes. In addition to regular Project Task Force meetings, the Project team has also held site walks and public information meetings throughout the environmental review process. Over 60 Project Task Force and public information meetings have been held to date.

MassDOT has collaborated with a wide range of stakeholders to work through many Project details.

The MEPA Draft Environmental Impact Report (DEIR) further refined and modified alternatives for the layout and design of the interchange, rail layover and West Station, and developed variations, now referred to as "options," under these alternatives for the design of the "Throat Area" of the Project — the relatively narrow existing multi-modal section where the I-90 viaduct is situated between the Charles River and BU. This area has been a major focus of design input from stakeholders due to the limited space available for the desired multimodal infrastructure improvements.

MEPA published the Notice of Availability for the DEIR on December 6, 2017, providing a 45-day comment period for the public which concluded on January 19, 2018. Federal, state and local agencies and the public submitted over 575 comment letters on the DEIR. Responses to comments from the Secretary's Certificate on the DEIR can be found in Appendix A. A list of frequently received comments and responses on the DEIR as well as the full list of individual comments received and responses is provided in Appendix B and Appendix C of this NPC, respectively. Several overarching themes were identified in the public comments submitted. These themes included:

- Support for the construction of West Station as soon as feasible.
- Lack of support for the Highway Viaduct option within the Throat Area as it would fail to address concerns that the height and position of the existing I-90 viaduct is a barrier between the Allston community and the Charles River.

- Lack of support for an elevated rail option within the Throat Area as it would result in inferior open space and less flexibility within this already constrained portion of the interchange.
- Support for a pedestrian and bicycle bridge extending northward from Harry Agganis Way adjacent to Nickerson Field.

1.2.2 Interchange (Alternative 3K)

The Secretary's Certificate on the ENF required MassDOT to evaluate a new concept that modified the ramp connections of Alternative 3J, described in the ENF. This modification included changing ("flipping") the eastbound and westbound I-90 ramp connections to the local roadway network, so the eastbound ramp connections occurred at the Seattle Street and Stadium Way Connectors and the westbound ramp connections occurred at East Drive and the West Connector. This concept was identified as Concept 3K Series (See Figure 1.2.2-1). Alternatives 3J-1, 3J-2 and 3J-3, described in the ENF, were revised and renamed 3K-1, 3K-2 and 3K-3.

Concept 3K-3 was later renamed 3K-4 due to modification of the Cambridge Street South alignment further to the south within the interchange. Alternative 3K-4 was modified and renamed 3K in response to the Boston Planning & Development Agency Placemaking Study, Project Task Force input and public input. Specifically, modifications were incorporated to promote community cohesiveness and encourage interconnections within the Project Area and surrounding neighborhoods and spaces. These modifications included a more direct vehicular connection between I-90 and SFR, elimination of the SFR westbound off-ramp to Cambridge Street/River Street, realignment of SFR westward creating over two acres of new publicly accessible open space continuous to the river's edge, depressing a portion of SFR below grade and constructing an at-grade overpass for pedestrians and bicycles, an east-west transportation link between the Cambridge Street Bridge and the SFR/PDW Path, and a new north-south connector (Cattle Drive) linking the street grid to Harvard's North Allston Landing redevelopment area. In addition, and as required by the Secretary's Certificate on the ENF, a variation of Alternative 3K that included a north-south transportation link to Commonwealth Avenue was evaluated.

Alternative 3K was identified as superior to previous versions because it has the best operational characteristics and traffic circulation flexibility. Therefore, it was identified as MassDOT's Preferred Alternative in the DEIR. Alternative 3K offers two-way circulation throughout the street network and provides a more extensive street grid system. The proposed street network will provide opportunities for the dispersion of traffic compared to the high concentration of traffic that currently exists at the existing, ramp system, which is functionally obsolete. Cambridge Street South in this alternative represents the best pedestrian and bicycle connectivity, when compared to Alternatives 3K-1 and 3K-2, because it provides a more direct link between the North Allston neighborhood and the PDW Path. The new street location was also most responsive to urban planning, future land development and parcel access.

The Throat Area continues to be the most significant area of public debate on the Project.

1.2.3 Throat Area

Alternative 3K focuses on the reconfiguration of the interchange ramp system west of the Throat Area, the relatively narrow existing multimodal section where the I-90 viaduct is situated between the Charles River and BU. The Throat Area extends from where I-90 passes under the Commonwealth Avenue bridge to an approximate location about 2,500 feet to the west where the existing I-90 viaduct ends. The DEIR reviewed three potential variations or options of this area as well.

The Highway Viaduct variation or option for the Throat (Alternative 3K-HV in the DEIR) includes I-90 elevated and the rail operations at-grade close to their existing horizontal alignment. The shoulder width of I-90 would be improved over existing conditions and I-90 would be at the same elevation as the existing structure. SFR would be reconstructed to its existing lane and shoulder width dimensions on an alignment shifted towards the viaduct to allow for an increase in open space adjacent to the Charles River. The PDW Path would be widened to a 12-foot cross-section.

A Project Task Force member who authors an internet blog called "The Amateur Planner" and represents the advocacy group, Livable Streets Alliance, proposed another option for the Throat Area (Alternative 3K-AMP in the DEIR). This AMP variation or option for the Throat Area included reconstructing the I-90 highway at grade or slightly below, adjacent to the WML tracks, which would also be at grade or slightly below. GJR would be relocated to an elevated structure over the eastbound lanes of I-90. This would include space for an elevated shared use path. The mainline track alignments would shift south, requiring a 7-foot-wide property acquisition from BU. The acquisition would impact parking facilities and utilities. Finally, A Better City, an advocacy group that represents the interests of sponsoring Boston businesses and institutions, proposed reconstruction of I-90 mainly at grade and relocation of all other transportation infrastructure at grade to the maximum extent possible (Alternative 3K-ABC in the DEIR), instead of the highway on viaduct.

1.2.4 Rail Operations and West Station

The DEIR included a multimodal West Station located within BPY along the existing WML tracks on the southern edge of the site roughly between Malvern Street and Babcock Street. The design included provision of daytime layover space within the existing layover easement to the north of West Station. While the MBTA has identified BPY as the best layover location to address current and future layover deficiencies from South Station to points west, the environmental analysis of the layover was deferred to the environmental review processes for the I-90 Allston Multimodal Project as layover would ultimately be tied to the selection of the I-90 interchange configuration. Under this West Station design, there would be two WML tracks maintaining an alignment that supports existing 79 mile per hour maximum design speeds through BPY, two GJR tracks, three platforms, and walk-up access from the south for pedestrians to access the station platforms. The layover yard would include four tracks to accommodate eight layover train sets and access via a lead track from the GJR. Bus access to West Station would be provided from the highway interchange. Pedestrian access to the station and bus terminal would be achieved through the construction of new bicycle and pedestrian ramps from Malvern Street and Babcock Street from the south, and from the north via sidewalks along the bus loop. Such an arrangement would favor maintaining and expanding service along the WML, including express service, and near universal flexibility among the WML, layover yard and GJR tracks for rail operations. The DEIR concept did not include direct roadway access to air rights development south of I-90, with access presumed to originate north of the highway via elevated structures above the highway.

2.0 Description of Material Changes to Project as Previously Reviewed

2.1 Material Changes to the Project: Purpose and Need

The Purpose and Need of the Project has been updated in response to feedback received from Project stakeholders including regulatory agencies, the Project Task Force and the general public, as well as to better align with the Project Purpose and Need developed during the NEPA process. The following description details the Project's current Purpose and Need which has updated the following items since publication of the DEIR:

- Emphasizes improvements to mobility and transportation access within the Project Area, identifying level of service within the I-90 interchange as well as the need to provide or allow for a connection from BU and the Allston, Brighton and Brookline neighborhoods to the Charles River Reservation
- Specifically identifies an upgrade to the PDW Path to provide a two-way pedestrian and bicycle facility
- Continues to include rail improvements such as construction of a new West Station and infrastructure supporting mid-day commuter rail operation
- Continues to identify opportunities for roadway alignment and safety improvements including replacement of the structurally deficient I-90 viaduct
- Clarifies that the separate Bridge Preservation Project does not affect the overall need for the I-90 Allston Multimodal Project.

2.1.1 Project Need

The Project needs are the multimodal deficiencies within the transportation system that MassDOT is proposing to address. The Project needs were initially driven by the structural deficiencies of the I-90 viaduct but now include addressing transportation deficiencies across modes within the Project Area that affect connections between the Project Area and the greater Boston region, the nearby neighborhoods and the Charles River Reservation. The most critical Project needs are summarized below and discussed in more detail in the following sections (AA – DD).

A. Roadway Deficiencies

A.1, I-90 Viaduct Condition and Remaining Service Life: Bridge inspections show that the I-90 viaduct is structurally deficient and continues to deteriorate. MassDOT is currently preparing a separate Bridge Preservation Project to address those elements that require immediate attention in order to keep the structure in safe operation and avoid any load restrictions. However, these repairs are only an interim solution to extend the service life of the structure for the duration needed until it can be replaced. These interim repairs would only provide approximately 15 additional years of service life and would be necessary regardless of the construction staging schemes currently under consideration for the larger I-90 Allston Multimodal Project. The comprehensive Structure Assessment performed in 2014 documented that replacement of the structure is recommended due to its age and continuing deterioration as well as the fact that construction of the existing structure preceded current design loading or current design codes. Repair projects would not address these issues and increased frequency and costs for repairs and maintenance will be required to keep the structure operational.

A.2, Substandard Highway Layout and Geometry: Certain layout and geometric elements within the I-90 mainline and interchange are obsolete, meaning certain segments are no longer in conformance with current MassDOT and American Association of State Highway and Transportation Officials (AASHTO) design guidelines and require upgrading.

B. Safety

B.1, Crash Rates, I-90 Mainline and Viaduct: Crash rates on I-90 within the Project Area are higher than statewide average for urban interstates, which are likely due in part to substandard layout and geometry.

B.2, Crash Rates, I-90 Interchange: The intersection of Cambridge Street and SFR is in the top 5% of crash locations in the City of Boston.

C. Rail Limitations

C.1, Commuter Rail Operations: Existing functionally obsolete infrastructure within the Project Area constrains movements of commuter rail operations and GJR operations.

C.2, Transit Demand and New Connections: There is a lack of multimodal connections on the WML and other existing transit modes in the Project Area, while short- and long-term ridership is increasing.

C.3, Commuter Rail Layover: Existing mid-day layover capacity on the MBTA's South Side rail system is currently deficient. Layover within the Project Area only reflects a portion of the MBTA layover needs.

D. Mobility Limitations and Transportation Access within the Project Area

D.1, Interchange Ramps: Under the highway's existing layout within the Project Area, deficient levels of service (LOS F) and delay/queuing occurs at ramp terminus intersections, resulting in substantial delays and severe congestion during the morning and afternoon peak periods.

D.2, Substandard Bicycle and Pedestrian Infrastructure: The PDW Path has sections that are substandard width to accommodate two-way mixed bicycle and pedestrian use.

D.3, Access to Charles River Reservation: The height and position of the existing I-90 viaduct impede opportunities for the public in neighborhoods in Allston, Brighton, Brookline and BU to access the Charles River Reservation via walking and cycling.

D.4, Multimodal Transportation Access: Existing infrastructure limits multimodal access to land within the Project Area. The new proposed interchange will support a large, new mixed-use development in North Allston. With growth and development expected in the Allston area, multimodal access should be improved to support multimodal connectivity between environmental justice neighborhoods with job, health, recreational, and educational opportunities within the Project Area.

AA. Roadway Deficiencies

AA.1. I-90 Viaduct Condition: Based upon the findings of the 2014 Structure Assessment Report, the condition of the I-90 viaduct must be addressed. The separate Bridge Preservation Project currently under design is intended as an interim solution to address the near term needs of the structure. The bridge requires major rehabilitation or replacement based on a number of factors including:

- age of the structure (55+ years);
- continued deterioration of the structure;
- material testing results; and
- significant traffic volume (73,000 vpd in each direction) on the structure.

Construction of the viaduct predates current AASHTO and MassDOT design loads and is not detailed in accordance with current AASHTO and MassDOT standards. National Bridge Inspection Standards (NBIS) bridge inspections conducted after the 2014 Structure Assessment Report document the continued deterioration of the structure and reduction in structural capacity. The following is a summary of the overall condition of the I-90 viaduct based on the resulting report and field observations.

Deck: The exposed concrete deck is in poor condition with extensive areas of cracking, potholes and patched areas. Many of the patched areas are failing, with an uneven surface and depressions. The concrete joint headers, located at the bridge deck joints at the piers, have significant concrete spalling with exposed steel reinforcement. Also visible are scattered spalls and deterioration (corrosion) of the metal stay-in-place forms on the underside of the deck. The deck under the median is hidden by timber shielding due to the spalling of the concrete along this area. Spalled concrete is amassing on this timber shielding. The separate Bridge Preservation Project will address the most severely deteriorated deck areas with patching and localized replacement. However, the deck is nearing the end of its useful life and these interim repairs will only allow it to remain operational for 15 years.

Superstructure: The longitudinal steel stringers (beams) that support the concrete deck have a failing paint system that is faded, chalky, and peeling. There are also areas of light to moderate rusting along the bottom of most beams. The outermost beams, and the beams under the viaduct median, have areas of localized corrosion. The bottom portions of these beams have some steel section loss, and steel is flaking off or delaminating (hollow areas) due to rusting and corrosion. The loss of steel section reduces the structural capacity of these beams to support applied loads. The steel cross girders transfer the loads from the longitudinal beams to the concrete column pier foundations. These members are considered "fracture critical" members because they are steel members with no redundancy.

Two cross girders comprise the pier cap at each pier/foundation location. Many of the cross girders have rusting, corrosion and steel section loss. This deterioration is primarily located on the side of each cross girder that is exposed to the open deck joint above, where water (and salt) run off the roadway. Many cross girders have been reinforced with new steel plates but continue to deteriorate with new corrosion and loss of steel section. The separate Bridge Preservation Project will include repairs and retrofit to the most severely deteriorated members that could create conditions that would require restrictions to allowable loads on the structure unless they are addressed in the near term.

Substructure: Most of the piers are comprised of individual concrete columns that support the steel cross girder pier caps, as previously described. The majority of the columns show widespread deterioration. This deterioration consists of areas of map cracking (intersecting cracks), concrete delamination (hollow areas), rust and water staining, and concrete spalling with areas of exposed reinforcement. Many of the columns have also been previously repaired (patched). Many of these repaired areas are exhibiting map cracking. There are also several columns that have spalling at the top of the column. In some cases, these spalls extend to the bearings of the steel cross girders and have caused partial undermining of the bearing base plate. The line of columns along the south edge of the viaduct is in a condition warranting the greatest need for repairs. The concrete abutments at each end of the bridge are generally in satisfactory condition. The abutments have some minor cracking with localized hollow

areas. There are also scattered spalled areas just below the armored deck joints. The separate Bridge Preservation work will include repairs to patch all of the spalling and delaminating concrete on the abutments, piers and pier columns with additional reinforcement added at the most severely deteriorated areas.

Maintenance: Frequent maintenance of the existing I-90 viaduct has been required due to the deteriorating condition of the structure. This maintenance also requires more frequent bridge inspections due to the condition, as well as immediate repairs that typically result from these inspections, including deck joint patching, concrete deck patching and structural steel repairs. Currently, it costs approximately $1M annually to maintain the viaduct. The separate proposed Bridge Preservation Project is at least the 5th repair contract that has been developed for this structure and is intended to address the immediate needs of the structure until it can be replaced and is not a long-term solution. Continued maintenance of the existing I-90 viaduct will be increasingly expensive, and the lifecycle costs associated with operating the structure will soon outweigh the lifecycle costs of replacement.

Visual: The existing viaduct contributes to visual impacts to the neighborhood viewshed.

Deteriorated concrete column supporting the I-90 viaduct

AA.2 Substandard Highway Layout and Geometry

This segment of I-90 was constructed in the mid-1960s. The highway geometry is constrained by the former BPY rail layover facility, SFR, which was constructed in the early 1930s; other rail infrastructure that long predates construction of I-90; and accommodation of a traditional toll plaza. As a result, the existing interchange has elements that are not in conformance with current MassDOT and AASHTO interstate design guidelines. Based on these current design guidelines, the highway within the Project Area has the following deficient design criteria:

Horizontal Curves: There are several curves on I-90 with radii, length and super elevation rates that were built pursuant to a design that is no longer compliant with current AASHTO interstate guidelines for their respective design speeds.

Shoulder Width: Left and right shoulder widths and lateral offsets between the shoulders and adjacent features at certain locations within the Project Area are not compliant with current AASHTO interstate guidelines. Narrow shoulders do not provide breakdown refuge and access for first responders, or area for stormwater collection to prevent ponding water and ice hazards that encroach into adjacent travel lanes.

Stopping Sight Distance: Horizontal stopping sight distance is substandard at locations where ramp overpass piers do not allow for recommended shoulder widths that would provide adequate sight distance to obstruction.

Left-hand Exit: The eastbound exit 131 (formerly exit 18) ramp is a left-hand exit ramp, which differs from the westbound exit ramp and other exit ramps along the I-90 corridor that are traditional right-hand exit ramps. Features like this are no longer recommended by AASHTO because the exit is made from the high-speed travel lane, which introduces a potential safety hazard due to the differential in vehicular travel speeds in that lane.

BB. Safety

BB.1. Crash Rates, I-90 Mainline and Viaduct: Crash data for the I-90 mainline within the Project Area (between the Everett Street Bridge and the Commonwealth Avenue overpass – approximately 1.6 miles) indicates that this section of I-90 has a crash history that is above the statewide average for urban interstate highways. For the four-year period from 2015-2018, a total of 234 crashes occurred on this segment of I-90, an average of 59 crashes per year. The crash rate for this segment of I-90 was 0.72 crashes per million vehicle miles traveled (MVMT), which exceeds the statewide average rate for urban interstates of 0.61 crashes per MVMT. However, the eastbound direction had a higher crash rate during this time period (0.81 crashes per MVMT). This rate is 33% above the statewide crash rate for urban interstates. The substandard layout and geometric elements previously identified in the Roadway Deficiencies section may be contributing factors to the high frequency of crashes within the Project Area.

East of the Allston interchange, I-90 is an elevated viaduct approximately 0.5 miles in length, spanning over several rail lines. Crash data for the four-year period of 2015-2018 on the viaduct section of I-90 alone reveals that a total of 120 crashes occurred during this time frame. This translates to an average of 30 crashes per year and a crash rate of 0.94 crashes per MVMT, which is 54% higher than the statewide interstate average rate of 0.61 crashes per MVMT. Both directions of I-90 exceed the average statewide crash rate for urban interstate highways; however, in the westbound direction, the crash rate was notably higher (approximately 1.26 crashes per MVMT), which exceeds the statewide interstate rate by 107%. The viaduct section of I-90 also has roadway deficiencies that do not comply with current AASHTO guidelines for interstate highways, as described above in the Roadway Deficiencies section. These elements may have contributed to the high crash rate on the viaduct.

BB.2. Crash Rates, I-90 Interchange: In addition to the viaduct and mainline, the intersection of Cambridge Street and SFR with the terminus of the I-90 eastbound and westbound ramps is a Highway Safety Improvement Program (HSIP) high-crash intersection, as it is in the top 5% of crash locations within the City of Boston. During the period from 2015-2018, 94 crashes occurred at this location. The crash rate at this intersection was 1.88 crashes per million entering vehicles. This rate is approximately 140 percent above the statewide rate of 0.78. High traffic volumes, five entry legs, complicated signal phasing and extensive queuing on many of the intersection approaches may all be contributing factors to the high number of crashes at this location.

Cambridge Street looking north-west

CC. Rail Limitations

CC.1. Commuter Rail Operations: Improvement to operations of the WML is needed to accommodate increases in ridership and to help decrease travel time. The GJR is the only link within the Boston Metropolitan Area between the MBTA's South Side and North Side systems. Currently, turns are made by pulling South Side trains over WML tracks westerly past the Project Area to turn on a tail track by the new Boston Landing Station before returning through the Project Area to reach the GJR and the MBTA's Commuter Rail Maintenance Facility/Boston Engine Terminal (BET) across the river. Control Point (CP3) currently aligns to meet the needs of existing operations but is a limiting factor in future growth along the WML. Retaining the existing crossover infrastructure as is would hinder improved operations over time.

CC.2. Transit Demand and New Connections: The MBTA's WML ridership ranks among the highest of its commuter rail. The Worcester Line experienced the largest absolute growth in ridership on a representative weekday (increase of 2,902 inbound riders and 2,948 outbound riders) between 2012 and 2018, among all MBTA commuter rail lines. Ridership on the WML increased 45.7% between 2012 and 2018. This growing demand in Allston and along the WML highlights the opportunity for new transit connections or a new transit station, such as a West Station on the WML built to accommodate improved bus connections and future Grand Junction service.

A majority (75%) of Allston residents work in Boston, Cambridge or Brookline and many (40%) commute via transit. Ridership analysis conducted during Project development also indicates a high demand for bus service, including service that provides a north to south connection through the Project Area[1] as well as for options that do not preclude future intercity rail service and transit service on the GJR line. The existing transit demand is projected to increase based on population growth in Allston, which grew 17% from 2000 to 2017[2] and is expected to continue to grow.

CC.3. Commuter Rail Layover: Layover facilities serve essential functions. They are used to store trains off active tracks and as service areas to perform essential running repairs and light maintenance. The MBTA has determined that the layover capacity is insufficient to store trains and conduct midday servicing activities. The MBTA currently moves and stores layover trains at three locations accessed via the Fairmount line to and from South Station. The MBTA owns and can store up to 12 trains on its own storage tracks at Readville. It also utilizes two tracks at Amtrak's Front yard, and four stub-ended tracks at Amtrak's Southampton facility. While there is the possibility of increasing layover capacity at other facilities, the MBTA has identified BPY as the best layover location to address current and future layover deficiencies from South Station to points west, which includes the WML due to its proximity to South Station.

DD. Mobility Limitations and Transportation Access within the Project Area

As described in MassDOT's Separated Bike Lane Planning & Design Guide (2015), MassDOT is dedicated "to providing Massachusetts residents and visitors with a variety of safe and convenient transportation choices." This commitment includes facilities, such as the PDW Path, which encourage pedestrian and bicycle trips. MassDOT has also committed to providing its customers with access to safe and comfortable healthy transportation options, such as walking and bicycling, at MassDOT facilities[3].

DD.1 Interchange Ramps: The intersection of the I-90 ramps with Cambridge Street and SFR is severely congested throughout the morning and the afternoon peak periods. The LOS at the intersection of Cambridge Street and SFR is currently rated LOS F. Substandard geometry, five entry legs, complicated signal phasing and high vehicular demands are all contributing factors to the operations deficiencies at this location.

DD.2 Substandard Bicycle and Pedestrian Infrastructure: Non-motorized use of the Charles River Reservation is significant and the PDW Path is heavily used by pedestrians and bicyclists, including approximately 1,000+ pedestrian and bicycle trips per day.[4] Many of these users are using the path to commute to and from work. Sections of the PDW Path lack adequate width for shared pedestrian/bicycle use. Multi-use paths, such as the PDW Path, place people walking on the same paths as those cycling. The existing PDW Path is 8 feet wide within the Project Area. AASHTO recommends a two-directional multi-use path be at least 10 feet wide, and in certain conditions, such as paths that are heavily used by pedestrians and bicyclists, it is more appropriate for them to be 12 to 14 feet wide[5].

DD.3 Access to Charles River Reservation: Access to usable parkland within the Charles River Reservation is limited. The I-90 highway/railroad transportation corridor and the former BPY facilities are a barrier between neighborhoods in Allston, Brookline, Brighton and BU, the Charles River Reservation and the PDW Path. The height and position of the existing I-90 viaduct impede connectivity from existing residential neighborhoods to the Charles River Reservation. Pedestrians and bicyclists wishing to access the PDW Path from these areas must use a circuitous route on local roadways that can double their trip lengths and expose them to potential conflicts with motor vehicles. Providing more direct north-south pedestrian and bicycle connections to the PDW Path will enhance safety and encourage greater use of these sustainable modes of transportation in the future. In addition, neighborhoods in Allston/Brighton, Brookline and Cambridge each lie within one-half mile of the Project Area. The City of Boston Open Space and Recreation Plan 2015-2021 identifies the Allston/Brighton neighborhood as containing fewer acres of protected open space per 1,000 residents compared to city averages. The Open Space Plan identifies Allston as lacking in usable open space and anticipates an increasing need for such open space as the neighborhood develops further.

DD.4. Multimodal Transportation Access: The I-90 Interchange serves the economy of a much larger area, which is defined here as the three-county region of Norfolk, Suffolk and Middlesex Counties. This three-county area contains more than 83% of all trip ends served by the interchange. The region encompasses almost 2.5 million jobs, which have grown by 12% over the period between 2001 and 2015. The Project Area is situated at a pivotal location surrounded by growing neighborhoods, including North Allston and portions of Allston and Brighton, and several universities.

Several regional and local planning documents have been prepared which outline projected development within this area. Examples include the following:

- Placemaking Report, I-90 Allston Interchange Improvement Project, Boston Planning and Development Agency, October 2016;
- Harvard University Institutional Master Plan for Harvard University's Campus in Allston, July 2013, revised October 2013;
- Boston University Charles River Campus 2013-2023 Institutional Master Plan, January 17, 2013, updated January 2020; and
- North Allston-Brighton Community-Wide Plan (CWP), Boston Redevelopment Authority, 2008-2009 and others.

These planning documents illustrate the potential for a large, new mixed-use district in North Allston facilitated by a multimodal network of streets, paths, bus, rail and transit facilities providing improved connectivity for pedestrians, bicyclists and transit users. Since the DEIR publication, Harvard University has begun City and State permitting approximately two million square feet of development as part of its Enterprise Research Campus (ERC) in the area between Western Avenue and Cambridge Street referred to as Allston Landing North (ALN). The transportation analysis supporting this environmental process assumes eight million square feet of new development could occur in the vicinity of the Project Area by 2040.

The existing layout of the interchange consists of recently vacated sprawling railyards and I-90 aligned to accommodate toll booths that no longer exist. These elements impede multimodal access to adjacent neighborhoods, institutions and businesses. The Project would support development within the Project Area. MassDOT will continue to coordinate with landowners relative to access both during and after construction. Layout lines are being established and will be coordinated with the landowner during the environmental review process.

2.1.2 Project Purpose

The purpose of the Project is to address roadway deficiencies and address safety issues of I-90 mainline and I-90 interchange exit 131 (formerly exits 18, 19 and 20) in the Allston neighborhood of Boston, Massachusetts. The Project would also provide improved rail infrastructure and improve mobility and multimodal transportation access within the Project Area. Specifically, the purpose of the Project will:

A. **Address Roadway Deficiencies:** Replace the I-90 viaduct and reconfigure the I-90 Interchange. The I-90 viaduct needs to be replaced due to structural deficiencies and increasing maintenance frequency and cost. Layout and geometric elements within the I-90 mainline and interchange require upgrading as their construction precedes current geometry and design guidelines. Addressing the deficiencies of the viaduct should include an improvement to the visual quality of the neighborhood.

B. **Address Safety Issues:** Reconfigure the I-90 Interchange, including the viaduct. Roadway design characteristics within the Project Area and the current configuration likely contribute to higher-than-average crash rates on the I-90 viaduct and mainline and the I-90 Interchange.

C. **Provide Rail Improvements:** Reconfigure transit and commuter rail facilities, including the construction of a new West Station and infrastructure supporting mid-day commuter rail operations. Obsolete infrastructure contributes to transit and rail operation issues. Projected increases in ridership demonstrate the need for a new West Station. The Project would not preclude future intercity rail service and transit service on the GJR line.

D. **Improve Mobility and Transportation Access within the Project Area:** Level of Service issues contribute to substantial delays in the I-90 Interchange area. The Project would provide or allow for connections from the Allston, Brighton, Brookline and BU neighborhoods to the Charles River Reservation, and upgrade the PDW Path to provide a two-way pedestrian and bicycle facility. Land use planning efforts in the area illustrate the potential for a large, new mixed-use district in North Allston facilitated by a multimodal network of streets, paths, rail and transit facilities within the Project Area. The Project promotes multimodal transportation access and supports economic development.

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[1] MassDOT I-90 Allston Interchange Improvement Project DEIR

[2] MassDOT, Allston Early Action Transit Study, Nov 2018 with Data from Boston Planning and Development Agency

[3] MassDOT's Healthy Transportation Policy Directive (2013) https://nacto.org/wp-content/uploads/2015/06/MassDOT_Healthy-Transportation-Policy-Directive_09.09.13.pdf

[4] Charles River Basin Pedestrian and Bicycle Study: Non-Motorized Bridge & Pathway User Counts, January 2015.

[5] Guide for the Development of Bicycle Facilities, Fourth Edition, 2012, AASHTO Guide for the Development of Bicycle Facilities, 4th Edition, 2012 (njdotlocalaidrc.com)

2.1.3 Screening Criteria

In addition to the Purpose and Need, the NEPA environmental review process also outlined additional screening criteria to aid in the determination of reasonable alternatives for the Project. These have been refined and expanded upon for the MEPA review process. Those screening criteria include:

Construction Logistics and Feasibility

- Is the alternative feasible to construct with existing technologies?

Environmental Impacts

- Does the alternative cause excessive permanent environmental impacts to natural resources when compared to other alternatives?

Traffic Operations

- Does the alternative adversely impact travel times within the Project Area due to congested conditions on existing or proposed roadways, or at existing or proposed intersections?
- Does the alternative result in worse LOS at existing or proposed intersections, or long vehicular queues that impact operations at adjacent intersections?

Rail Operations

- Does the alternative support local and regional multi-modal (pedestrian, bicycle, bus, passenger vehicle, and transit) access to a future West Station?
- Does the alternative support the rail operation needs of MBTA including providing operational flexibility between WML, layover and GJR?

Cost and Schedule

- Does the alternative require an unreasonably high cost compared to other alternatives?
- How does each alternative compare with regard to constructability and length of disruption?

Value of Economic Development

- Does the alternative support development on or over retained rights, including technically feasible and economically viable construction of decking and sufficient access?

2.2 Material Changes to the Project: Alternatives

2.2.1 No Build

Review of the No Build Alternative is required in the MEPA review process and serves as a baseline against which the impacts of other alternatives can be compared. The No Build Alternative (Figure 2.2-1) describes the conditions that would exist should the Project not be implemented and makes assumptions regarding the future transportation network including what physical improvements would occur. The DEIR described a No Build Alternative which consisted of rehabilitating the existing viaduct and left the rest of the interchange in its current configuration (with the removal of toll booths and the reconfiguration of the original toll plaza), while preserving MBTA layover space and allowing use of the existing layover tracks.

Subsequent to the MEPA DEIR, the NEPA Scoping Summary Report described a No Build Alternative which included major preservation of the existing I-90 viaduct, replacement and repair of various superstructure and substructure elements of the Cambridge Street Bridge over I-90 and MBTA Railroad, and preservation of the Franklin Street Pedestrian Bridge over I-90 and MBTA Railroad. However, much of this work is now being initiated and undertaken by MassDOT as part of separate, standalone projects including a Bridge Preservation Project that would preserve the viaduct for approximately 15 years and is estimated to be completed prior to final construction of the I-90 Allston Multimodal Project. Consequently, the Project's No Build Alternative has been revised and now consists of frequent and continuous preservation activities that would be necessary beyond the useful life of the repairs conducted under the Bridge Preservation Project, such as safety and maintenance improvements, to maintain continuing operation of the existing interchange and eventual superstructure replacement.

Under the No Build Alternative, there would be no significant changes to the existing rail yard or WML operations. The MBTA would utilize the layover space within its current easement area at BPY under the No Build Alternative as defined under an existing easement agreement. Yard operations would include use of four existing tracks allowed within the MBTA easement area to address the midday storage deficiencies. MassDOT would use the existing tracks (with minor upgrades) for layover of commuter trains within the MBTA easement, needing only minor modifications to the 27 yard leads. Electric plug-ins for locomotives would be installed to limit engine idling in conformance with regulatory agreements. A No Build Alternative without layover would not meet MassDOT and MBTA system-wide needs, would be inconsistent with the MEPA/NEPA decision made in the South Station Expansion (SSX) document that identified this location for continued layover use, and is an existing MassDOT by right use. Therefore, the No Build Alternative to be carried forward includes layover.

Layover tracks would support up to eight train sets (locomotive and up to nine passenger coaches) on four tracks. The MBTA existing easement area includes nine total tracks, split between a Main Line easement area and a layover/layup area. Four of the existing tracks provide enough space to store eight train sets. The agreement also allows for the construction of a structure within the layover area to provide shelter for MBTA employees. This layover use would address the past, current, and increasing lack of midday commuter rail storage space on the MBTA's South Side commuter rail system.

The No Build Alternative would not include West Station and would not provide a multimodal West Station connection, or any of the station's associated bicycle, pedestrian, and transit connections.

2.2.2 3L Re-alignment Alternative

The 3L Re-alignment Alternative represents the alternative that responds to the stakeholder comments from the MEPA process to date and addresses the Secretary's Certificate comments on the DEIR, as advanced from DEIR Alternative 3K. The alternative includes modification to the design of the interchange, the rail layout and Throat Area options including a new hybrid option. In addition, MassDOT is no longer relying on the phasing plan described in the DEIR. The Project will be built under a single phasing scenario. A constructability analysis, including details regarding phasing and construction of West Station as well as the entire Project will be prepared and presented in the Supplemental Draft Environmental Impact Report (SDEIR).

2.2.2.1 3L Re-alignment Alternative: Interchange

The 3L Re-alignment Alternative is MassDOT's Preferred Alternative for the reconfiguration of the existing I-90 ramp system and the future street, pedestrian and bicycle infrastructure network to be constructed within the Project Area. Further refinements to the interchange may be made during the environmental review process as the Project team continues to optimize traffic and rail operations and seek input from regulatory agencies and other stakeholders. The 3L Re-alignment Alternative is compatible with all three Throat Area options being considered.

During the course of this Project, MassDOT has evaluated over 25 distinct interchange layout options, many with multiple variations. The alternatives development process was evolutionary in nature, as the concepts were continuously refined and improved upon based on input received from the Project Task Force, the public and key Project stakeholders; engineering and traffic analyses performed by MassDOT; and other studies/analyses such as the City of Boston's Placemaking Study. The 3L Re-alignment Alternative is the culmination of this planning process. The Cambridge Street Bypass Road will be included in the SDEIR as a potential refinement to the 3L Re-alignment Alternative to understand its impacts and benefits of this connection.

The 3L Re-alignment Alternative addresses the transportation system's multimodal deficiencies within the interchange area as identified in the Project's Purpose and Need (See Section 2.1). Those needs include roadway deficiencies; safety deficiencies; mobility limitations; and transportation access to the Charles River Reservation. MassDOT's Preferred 3L Re-alignment Alternative will provide benefits for all users and achieves many of the Project's goals identified by the community and the Project Task Force early in the planning process, including:

Transit

- Constructing a multimodal West Station with adequate capacity to serve commuter rail, buses and potential future urban rail services.
- Providing a North-South Transit (bus) connection from Cambridge Street to Commonwealth Avenue.
- Preserving the ability to provide future rail service via the GJR line.
- Providing layover/layup tracks for Worcester Main Line trains.
- Providing an Express/Bypass Track to support on-time performance adherence and operational flexibility.
- Proposed alignments and cross-sections preserve the ability to accommodate future two-way bus lanes or bus rapid transit service.

Pedestrians and Bicyclists

- Providing safer and more direct pedestrian and bicycle connections from the community to the Charles River Reservation, including separated bicycle facilities along the north side of Cambridge Street South and an at-grade crossing over SFR.
- Providing North-South pedestrian and bicycle connections from the neighborhoods south of the BPY (Packards Corner/Brookline) to the Allston neighborhoods north of Cambridge Street.
- Replacing the existing Franklin Street pedestrian/bicycle bridge over I-90.
- Continuing to advance development of a future pedestrian/bicycle connection from the BU campus area to the Charles River Reservation at

Harry Agganis Way for potential inclusion into the Project's Build Alternative.

- Continuing to advance development of a shared use path from Franklin Street Pedestrian Bridge to the Harry Agganis Way connection to the Charles River Reservation for potential inclusion into the Project's Build Alternative.

Charles River Reservation

- Substantially expanding the usable/accessible parkland in the Charles River Reservation within the Project Area.
- Enhancing (widening) the PDW Path through the Project Area.
- Providing more space for pedestrian and bicycle users within the Charles River Reservation at "the narrows."

Economic Development

- Providing a roadway infrastructure network and allowing for appropriate access points to serve as the framework to support mixed use development within the BPY.

Cambridge Street

- Reconstructing Cambridge Street as a "complete street," including separated bicycle facilities on both sides of the street within the Project Area.
- Improving safety and operations for all users at the intersection of Cambridge Street/River Street with the SFR ramps.

I-90/I-90 Ramps

- Improving safety and operations on the I-90 mainline and at the highway ramp junctions (highway merges and diverges) by re-aligning I-90.
- Replacing the existing I-90 eastbound left-hand off-ramp with a traditional right-hand exit ramp.
- Providing a more direct vehicular connection between SFR and the I-90 ramps.

New Street Grid System

- Maintaining or improving operations at all existing local intersections that will be modified by the Project.
- Providing sufficient capacity at all new intersections created by the Project to ensure local neighborhoods will not be negatively affected by "cut-through" traffic.
- Providing efficient intersections designed to support multiple users including pedestrians, bicycles, transit, vehicles, and trucks.

Noise Mitigation

- Constructing noise walls on the north side of I-90 along Lincoln Street and the south side of the commuter rail tracks and the BPY layover yard along Pratt and Wadsworth Streets to reduce the noise impacts of the highway and rail operations on adjacent neighborhoods.

Roadway Network Changes Since the DEIR

The geometric changes incorporated into MassDOT's Preferred 3L Re-alignment Alternative since the DEIR documentation of Alternative 3K are a direct result of comments MassDOT received on the DEIR from the public, the Project Task Force and key Project stakeholders. Those roadway network refinements include the following:

Provide Transit Connection to Commonwealth Avenue. A new road between West Station and Ashford Street was added to the proposed roadway network. The new roadway (Malvern Street Transitway) will be restricted to transit vehicles only and will provide infrastructure for a bus connection between West Station and areas north of I-90 to Commonwealth Avenue and areas south of I-90. This new roadway will include the pedestrian and bicycle connections along the roadway alignment that were proposed under Alternative 3K.

Boston University noise measurement location

Restore SFR westbound off-ramp to Cambridge Street. Based on comments received on the DEIR from Cambridge, the SFR westbound off-ramp to Cambridge Street/River Street will be restored to the roadway network. However, the off-ramp will be a single lane ramp that will primarily serve the right turn movement into Cambridge. Through movements towards Western Avenue will be allowed but left turns from the ramp onto Cambridge Street westbound will be prohibited.

Remove North Connector Road. The proposed North Connector Road, which ran parallel to Cambridge Street between the SFR southbound frontage road and Stadium Way, was removed from the roadway network. It is expected that traffic destined for the I-90 ramps from Western Avenue and Memorial Drive will shift south to Hotel Way and Cambridge Street.

Include Hotel Way. Hotel Way, which under Alternative 3K was to be constructed by others, will be included in the proposed roadway network to be constructed by MassDOT. Hotel Way has a general east-west alignment and is located approximately halfway between Cambridge Street and Cambridge Street South. The facility will run from SFR to the Stadium Way Connector, intersecting with Cattle Drive and East Drive Connectors.

Remove West Connector. West Connector, which had a general north-south alignment and connected Cambridge Street with the I-90 westbound ramp system has also been removed from the proposed roadway network. The West Connector was removed to reduce the number of signalized intersections along the Cambridge Street and Cambridge Street South corridors, as well as to reduce the number of "short blocks" on those corridors.

Grade Separation of Cambridge Street South and Stadium Way Connector. With Alternative 3L, Stadium Way Connector will pass under Cambridge Street South and connect to the I-90 westbound ramp systems instead of the two roads intersecting. Grade separation will improve bicycle/pedestrian connectivity and safety between the community and the Charles River Reservation by elimination of traffic signal delays and vehicular conflicts associated with the former intersection. Traffic flow will also be improved along the Cambridge Street South corridor as potential congestion associated with "short blocks" has been eliminated at this location.

Extend Stadium Way Connector to Westbound Ramps. Under previously developed alternatives, Stadium Way Connector terminated at a signalized intersection with Cambridge Street South. With Alternative 3L, Stadium Way Connector will connect directly with the I-90 westbound ramps and provide a fifth connection point between I-90 and the local street network. The extension of the Stadium Way Connector to the westbound ramps will be a two-way facility, with the southern terminus at the I-90 westbound ramp frontage road controlled by a traffic signal.

The 3L Re-alignment Alternative is illustrated on Figure 2.2.2-1.

Traffic Circulation Benefits

In general, the roadway network refinements made since the DEIR will not significantly change how the proposed Allston interchange ramps or proposed street grid system will function. One of the principal traffic operational objectives of the Project — to provide drivers using the interchange with as many route options as possible to disperse rather than concentrate traffic — will be preserved with the 3L Re-alignment Alternative. Traffic volumes entering, exiting or passing through the Project Area will be able to do so in a similar fashion as was documented in the DEIR.

The provision of the proposed transit-only (bus) vehicular connection between Cambridge Street and Commonwealth Avenue via Malvern Street will not have an appreciable effect on non-transit traffic circulation, or on operations within the interchange and proposed street grid system.

Critically, the I-90 ramps and local street network associated with the proposed 3L Re-alignment Alternative will be compatible with any of the Throat Area options that have been considered to date. It is anticipated, however, that reorientation of some of the traffic flows within the 3L Re-alignment Alternative street grid system because of the refinements made since the DEIR will have positive impacts for area residents and the future North Allston neighborhood. Specifically, those benefits include:

- With restoration of the SFR westbound off-ramp to Cambridge Street/River Street, SFR westbound traffic destined for Cambridge will have a more direct route than was proposed with the DEIR Alternative 3K concept.
- With elimination of the North Connector Road, traffic that had been forecast to use that roadway will shift to Cambridge Street and Hotel Way. This will reduce traffic traveling through Harvard's proposed ERC and shift it closer to the I-90 ramps.

- With elimination of the West Connector Road and extension of the Stadium Way connector to the I-90 westbound ramp system, traffic from Allston Landing North and the BPY redevelopment area destined for the I-90 westbound on-ramp will do so via a more direct route.
- Elimination of two traffic signals on Cambridge Street South, at West Connector (removed from network) and at Stadium Way Connector (grade separation), will improve traffic operations along the Cambridge Street South corridor and alleviate the "short block" queuing concerns.
- Elimination of the two signals on Cambridge Street South will reduce the number of potential conflicts between pedestrians/bicyclists and vehicles and improve traffic flow between Cambridge Street and SFR.

Utilities

Similar to the DEIR, for MassDOT's Preferred 3L Re-alignment Alternative and Throat Area options, the various utilities within the Project Area will be removed, relocated, terminated or retained in place as necessary to facilitate construction. Certain existing utilities will be removed and terminated at Cambridge Street when the Project is constructed. New utility infrastructure to service the Project will be installed within the new highway and street system. However, large water, drain and sewer pipes that currently traverse the Project Area will remain in their existing locations within the interchange area but will require partial or full relocation for the Modified At-Grade and SFR Hybrid options. These utility facilities are located within permanent easements and are owned by either the MWRA, BWSC or MassDOT. Utilities related to MassDOT's Preferred Interchange Alternative including highways and streets, rail operations and West Station will be as described in the DEIR with only minor changes as a result of the Modified Flip West Station and BPY Rail Layout.

Typical utility trench

Potential Refinement

An alternative to be considered as part of the subsequent environmental studies is construction of the Cambridge Street Bypass. This would include a new two-way roadway departing the Cambridge Street bridge over I-90 and connecting with West Station and Cattle Drive. Its technical and financial feasibility would need to be determined through this additional review.

2.2.2.2 3L Re-alignment Alternative: Throat Area Options

Individual Project Task Force members proposed two additional designs for the Throat Area presented in the ENF. All three Throat Area options were analyzed in the DEIR. The Throat Area options differ in the layout and structure type (i.e., on viaduct or at grade) of transportation infrastructure including the interstate, GJR tracks, the two WML tracks, connecting tracks between the WML and GJR tracks, SFR and the PDW Path. Some changes extended into the layover and West Station areas, but for the most part, these options were independent of other Project components, which resulted in MassDOT's preferred concept for the interchange that would work with any of the three Throat Area options under consideration.

After publication of the DEIR and at the request of the Secretary of Transportation, an Independent Review Team (IRT) further evaluated the three Throat Area options and documented their findings in an October 2018 technical report. The report came to the following conclusions:

The Highway Viaduct. After evaluating the Highway Viaduct option, the IRT recommendations were similar overall to those proposed in the DEIR with suggestions for changes to staging plans including shifting demolition and reconstruction zones by 10 feet and considering a three-column replacement arrangement in the Throat Area.

The At-Grade (formerly "ABC"). The IRT's evaluation of the At-Grade option suggested placing the PDW Path on a cantilever or pile supported structure over the Charles River. The two WML tracks, two GJR tracks, I-90 eastbound and westbound, SFR westbound and PDW Path would all be at-grade and SFR eastbound would be raised four feet on retained fill. The Grand Junction Bridge over SFR would be replaced.

The SFR Hybrid. After reviewing the AMP option, the IRT suggested elevating SFR, instead of GJR, above I-90. The AMP option would be extremely heavy compared to the existing viaduct, while not being fully utilized in its span across I-90 for other uses. In the elevated SFR option developed by the IRT (the SFR Hybrid), both directions of I-90 and all rail lines would be at-grade with SFR elevated above I-90 EB. In this option, there is little unused space and approximately 20 additional feet of corridor is available when compared to the AMP option. This additional space can be converted into green space adjacent to the river. Vertical clearance for the SFR Hybrid option also allows for a north-south connection from Harry Agganis Way to the PDW Path for pedestrians / bicyclists at a lower crossing elevation. In the SFR Hybrid option, the Grand Junction Bridge over SFR would be replaced. The SFR Hybrid option provides a more efficient use of space and provides greater green space than the AMP option. As evident in public comments received on the DEIR, there was very little public support for the AMP option. Therefore, the AMP option has been dismissed from further evaluation and has been replaced with the SFR Hybrid option.

Throat Area – Continued Refinement

Upon review of the IRT report, MassDOT further refined the IRT options developed for the Throat Area. More details regarding further refinements made to the Throat Area options are described below. Under the 3L Re-alignment Alternative, the Throat Area options are differentiated by how I-90, the WML and GJR tracks, and SFR are structurally accommodated horizontally and vertically by retained fill sections, depressed sections with retaining walls or elevated viaduct. The 3K-HV and 3K-ABC options have changed since the publication of the DEIR and the SFR Hybrid is a new Throat Area option. The Amateur Planner (AMP) option of the Throat Area has been dismissed from further consideration based on the IRT's analysis described above.

The Modified Highway Viaduct (HV) Option

The Modified Highway Viaduct option (See Figures 2.2.2-2 and 2.2.2-3) is a refined version of the Highway Viaduct variation described in the DEIR. This option for the Throat Area includes a new I-90 elevated structure to replace the existing structure while all other transportation infrastructure remains at grade. Refinements include narrowing the viaduct by 8 feet compared to the DEIR Highway Viaduct variation which allows for a reduction in columns that support the structure. The DEIR Highway Viaduct option maintained a four-column pier arrangement similar to the existing viaduct. A three-column layout would be feasible with the reduced cross section. The Modified Highway Viaduct allows for a pedestrian and bike connection from the Allston, Brighton, Brookline and BU neighborhoods to the Charles River Reservation.

Geometry. The WML and GJR tracks would remain at-grade similar to their existing horizontal alignments, with extension of the GJR into West Station. The existing GJR bridge over SFR would remain unimpacted. The MBTA commuter rail lines would remain adjacent to the existing right-of-way line with BU property to the south. Switch connections between the WML and GJR tracks would remain at-grade and provide the maximum cross-over flexibility to access the rail yard and West Station platforms from the east. The outside shoulder widths on I-90 would be 4 feet to be comparable to those proposed for the Modified At-Grade and SFR Hybrid Throat Area highway cross sections.

This modification narrows the overall cross section of the viaduct by 8 feet compared to the DEIR Highway Viaduct variation and subsequently allows for a three-column pier arrangement versus the four-column pier arrangement provided for the DEIR Highway Viaduct option. Narrowing the viaduct and reducing the columns allows for infrastructure, including SFR, to shift further south, opening up additional open space along the Charles River within the Throat Area. The PDW Path would provide 10-foot wide separated bike and pedestrian facilities within a majority of the Throat Area and a minimum 12-foot cross-section where separated facilities cannot be provided.

The Modified At-Grade Option

The Modified At-Grade option is a refined version of the ABC variation described in the DEIR and the at-grade design developed by the IRT. This Modified At-Grade option proposes to reconstruct I-90 at-grade to eliminate the viaduct and retain all other transportation infrastructure at-grade, with the exception of a length of GJR track as it passes over I-90 and SFR after rising in elevation in a parallel alignment (See Figures 2.2.2-4 and 2.2.2-5). The Modified At-Grade option also allows for a bicycle and pedestrian connection from neighborhoods in Allston, Brighton, Brookline and BU to the Charles River Reservation. Design of the Modified At-Grade improves the visual quality for the neighborhood beyond existing conditions by eliminating the visual barrier of the elevated viaduct and providing enhanced neighborhood views.

Geometry. Both directions of I-90 would be reconstructed at-grade and partially below-grade in depressed structural sections with retaining walls to be low enough in elevation to accommodate the profile of the proposed overpassing Grand Junction railroad structure. This option would require replacement of the GJR bridge over SFR to enable the railroad profile to rise to the required elevation above I-90. The PDW Path would be 20 feet wide (16 feet useable space) on a boardwalk structure over the Charles River in the Throat Area. In addition, the lane widths of reconstructed SFR would be 10.5-foot widths with 1-foot shoulders. The travel lane widths of I-90 would remain 11-feet-wide as described for the DEIR ABC at-grade variation, with 4-feet-wide outside shoulders and 2-feet-wide inside shoulders. Approximately 7 feet of BU property would be taken to provide enough width to reconstruct the WML tracks on an alignment supporting Throat Area infrastructure.

FHWA Refinement

Over the course of the NEPA environmental review process for the Project, FHWA has flagged concerns regarding the design of the Modified At-Grade and its ability to adhere to 23 CFR 650 Subpart A – Location and Hydraulic Design of Encroachments on Floodplains. As currently designed, the Modified At-Grade option includes a depressed section under the Grand Junction Rail bridge. FHWA has determined it is located within a floodplain because a 50-year rainfall event has the potential to result in pluvial flooding of that portion of I-90. MassDOT is continuing to coordinate with FHWA and is committed to refining the Modified At-Grade option to address the regulations and minimize impacts to floodplains.

The Soldiers Field Road (SFR) Hybrid Option

The SFR Hybrid option is a further refinement of the option proposed by the IRT after further review of the AMP Throat Area variation presented in the DEIR. The SFR Hybrid option proposes to stack SFR above an at-grade/below-grade four-lane section of the I-90 eastbound travel lanes and shoulders. To minimize the infrastructure cross section through the Throat Area, this option proposes to elevate SFR over I-90 as a means of avoiding that impact (See Figures 2.2.2-6 and 2.2.2-7). This arrangement is in comparison to I-90 being elevated over the railroad tracks per existing conditions and in the Modified Highway Viaduct option. The SFR Hybrid option also allows for a bicycle and pedestrian connection from neighborhoods in Allston, Brighton, Brookline and BU to the Charles River Reservation.

The Secretary's Certificate on the DEIR encouraged MassDOT to incorporate desirable elements of all Throat Area options into the design of the Throat Area Preferred Alternative. This new Throat Area option, the SFR Hybrid option, was developed with the intent to incorporate the desirable elements of all options as encouraged by the Secretary. However, construction is estimated to be the longest for this Throat Area option, approximately eight to nine years (see Section 2.3.21 for further discussion), and construction staging of this option would require relocation of Soldiers Field Road and the PDW Path over the Charles River, resulting in construction duration impacts to the Charles River as discussed in Section 2.3 below. Therefore, further analysis is needed to fully evaluate each Throat Area option currently under consideration.

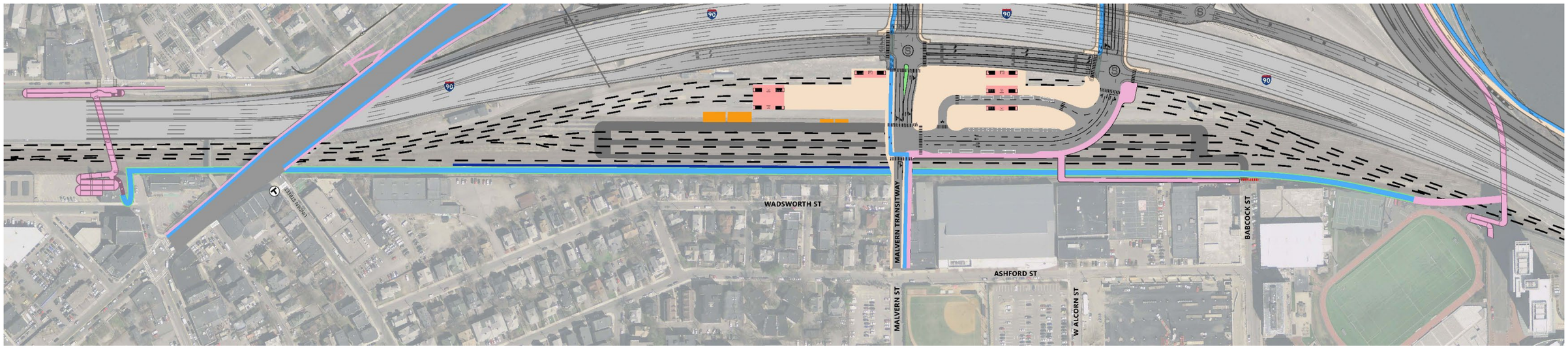
Geometry. Both directions of I-90 would need to be reconstructed partially below-grade in depressed structural sections with retaining walls to be low enough in elevation to accommodate the profiles of the stacked SFR and crossing railroad structures. The two GJR tracks would rise in elevation from an at-grade elevation near West Station, transition to retained fill and then to an elevated viaduct that passes over both directions of I-90 before passing over SFR on a new structure. The two WML tracks that partially parallel the alignment of the Grand Junction tracks would follow the same transitional profile as GJR to accommodate switch operations. East of the switches, the WML tracks would return to its current profile just west of the Commonwealth Avenue bridge. The travel lane widths of I-90 in this option would be 11-feet with 4-foot shoulders. The travel lane widths of SFR in this option would be 11-feet wide with 2-foot shoulders. The PDW Path would remain at-grade, providing separate paths for bicycle and pedestrian uses. Each path would be approximately 10-feet wide with a 4-foot wide buffer between the pedestrian and bicycle paths. This option opens almost 20 feet of new park space adjacent to the Charles River. Approximately 7 feet of BU property would be taken to provide enough width to reconstruct the WML tracks on an alignment supporting Throat Area infrastructure.

2.2.2.3 3L Re-alignment Alternative: Rail Operations and West Station

West Station is envisioned as a multimodal transportation hub, connecting commuter rail, bus, shuttle, private vehicle and bicycle and pedestrian facilities. In the DEIR, West Station was presented as "a commuter rail station with three platforms (two side platforms and one center island platform served by four tracks) and a multimodal bus concourse above the train tracks with bus berths, bus layover space, and drop-off/pick-up areas for passenger cars and private shuttles." Since the publication of the DEIR, designs for West Station have been advanced, and MassDOT continues to refine rail facilities details in conjunction with the overall interchange alternative 3L. Changes to the West Station layout since publication of the DEIR are described in the following sections and are not dependent on the design of the Throat Area. As the Project progresses, the design of West Station may evolve. The current conceptual design reflects the discussion below.

Malvern Street Transitway

The DEIR included bicycle and pedestrian access to West Station from Malvern Street via a new ramp and bridge "between West Station and the intersection of Malvern Street with Ashford Street via easement through private property located at 76 Ashford Street." Responding to public comment received on the DEIR and in subsequent public



Graphic 2.2.2.3-2: MassDOT will continue to advance development of a shared use path from Franklin Street to Agganis Way into the design of the Project's Build Alternative

meetings, MassDOT expanded this connection between the proposed West Station and Malvern Street to now serve bus transit, as well as bicyclists and pedestrians.

The Malvern Street Transitway (as it is now known, see Graphic 2.2.2.3-1) would be open to bus traffic only. General purpose traffic would be allowed access to the West Station busway from the interchange, but not via Malvern Street. This limited access busway viaduct is consistent with the Purpose and Need of the Project to improve intermodal service transfers between bus service and rail service. Bicycle and pedestrian access would also be provided on the Malvern Street Transitway. The SDEIR will include the proposed design and environmental benefits and consequences of the Malvern Street Transitway, including property impacts, stormwater design, noise and visual impacts.

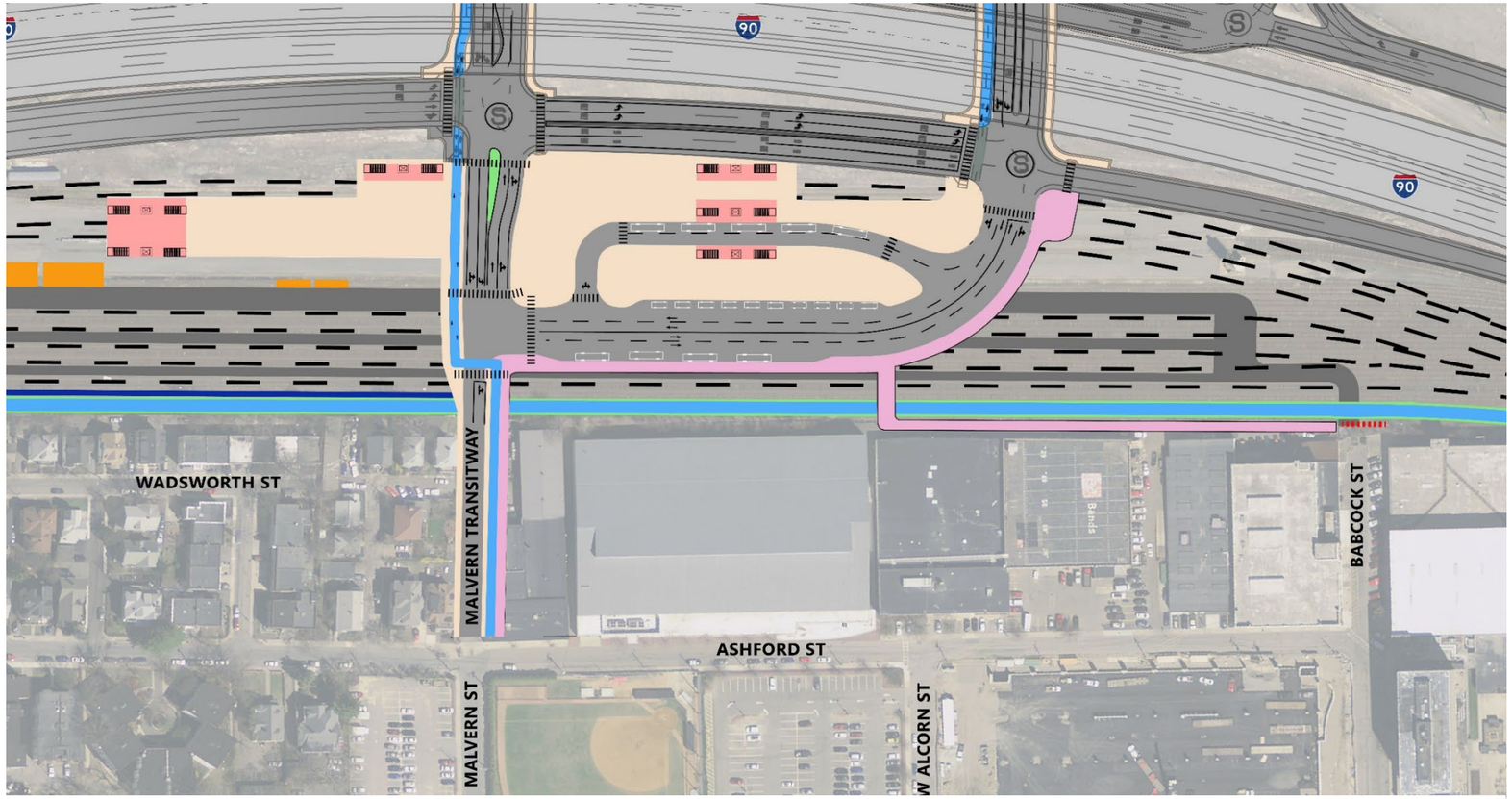
The Flip Layout

After publication of the DEIR, Harvard University conceived a design concept known as the "Flip" that would relocate the proposed West Station layout from its original concept position proposed in the DEIR. The Harvard Flip would locate West Station platforms to the north side of BPY (still south of I-90), adjust the layover yard to the south, and provide a transitway to the south. The Flip would include two WML tracks that divert to the north from the existing WML alignment, resulting in a reduction in Maximum Allowable Speed to 45 MPH or less. The layover yard would include four tracks for eight layover trainsets, but train access would be gained from a yard lead branched from the main line instead of from the GJR per the DEIR alternative alignments.

Bus access would be available from the new I-90 Interchange and points north. Bus access would also be facilitated between the station and Commonwealth Avenue to the south via the Malvern Street Transitway. The Flip layout would include a roadway connection to the south from West Station for restricted access by buses and non-motorized transport via a new Malvern Street Transitway.

Pedestrian access would be provided via the Transitway and a ramp leading from Babcock Street. Pedestrians and bicyclists may also benefit by the prospective Cambridge Street Bypass Road, for east-west connectivity between North Allston and West Station. In addition, Harvard's concept included a new linear buffer park containing a shared-use path in the location of the existing WML track along the southerly property line. The path would connect the West Station area to a new bicycle and pedestrian bridge over I-90 from Franklin Street in North Allston.

The Flip would provide for future GJR service but would reduce allowable operating speeds and increase travel time for many WML riders destined between South Station and the MetroWest. It would also limit operational flexibility among the WML, layover and GJR because the geometric constraints presented by the Flip prevent some crossover moves contained in the DEIR layout. This alternative would also require the limited freight movements along this line to cross over mainline tracks on each side of the yard, introducing freight/commuter rail conflicts that could be avoided with other layouts.



Graphic 2.2.2.3-1: MassDOT expanded this connection between the proposed West Station and Malvern Street to now serve bus transit, as well as bicyclists and pedestrians.

The Modified Flip Layout

MassDOT refined the Flip to optimize and balance goals of both the landowner (Harvard University) and the operator (MBTA), resulting in a West Station layout called the "Modified Flip." The Modified Flip, previously referred to as Updated Modified Flip in the NEPA Scoping Summary Report (2020), would include the WML and GJR rail operational infrastructure of the DEIR layout, while incorporating key elements of the Flip. Like the original Flip, the Modified Flip locates West Station to the north side of BPY, with bus access available from the new interchange and points north as well as from the prospective Cambridge Street Bypass Road. The Modified Flip would also provide the transitway connection between West Station and Malvern Street. The Modified Flip would provide four station tracks and three platforms serving both WML and potential GJR passenger service.

This West Station layout is supportive of the RailVision aspirational future service, such as 15-minute bi-directional rail passenger service on both the WML and the GJR (See Figure 2.2.2-8). The Modified Flip would include one 'express' track along the existing WML alignment, which would allow express commuter rail and Amtrak trains to bypass West Station and offer operation flexibility to bypass a stalled train and provide flexibility within the Right of Way for future aspirational services. In response to community input, MassDOT will continue to advance development of a shared use path from Franklin Street to Agganis Way and the Charles River Reservation into the design of the Modified Flip and the Project's Build Alternative (see Graphic 2.2.2.3-2).

The Modified Flip would position a four-track layover yard to the south of West Station, with the lead track into the yard developed from the West Station commuter rail track, leaving the express tracks and Grand Junction tracks largely unimpacted by yard moves from South Station. The Modified Flip layout would be consistent with the MBTA's current rights. The Modified Flip layout would offer flexibility among the WML, layover yard and GJR, while balancing prospective future GJR service with expansion of high-speed intercity service and express commuter rail service along the WML.

2.2.2.4 3L Re-alignment Alternative: Summary

The 3K Alternative described in the DEIR has been updated and refined to the 3L Re-alignment Alternative. The 3L Re-alignment Alternative remains the Preferred Alternative for the interchange. Further refinements to the interchange may be made during the environmental review process as the Project team continues to optimize traffic and rail operations and seek input from regulatory agencies and other stakeholders. The design of West Station has also been refined to optimize and balance goals of both the landowner (Harvard University) and the operator (MBTA), resulting in a West Station layout called the "Modified Flip."

As part of the ongoing environmental review processes and in response to the Secretary's Certificate on the 2017 DEIR as well as public and stakeholder comments received to date on the Project, MassDOT has continued to refine design of the Throat Area options to present an optimized design for each option. The refinement efforts will continue prior to the completion of the SDEIR and will be reported upon and evaluated in that document. MassDOT has publicly announced it will focus on advancing the Modified At-Grade design for the I-90 Allston Multimodal Project which comes after significant stakeholder engagement as well as input and support from elected officials and the Project Task Force.

2.3 Project Changes: Environmental Impacts of Throat Area Options

Since publication of the DEIR, the Throat Area options have been modified by additional analysis performed by the IRT and further refined by MassDOT, as described above (Section 2.2.2.2). A preliminary description of changes to environmental impacts or effects of each Throat Area option since publication of the DEIR is provided below. The SDEIR will provide a complete analysis of impacts associated with the updated No Build and 3L Re-alignment Alternatives including impacts associated with the interchange, updated West Station design, updated Throat Area options and the Cambridge Street Bypass Road as well as other elements that meet the Purpose and Need of the Project.

2.3.1 Geology, Topography and Soils

Geology, topography and soil impacts have not changed since publication of the DEIR. Soils within the Project Area largely consist of urban fill. For MassDOT's I-90 Urban Interchange Preferred Alternative and Throat Area options, there will be temporary impacts to geology and soils, but the Project will not result in long-term geology and soil impacts. Temporary impacts to topography will result from the removal of the embankments that support the existing I-90 Interchange and ramp system. New embankments to support the proposed Cambridge Street South and its intersecting streets, Seattle Street Connector, Cattle Drive Connector and East Drive Connector, will be constructed in the Project Area. An additional embankment is proposed just north of the rail lines to support the proposed I-90 eastbound off and on-ramps. The same impacts will occur for all Project components during construction. The Modified Highway Viaduct and the Modified At-Grade options will have temporary impacts to soil and topography, with cuts required along SFR for the construction of a portion of the SFR underpass.

Under the SFR Hybrid option, I-90 would be reconstructed at-grade and partially below-grade in depressed structural sections with retaining walls to be low enough in elevation to accommodate the profile of the proposed overpassing Grand Junction railroad structure. In the final condition the existing berms, located in various locations throughout the Project, will be removed thereby eliminating several visual obstructions. No long-term impacts to Project Area soils will occur as a result of the Project since all areas exposed during construction will be stabilized with pavement and/or landscaped surface treatments, including grass and mulch. Proposed future rail operations will take place within the same areas historically designated for these uses, and the proposed West Station will be constructed in the same areas historically designated for railroad operations. There will be no long-term impacts to geology, topography and soils from the proposed rail operations or West Station.

2.3.2 Land Use

2.3.2.1 Future Land Use

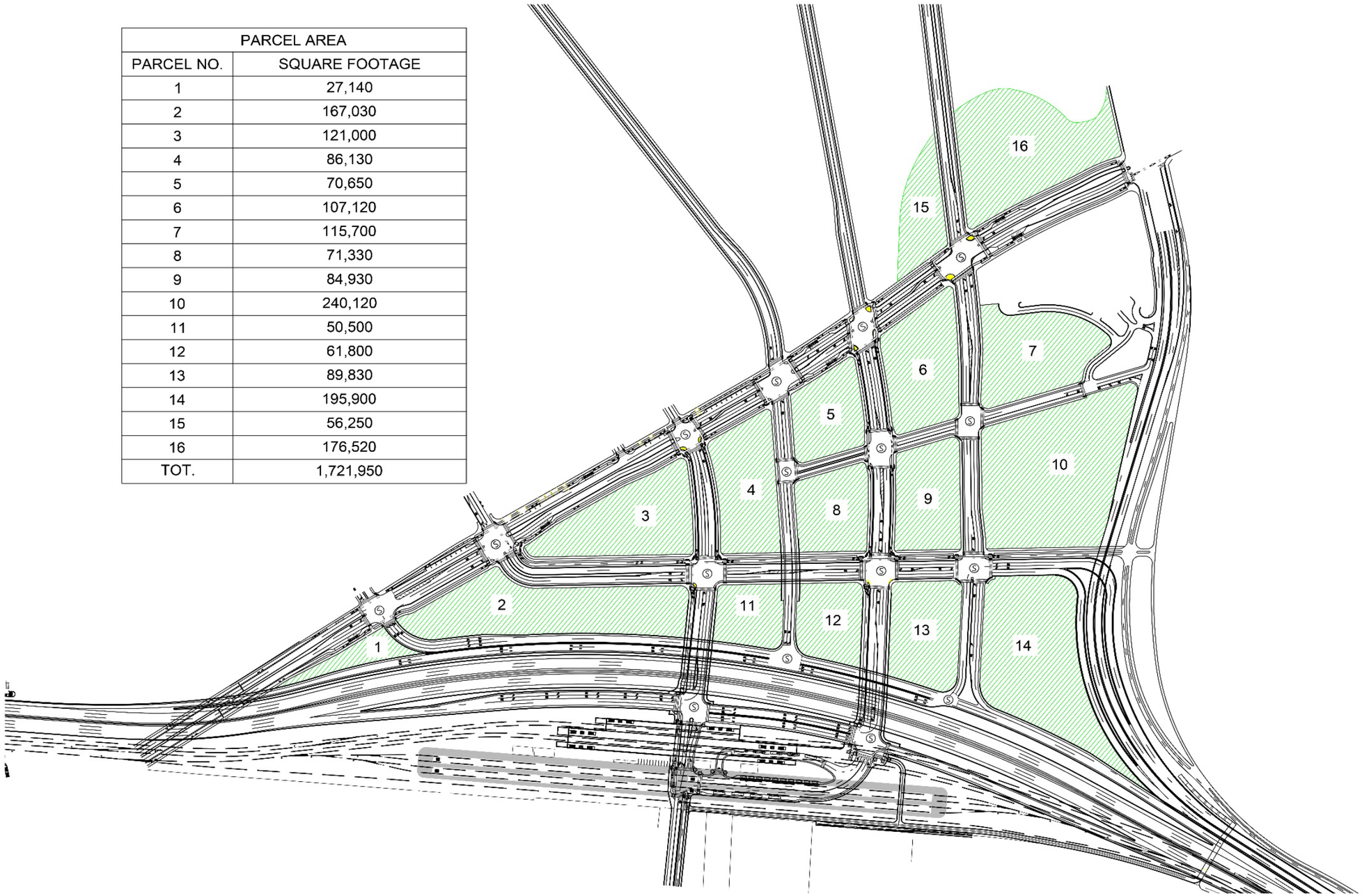
As described in the Purpose and Need (see Section 2.1), several regional and local planning documents illustrate the potential for a large, new mixed-use district in North Allston facilitated by a multimodal network of streets, paths, bus, rail and transit facilities providing improved connectivity for pedestrians, bicyclists and transit users. For example, since the DEIR publication, Harvard University has begun City and State permitting of approximately two million square feet of development as part of its Enterprise Research Campus (ERC) in the area between Western Avenue and Cambridge Street referred to as Allston Landing North (ALN). The transportation analysis supporting this environmental process assumes eight million square feet of new development could occur in the vicinity of the Project Area by 2040.

Graphic 2.3.2-2: New riverfront park

To a great extent, the evolution of the alternatives for the BPY area was influenced by land use considerations, in addition to safety and operations of the interchange. Common to all Throat Area options is a street grid, I-90 mainline/ramp alignment and MBTA rail yard plan that reflect the input of many stakeholders with a common goal of enabling a commercially viable mixed-use neighborhood connected to its immediate environment and to the regional transportation network. Additional curb cuts and interstitial streets will be required as development proceeds. The City of Boston will review and approve these new streets and access points. In addition, the Cambridge Street Bypass Road will be reviewed in future environmental filings as a potential refinement to the 3L Re-alignment Alternative, subject to its environmental consequences and technical and financial feasibility.

The reconfiguration under Alternative 3L will support development on a series of parcels sized to accommodate various development scenarios and building footprints, as shown in Graphic 2.3.2-1 on the following page. It will change Cambridge Street from a one-sided street with homes and businesses on one side and earth berms and I-90 on the other side, into a two-sided street with development potential on both sides for approximately 2,000 feet. The newly created development parcels and street grid, in combination with connections to the Charles River Reservation, I-90 and the future West Station Intermodal Transportation Center, are a framework for a new livable 21st century neighborhood. The I-90 Allston Interchange reconfiguration will also enable a new riverfront park by realigning SFR on land proposed to be donated by Harvard University as part of the Project and as shown in Graphic 2.3.2-2.

PARCEL AREA	
PARCEL NO.	SQUARE FOOTAGE
1	27,140
2	167,030
3	121,000
4	86,130
5	70,650
6	107,120
7	115,700
8	71,330
9	84,930
10	240,120
11	50,500
12	61,800
13	89,830
14	195,900
15	56,250
16	176,520
TOT.	1,721,950



Graphic 2.3.2-1: Parcels Created by the 3L Concept: Land formerly dedicated to highway and rail infrastructure indicated in green.

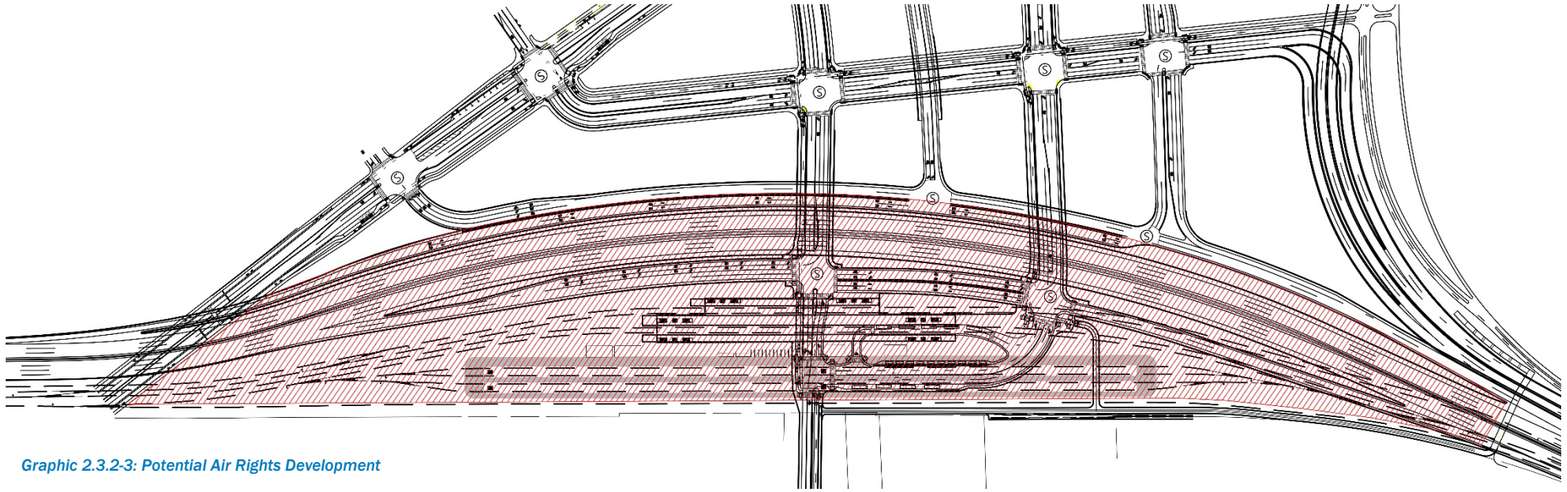
2.3.2.2 Air Rights

Air-Rights Development

As shown in Graphic 2.3.2-3, there is a gross area of approximately 1.4 million square feet for air-rights development sited over I-90 and the I-90 ramps connecting to the proposed street grid, West Station, the MBTA commuter rail layover yard and the WML. Some percentage of this area would be required for general purpose roads and service roads and for open space, sidewalks and bicycle lanes. Therefore, the available development footprint would be significantly smaller than the gross area.

Provision has been made for others to construct potential future air-rights development. In particular, the Project would align the tracks, layover yard facilities and access roads to leave space for future air rights foundation construction between the track pairs (two parallel tracks bounded by air rights foundation lines on each side) and on the perimeter. Further, the Project will support concurrent or reasonably foreseeable construction of a future deck and development. It is anticipated that the preliminary engineering and appropriate environmental review and approvals/authorizations for air-rights development would be completed by others concurrent with, or prior to, the I-90 Allston Multimodal Project's state and federal environmental review and advancing the design of the interchange and West Station.

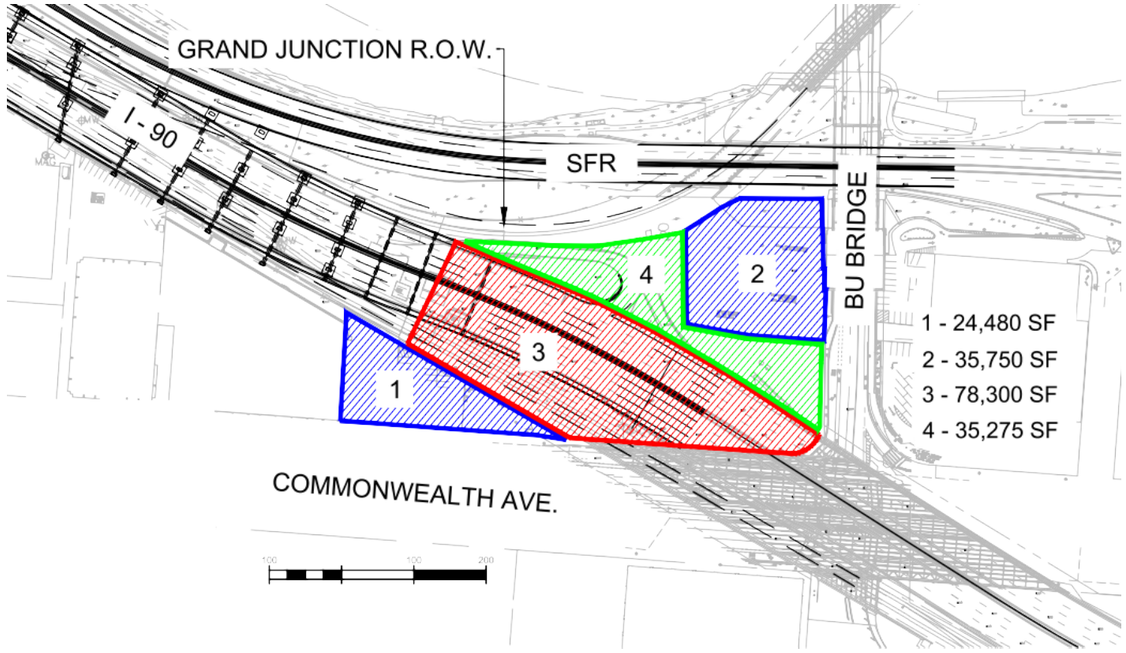
MassDOT will continue to work with the City of Boston and the landowner to develop an access scheme that supports development and does not compromise interchange or local road operations.



Graphic 2.3.2-3: Potential Air Rights Development

Boston University IMP Site 1

There is a parcel identified at the northwest corner of Commonwealth Avenue and the BU Bridge for future development in BU's Institutional Master Plan. Labeled as "Site 1," this parcel is composed of two tracts owned by BU and a tract owned by MassDOT (of which a large portion is an air-rights parcel over I-90). Sites 1 and 2 are owned by BU and Sites 3 (potential air-rights) and 4 are owned by MassDOT. All three Throat Area options retain the development potential of Parcel 1 with access from Commonwealth Avenue There are differences in the development potential of the remaining parcels based on the Throat Area option. The Modified Highway Viaduct option is supportive of development on parcels 2 and 4, with access from the BU bridge approach road, but the viaduct may limit the area of development above I-90 (Parcel 3). The Modified At-Grade and SFR Hybrid options may offer a better opportunity to construct over I-90 in the absence of the viaduct, but would be more limited by a stormwater pump station that would need to be relocated to that area as well as by pipes that discharge the collected stormwater to the Charles River. An existing pump station that lies below the I-90 viaduct in Parcel 3 would be displaced by I-90 under the Modified At-Grade and the SFR Hybrid Throat Area options. See Graphic 2.3.2-4.



Graphic 2.3.2-4: Boston University IMP Site 1: Potential Air Rights and parcelization diagram at east end of Project Area at the BU Bridge for 3L-MHV.

2.3.3 Visual Resources

The following visual analysis updates the analysis described in the 2017 DEIR for the Throat Area options currently under consideration. Notably, the Project's Purpose and Need (see Section 2.1) identifies improvement to the visual quality of the neighborhood as one of the issues that should be reviewed when addressing the deficiencies of the viaduct.

All three Throat Area options will be seen from the Charles River and its bridges, from across the river at Magazine Beach, the BU Bridge and various other locations, at close proximity from the PDW Path, at close proximity from BU including Commonwealth

Avenue, Harry Agganis Way and Nickerson Field, from surrounding buildings above and from the driver's view. See Graphics 2.3.3-1 through 2.3.3-3. In general, the below analysis suggests removing the existing viaduct would result in the best views for all users, particularly bicyclists and pedestrians, by eliminating this visual barrier and increasing visibility of the Charles River and parkland.

2.3.3.1 Visual Impacts from across the Charles River and from River

Modified Highway Viaduct Option. The elevation of the I-90 viaduct under the Modified Highway Viaduct option will continue to be seen as elevated structure against BU's Student Village and 10 Buick Street buildings as is the existing viaduct and will be seen at approximately the same elevation. However, the additional setback of SFR from the river's edge and realignment of SFR allowed by the reduction in viaduct columns will allow for more substantial plantings and there is greater opportunity to buffer the view of the viaduct itself with new plantings at the restored river bank and for some portion of the Project in between the PDW Path and the viaduct. The park itself will be visible from the river and is an improvement from the existing view of the riverbank. See Graphic 2.3.3-1.

Modified At-Grade Option. This layout allows for increased views of buildings adjacent to the Throat Area from across the river as the building elevations would not be interrupted by viaduct structures present in the other options. The width of I-90, SFR and the railway is less noticeable from a distance although the tops of vehicles will be seen – the degree to which will depend on the types and heights of barriers. As with other options, the relocated enhanced riverbank can be planted and would serve as a planted buffer to SFR, I-90 and the railway. The PDW Path on a boardwalk outside of the planted riverbank will be visible and will express the recreational use of the parkland from the river, the BU Bridge and from Magazine Beach. See Graphic 2.3.3-2.

SFR Hybrid Option. The elevation of the SFR viaduct under the SFR Hybrid option will also be seen from across the river as an elevated viaduct. The elevation will be lower than with the Modified Highway Viaduct and there will be fewer larger vehicles and trucks traveling over the elevated SFR than there would be on I-90. And so, the visual impacts of the viaduct against BU's buildings will be less than with the Modified Highway Viaduct. The option would also allow planting improvements at the riverbank and in between the PDW Path and the viaduct for a portion of the Throat Area. See Graphic 2.3.3-3.

2.3.3.2 Visual Impacts from the Paul Dudley White Bike Path

Modified Highway Viaduct Option. The Modified Highway Viaduct option allows for separated pedestrian and bicycle paths for most of the Throat Area. The visual impacts for path users vary depending on the distance from SFR and the opportunity to create a buffer in between the path and roadways (including planting and attractive roadway edge treatments). Assuming a minimum of ten feet for a planting buffer (fifteen feet preferred), this alternative allows for ten feet of buffering for approximately 25 percent of the approximately 1,920 LF Throat Area assuming a 4' separation in between bicyclists and pedestrian paths as shown in typical sections.

As the PDW Path and parklands are separated from the adjacent neighborhood, distance between access points, visual permeability and "eyes on the path" all affect the path user's experience and whether some users feel safe. Distance between future access points (the BU Bridge, Agganis Way pedestrian bridge and the at-grade crossing at Cambridge Street South) are comparable on all schemes. Between the BU Bridge and Cambridge Street South, the path will be adjacent to SFR which can be designed with a low rail or barrier to allow for sight lines to the path. A ramp from a future pedestrian bridge at Agganis Way into the park would also form a barrier and create shadow within the park.

The bicycle and pedestrian paths afford views of the river and those views would need to be balanced with the needs to buffer views of the viaduct from across the river in bank areas where there is not space at the back of the paths for adequate buffering. In all cases, the banks will be restored to create greater biodiversity which will include trees as well as shrub and herbaceous plantings. See Graphic 2.3.3-4.

A view from the PDW Path, adjacent to the Cambridge Street exit from SFR. It demonstrates the close proximity of the roadway to the path. The narrowness of the path is apparent, bounded by a highway guard rail and decorative guardrail.

Modified At-Grade Option. There would be minimal adjacent elevated structure in comparison with the other options. This alternative affords the best views of the river for PDW Path users and also offers opportunities for path users to visually engage with the restored, more diverse river bank.

The Modified At-Grade option allows for separated pedestrian and bicycle paths for a portion of the Throat Area. As the PDW Path is on a boardwalk outside of the river bank area, any land in between the edge of SFR and the top of the riverbank is available for buffer planting. Assuming a minimum of ten feet for a planting buffer (fifteen feet preferred), this alternative does not allow for adequate buffering at the top of bank. However, the bank in this alternative could be planted as a buffer for bicyclists and pedestrians on the PDW Path as well as for viewers from across the river. Other potential concepts for shoreline treatments associated with the Modified At-Grade option are described in Section 2.3.12 and will be further explored in the SDEIR. The edge of SFR through the Throat Area where bicyclists and pedestrians are on the boardwalk could be treated with the experience of the parkway driver in mind (views out) as pedestrians and bicyclists are on a separated boardwalk structure. There would be a 4' separation in between bicyclists and pedestrians on the boardwalk as well as on land as shown in typical sections.

With the Modified At-Grade option, the pedestrian/bicyclist boardwalk will be visible from surrounding bridges and roadways. As with the other alternatives, the ramp from a future Agganis Way pedestrian bridge would create a barrier and some shadow impacts. This alternative affords the best views of the river for PDW Path users and also offers opportunities for path users to visually engage with the restored, more diverse river bank. See Graphic 2.3.3-5.

SFR Hybrid Option. The SFR Hybrid option allows for separated pedestrian and bicycle paths for the entire Throat Area (except where they need to join to pass under the Grand Junction and BU Bridges). This alternative allows for adequate buffering for approximately 33 percent of the Throat Area assuming a 4-foot separation in between bicyclists and pedestrian paths as shown in typical sections. Within the narrowest section of the Throat, the separation can be reduced to allow space at the edge of the depressed I-90. The edge condition through this narrow section can be treated as an attractively designed wall or a green wall if the maintenance required for a green wall is addressed.

The SFR Hybrid option can allow for a future connection from the corner of Commonwealth Avenue and the BU Bridge to the PDW Path under the GJR and the elevated SFR. This would introduce an additional access point that could allow for greater visual permeability as well as access. For much of the space in between the BU bridge and the Agganis Way pedestrian bridge, I-90 is below grade and the edge of the highway will need to be a barrier at a height sufficient to prevent any path users from accessing or throwing obstacles into the interstate. The edge with the park and the PDW Path will be a wall/fence and would create a strong separation with the highway/roadway system. Although the path can be seen from the elevated SFR, there is a greater separation which could result in path users feeling isolated and less safe. A ramp from a pedestrian bridge at Agganis Way into the park would be longest in this scheme creating the greatest visual and shadow ramp impacts of the three Throat options.

The bicycle and pedestrian paths afford views of the river and those views would need to be balanced with the needs to buffer views of the viaduct from across the river for the limited areas where there is not space at the back of the paths for adequate buffering. See Graphic 2.3.3-6.

2.3.3.3 Visual Impacts from Boston University

Modified Highway Viaduct Option. The viaduct is approximately elevation 53 feet, approximately 20 feet higher than Harry Agganis Way and is visible from Commonwealth Avenue as well as Agganis Way, Agganis Arena, Nickerson Field and surrounding BU buildings. This is the location of a future pedestrian/bicycle crossing to the park and the viaduct and entrance to the pedestrian bridge crossing would be dominant visual features. The opportunities to create attractive entrance plazas vary with the alternatives depending on how much space is available and the space needed for accessible and comfortable access to the pedestrian bridge and parkland beyond. With the Modified Highway Viaduct scheme, the pedestrian bridge elevation must be at approximate elevation 35.8 feet as it is threaded in between the clearance needed for the railway and the I-90 viaduct structure. A future pedestrian bridge would be approximately 2.5 feet higher than the base of Agganis Way, minimizing any ramping needed. Some or all of the elevation change on the BU side might be able to be

accommodated by adjusting the grade of the base of Agganis Way itself. The entrance to a future bridge itself would need to be as generous and open as possible and sight lines through the bridge would be important for it to feel safe and welcoming to park users.

Modified At-Grade Option. The roadway/highway elements would be below the grade of Agganis Way and would be visible. The view from Commonwealth Avenue would be of the ramp to a future pedestrian bridge which is approximately 8 feet higher than the base of Agganis Way. As with the Modified Highway Viaduct option, some of the ramping can be accommodated through adjusting the elevation of the base of Agganis Way and an entrance plaza can be created. As there is no viaduct in this scheme, the visibility across the ROW at the pedestrian bridge is good and the bridge is open to the sky. It would be important to maintain sight lines, particularly as the bridge itself is longer than in other schemes. There can be sweeping views of the river from the bridge itself depending on the design of bridge edges.

SFR Hybrid Option. Although elevated on the river side, the SFR viaduct would be below the grade of the base of Agganis Way and Agganis Way users would be looking down on the railroad and SFR traffic. The ramping structure needed to access a new future pedestrian bridge which is approximately 11 feet higher than the base of Agganis Way (the highest of the 3 alternatives) would require approximately 245 feet of ramp. As with other alternatives, some of the ramp can be accommodated with some raising of the grade of Agganis Way. In general, there would be less opportunity with this alternative to create plaza space as more space is needed for ramping to the pedestrian bridge elevation.

2.3.3.4 Views from Above

The roadway, highway and railway elements will be visible from above in all options and from various high-rise buildings and locations in the city. See Graphics 2.3.3-7 through 2.3.3-9. The right-of-way will be seen from the adjacent BU high rise buildings, the BU bridge and the future development. The expanded park land and restored banks of the river's edge will improve the view over what exists today in all options. The Modified At-Grade option will have the most impact from above in the Throat Area as there is no overlap of highway/roadway/rail components so there is an approximately 220-foot-wide swath of pavement/rail for 1,145 LF in the Throat Area. In the other options, the total width of highway/roadway/rail in the Throat Area is:

- Modified Highway Viaduct: 180-feet wide for 1,260 LF
- SFR Hybrid: 180-feet wide for 1,380 LF

An aerial view of the Throat Area shows the adjacency of the Charles River to the PDW Path, (obscured by tree cover), which abuts SFR. SFR is next to the railway, which has the 8-lane I-90 viaduct overhead.

2.3.3.5 Driver Experience

The Throat Area represents a relatively minor distance of the highway driver's experience and the driver on I-90 will likely be focused on adjacent traffic through the Throat Area. Although it is a relatively short distance for the driver on SFR as well, the road is a parkway and views of the river and adjacent parklands are important to the experience as such. In all options, SFR will pass through a new tunnel section at the at-grade crossing from Cambridge Street South to the PDW Path losing visual connection with the river, though this is a common experience on SFR and Storrow Drive due to the number of existing underpasses outside the Project Area.

Modified Highway Viaduct Option. This option is most similar to the existing experience but the SFR driver will be farther from the river and there will be new plantings at the road's edge for a portion of the Throat Area. The parkway is at-grade and visual connectivity with the river is maintained. On the viaduct side, the driver will see the underside of I-90 and the experience will depend on the design of the superstructure.

Modified At-Grade Option. This option results in the roadway being closest to the river's edge with just bank plantings and guardrail in between the parkway and the PDW Path on the boardwalk. The view will largely be of the boardwalk and railings with the river in the background. As there will be barriers in between SFR and I-90, the SFR driver will likely be aware of the barrier on the I-90 side but may see the top of vehicles as well.

SFR Hybrid Option. This option has the greatest impact on SFR as the parkway is elevated on a viaduct through the Throat Area which results in steep roadway grades ascending and then descending into the tunnel section. The driver will likely be focused on safely navigating the changing geometry and may have less visual continuity with the river and parklands — less of a parkway experience. This can be mitigated with tree plantings at edges where space allows.

Graphic 2.3.3-1: View of the Modified Highway Viaduct Throat Area from Magazine Beach, Cambridge, MA

Graphic 2.3.3-2: View of the Modified At-Grade Throat Area from Magazine Beach, Cambridge, MA

Graphic 2.3.3-3: View of the SFR Hybrid Throat Area from Magazine Beach, Cambridge, MA

Graphic 2.3.3-4: Modified HV view from PDW Path towards the widened park area

Graphic 2.3.3-5: Modified At-Grade view from PDW Boardwalk towards widened park area

Graphic 2.3.3-6: SFR Hybrid view from PDW Path towards the widened park area

Graphic 2.3.3-7: 3L-HV from 10 Buick St building looking down at the Throat

Graphic 2.3.3-8: 3L-Modified At Grade from 10 Buick St building looking down at the Throat

Graphic 2.3.3-9: 3L-SFR from 10 Buick St building looking down at the Throat

2.3.4 Open Space and Recreation

All three Throat Area options include additional park space along the Charles River that would address many of the goals of the City of Boston Placemaking Study, the DCR's Charles River Lower Basin Vegetation Management Plan and various workshops. Although there are differences in the land available for recreational use under each option (as outlined here), the qualitative, rather than quantitative, factors may be of greater importance to the success of and access to the riverfront park. Each option would require a portion of DCR land to be converted to MassDOT uses and require Article 97 approval for the land disposition. The overall land available for park use in between the various transportation uses and the riverbank for each option is:

- Modified Highway Viaduct Option: 7 acres
- Modified At-Grade Option: 6.6 acres and the 29,000 sf of boardwalk for the PDW path in the river
- SFR Hybrid Option: 8.1 acres

Outside the Throat, in the future condition under any option, would be a widened park section made possible through the removal of the Houghton Chemical rail spur. This parkland feature would be 170 feet wide at its widest dimension. The park area itself, which is programmable for uses other than the PDW Path and circulation, is about 1,235 LF long in the Modified Highway Viaduct option and the SFR Hybrid option and approximately 1,190 LF in the Modified At-Grade option.

All options allow for the park land to be used for informal recreation, gatherings, events, stormwater treatment/infiltration, increasing the biodiversity of the river, resiliency measures or some combination of these. The use of the park, its programming and design will be determined in coordination with DCR in the future. While none of the Throat Area options would preclude successful park use, each will include factors that would influence the experience of park users including:

- The experience of bicyclists and pedestrians on the PDW Path and ability to provide separation between modes
- The ease of access to the park from the adjacent communities
- Potential shadow impacts (see Section 2.3.3)
- The noise experience of park users (see Section 2.3.11)

2.3.4.1 Experience of Bicyclists/Pedestrians on PDW Path

Modified Highway Viaduct Option. This option allows for separation of faster moving bicyclists from pedestrians for most but not all of the Throat Area. The roadway edge condition at the back of the Throat Area is most similar to the current condition but there is more space for tree plantings and a more generous PDW Path — an improved condition over existing. The edge of SFR will likely be a guardrail allowing for good visibility and perceived safety on the part of the PDW Path user in the Throat Area.

Modified At-Grade Option. This option allows for separation of faster moving bicyclists from pedestrians for all of the Throat Area except for where the paths need to combine to meet the existing paths at the BU bridge. For the majority of the Throat Area, the separated bicycle/pedestrian boardwalk is over the watersheet approximately 20 feet from the top of the riverbank. Emergency response access to PDW Path users could be more challenging due to the separated facility from SFR. However, there are no safety issues to PDW Path users from SFR. The treatment of the edge of the at-grade SFR will be dependent on a safe treatment for the roadway users. There will be good visibility in this option as path users will be seen from the at-grade SFR and, as they are on a boardwalk over the river, they will be easily seen from the river. This option allows for an interesting experience for the PDW Path user as they will be able to see the restored riverbank from the outside on one side of the path and will be over the river on the other.

SFR Hybrid Option. This option allows for separation of faster moving bicyclists from pedestrians for all of the Throat Area except where the paths need to combine to meet existing at the BU bridge. The roadway edge condition at the back of the Throat Area is a fence or wall as I-90 abuts the park and will be partially below grade through this area. This may result in path users feeling somewhat isolated as they are not visible from the road. They may be seen from elevated SFR but may be hidden by the wall/fence at the edge of I-90 and barriers on SFR. The edge condition in the Throat Area for the SFR Hybrid option is the most challenging in creating a safe and attractive "back" to the park.

2.3.4.2 Ease of Access/Community Connection

All Throat Area options have very similar connections to River Street and over SFR at the new development site. The differences between the options have largely to do with the implications for design of a future pedestrian crossing at Agganis Way and its potential impact on the park and the potential for a new access point from Commonwealth Avenue and the BU Bridge.

Modified Highway Viaduct Option. This option has access points at River Street, Cambridge Street South, future Agganis Way (and West Station via Agganis Way); however, it does not include the continuation of the PDW Path under the BU bridge since the GJR bridge over SFR is not replaced under this option. The Agganis Way bridge in this option is located in between the clearance needed for the rail and the underside of the proposed I-90 viaduct. The height of the bridge is accessible from Agganis Way (a couple of feet rise from the roadway) and the ramp on the river side is a climb of approximately 23 feet). This is a fairly easily traversed access point and the challenge would be to design a structure that feels safe and welcoming as it passes under the viaduct.

Modified At-Grade Option. This option also has access points at River Street, Cambridge Street South, future Agganis Way (and West Station via Agganis Way) with the addition of the continuation of the PDW Path under the BU bridge since the GJR bridge over SFR must be replaced under this option. A future Agganis Way bridge in this option passes over the rail and at-grade I-90 and SFR. The bridge is open to the sky, and very visible from multiple locations. The climb from Agganis Way is approximately 8 feet and the climb from the river side is approximately 18 feet. It is an easily traversed connection point from Agganis Way and could be designed for sweeping views of the river and surroundings. The challenge with this crossing is to design a bridge which is open but still feels safe and secure to bridge users.

SFR Hybrid Option. As with the other two, this option has access points at River Street, Cambridge Street South, future Agganis Way (and West Station via Agganis Way) and from the continuation of the PDW Path under the BU bridge. A future Agganis Way bridge in this option passes over the elevated SFR and the required clearance places this bridge at the highest elevation of the Throat Area options. The climb from Agganis Way is approximately 11 feet and the climb from the river side is approximately 36 feet. The climb may discourage some from using this connection point and the ramp on the river side itself forms a longer barrier and greater visual impact. This option allows for the possibility of an additional access point from Commonwealth Avenue at the BU Bridge (if negotiated with landowner). The elevated SFR and Grand Junction Railroad at the edge of I-90 can be designed to allow for passageway under both, and the grade difference from Commonwealth Avenue allows for an accessible route down to the PDW Path.

2.3.4.3 Impacts to Parkland

As described in the DEIR, much of the parkland in the Project Area is located within the Charles River Basin Historic District and is therefore also a designated historic resource. Parkland within the Throat Area includes publicly accessible and inaccessible green space, SFR and the Charles River watersheet. All of these features are under the care, custody and control of the DCR. The changes to the Throat Area options since the DEIR have not changed the Project boundaries or the overall amount of parkland within the Project Area but impacts to the parkland from each of the options vary slightly from previous designs. The parkland impacts will be assessed for the following categories:

1. **Accessible greenspace impacts.** These are calculated as new occupation of vegetated parkland that is currently usable by the public and would turn the parkland greenspace to a transportation use.

2. **Impacts to watersheet.** These are calculated as occupation of the river that would disrupt or alter some water based recreational uses.

3. **Conversion of other areas of parkland.** This includes conversion of SFR (the scenic roadway itself is classified as a parkland, as it is included in the parkland designation of DCR-owned land) or conversion of inaccessible areas of the median and shoulders to a different use, such as the I-90 lanes support structures, or rail right-of-way.

Each of these three types of parkland impact are assessed as either temporary or permanent. And finally, each Throat Area option has the potential for parkland creation or enhancement through the removal of the Houghton Chemical rail spur, shoreline restoration and other additional mitigation measures, such as shifting the alignment of SFR away from the river. These impact types and potential for parkland creation are summarized below and will be presented in more detail in the SDEIR.

Modified Highway Viaduct Option. This option would result in approximately 500 square feet of permanent parkland occupation from the new I-90 piers on an area of inaccessible parkland adjacent to SFR. Placement of viaduct supports on DCR Land would require an Article 97 land disposition, as would the placement of the Grand Junction alignment within the Throat.

In addition, the viaduct would have an indirect effect on approximately 4,900 square feet of parkland from the structure overhang over inaccessible parkland. The Modified Highway Viaduct option requires a modification in the alignment of the GJR that would occupy approximately 3,000 square feet of parkland. This option would allow for the PDW Path to be widened compared to the existing path and provide separated pathways for bicyclists and pedestrians for the majority (but not the entirety) of the Throat Area. The path would be located on existing land adjacent to SFR throughout the Project Area, including the Throat Area. Through a shift in the alignment of SFR and the creation of new parkland from removal of the Houghton Rail Spur, the Modified Highway Viaduct option would create approximately 4.5 acres of new parkland. See Figures 2.3.4-1 and 2.3.4-2 for parkland impacts and creation of the Modified Highway Viaduct.

Modified At-Grade Option. This option would impact publicly accessible parkland through shifting SFR toward the Charles River, thus impacting the existing greenspace and PDW Path. The PDW Path would be relocated to a new boardwalk in the Charles River, converting approximately one acre of recreational use of the watersheet to bicycle and pedestrian parkland uses. The Modified At-Grade option would also result in approximately 1.3 acres of permanent conversion of parkland use to highway use by introducing I-90 at grade within the parkland envelope. I-90 would occupy approximately 1.3 acres of DCR owned parkland. Placement of I-90 at grade within the throat would require an Article 97 Land disposition. It is estimated that the Modified At-Grade would result in a net increase of approximately 3.6 acres of parkland over existing conditions through removal of the Houghton Chemical Spur in addition to 1.1 acre of parkland converted from watersheet to upland park (the boardwalk). Throughout the entire length of the Throat Area, the PDW Path would be widened compared to the existing path and provide separated pathways for bicyclists and pedestrians on a boardwalk over the Charles River. See Figures 2.3.4-3 and 2.3.4-4 for parkland creation and impacts of the Modified At-Grade.

Existing PDW Path

SFR Hybrid Option. This option would result in approximately 1.5 acres of parkland occupation from the at-grade and depressed portions of I-90 located in the DCR-owned parkland area. This option would also result in a temporary impact to approximately 4.2 acres of watersheet during the eight to ten-year construction period. This option would require the largest conversion of DCR controlled parkland to MassDOT control with much of I-90 landing within the parkland envelope in the Throat and therefore would require the largest Article 97 conversion of any option.

Along the entire length of the Throat Area, the PDW Path would be widened to provide separated pathways for bicyclists and pedestrians. The path would be located on existing land adjacent to at-grade and depressed I-90 within the Throat Area and adjacent to SFR outside of the Throat Area. The SFR Hybrid option would result in an increase of approximately 6.1 acres of parkland over existing conditions. See Figures 2.3.4-5 and 2.3.4-6 for impacts and parkland creation of the SFR Hybrid.

A complete comparison of parkland impacts and benefits between the Throat Area options will be provided in the SDEIR and NEPA DEIS. The NEPA DEIS will include a draft evaluation under Section 4(f) of the U.S. Department of Transportation Act of 1966.

2.3.5 Socioeconomics

Socioeconomic impacts and benefits for the 3L Re-alignment Alternative and each Throat Area option have changed since publication of the DEIR, based on changes in construction costs and projected land uses outside the immediate Project Area. At the regional level, the 3L Re-alignment Alternative with any Throat Area option is expected to result in expanded economic activity and user transportation benefits. For the purposes of the regional socioeconomic impact assessment, the three Throat Area options are considered to be similar. At the local level, the Project will improve pedestrian and bicycle facilities and reduce traffic on some local roadways, thereby improving safety, enhancing neighborhood livability, and potentially increasing property values, local retail sales, and the area's attractiveness for additional residential, business and institutional investment. New analyses will be undertaken for the SDEIR.

In the SDEIR, all existing conditions socioeconomic data will be updated with latest, best available data from government and proprietary sources used in DEIR (which were 2015 data). In summary:

- Increased construction costs will result in additional direct, indirect and induced one-time effects on jobs, household income and business sales. Updated analyses to be done in SDEIR.
- Changes in traffic, particularly travel time savings, will be evaluated in SDEIR for their effect on regional jobs, household income and business sales analyzed and reported in DEIR.
- Changes in land use projections reflected in MAPC/CTPS memoranda since the DEIR will be reflected in assessment of No Build and Build effects of development within the immediate Project Area, as well as direct, indirect and induced effects on regional jobs, household income and business sales of contingent development within the Project Area.
- Indirect socioeconomic effects will be added to the direct effects assessment in the DEIR. These will be assessed within the immediate Project Area, local communities and the three-county region used in the DEIR (Middlesex, Suffolk and Norfolk counties) capturing significant shares of current and forecast job and household trip ends attributable to interchange users.

2.3.6 Historic and Archaeological Resources

2.3.6.1 Historic Resources

FHWA initiated formal consultation under Section 106 of the National Historic Preservation Act of 1966 in a letter to the Massachusetts State Historic Preservation Officer (SHPO) dated November 12, 2019. FHWA, MassDOT and the SHPO have identified a variety of parties with a potential interest in historic properties that may be affected by the Project. FHWA has invited each to become a Section 106 consulting party. FHWA convened the first consulting parties meeting on August 27, 2020 to discuss the Section 106 process and solicit comments on the proposed Area of Potential Effect (APE) and the identification of historic properties within the APE.

The proposed APE and the identification of historic properties have changed little from what was published in the DEIR. The most significant change in the APE is the differentiation between a Direct APE and an Indirect APE. Project work will take place within the Direct APE but potential impacts, such as noise, shadow and visual impacts, could extend to the Indirect APE. The identified historic properties within the direct and indirect APE remain largely unchanged but have been clarified to include the Charles River as a contributing property within the Charles River Basin Historic District, which is listed in the National Register of Historic Places, as suggested by the SHPO. (See Figure 2.3.6-1.) The Section 106 consulting parties submitted comments regarding the APE and the identification of historic properties. FHWA forwarded the APE and the identification of historic properties within the APE to the SHPO for concurrence. The SHPO, in a letter dated March 8, 2021, wrote that the APE appears to be sufficient but it should be re-evaluated when a preferred alternative has been identified. The SHPO also identified a few additional historic properties within the APE that had previously been omitted.

Charles River Basin Historic District

FHWA convened a second consulting parties' meeting on March 19, 2021 to begin discussion of the Project's potential effects on historic properties. Further consultation with the SHPO, the Advisory Council on Historic Preservation, the Tribal Historic Preservation Officers and other consulting parties will be conducted before a determination of effect is made. Additional information about the Project's effects on historic properties will be included in the SDEIR. It is anticipated that a Programmatic Agreement, outlining the process for ongoing Section 106 review, will be executed for the Project.

It should be noted that the SHPO expressed concerns about the potential construction of a bypass road on a trestle in the river, in response to the NEPA Scoping Report published on November 6, 2019. The SHPO stressed the importance of carefully considering alternatives that would avoid adverse effects to properties that contribute to the National Register-listed historic district, including the Charles River.

Project impacts within the National Register-listed Charles River Basin Historic District vary in each of the three Throat Area options, as described in the following paragraphs.

Modified Highway Viaduct Option. The proposed Modified Highway Viaduct option would largely maintain the existing conditions within the historic district with a few exceptions. In this option, the new interstate highway viaduct would be constructed on the same alignment but would be slightly wider than the existing so a few of the new viaduct's piers would occupy approximately 500 square feet within the historic district. In addition, approximately 4,900 square feet of the viaduct would overhang the historic district. The alignment of the GJR would shift so that it occupies approximately 3,000 square feet of the historic district. SFR would shift away from the river onto the existing parkland between SFR and the railroad/highway viaduct, which would allow for additional parkland to be created adjacent to the PDW Path. See Figure 2.3.4-1 for I-90 and rail impacts within the historic district that are associated with the Modified Highway Viaduct.

Modified At-Grade Option. In the Modified At-Grade option, the existing highway viaduct would be removed, and I-90 would be brought down to grade partially within the historic district. I-90 would occupy a portion of the existing SFR and the existing parkland between SFR and the railroad/highway viaduct. The total area of I-90 that would be shifted into the historic district is approximately 57,000 square feet. The cross section of SFR would be reduced by 2 feet and the alignment would shift to the edge of the river. The riverbank would be reconstructed on fill or potentially replaced with a retaining wall (see Section 2.3.12). The PDW Path would shift onto a boardwalk structure in the river. The approach spans of the Grand Junction Bridge over SFR would be replaced to match the existing on a slightly altered alignment. See Figure 2.3.4-3 for I-90 impacts within the historic district that are associated with the Modified At-Grade option.

SFR Hybrid Option. In the SFR Hybrid option, SFR would shift onto a lower-level viaduct mostly outside the bounds of the historic district. I-90 would be reconstructed slightly below-grade with the eastbound lanes located under the SFR viaduct and the westbound lanes shifted to the north to occupy approximately 66,250 square feet of the historic district. The PDW Path would remain at the river's edge and a new wall or fence would be constructed to separate the path from the interstate highway. The approach spans of Grand Junction Bridge over SFR would be replaced. During construction, SFR would be placed on a temporary trestle in the river. See Figure 2.3.4-5 for I-90 impacts within the historic district that are associated with the SFR Hybrid option.

Impacts Outside of the Throat Area. Project impacts within the Charles River Basin Historic District, but outside the Throat Area, are similar for all three Throat Area options. Northwest of the Throat Area, SFR will be shifted away from the river outside the bounds of the historic district. The realignment of SFR will allow additional parkland to be created adjacent to the river within the historic district. SFR will be placed in an underpass to create a direct at-grade connection from Allston to the Charles River and parkland.

Project work adjacent to the Allston Depot, which is a contributing property in the National Register-listed Harvard Avenue Historic District and a local landmark designated by the Boston Landmarks Commission, is confined to the removal of an existing pedestrian bridge over I-90 that crosses a corner of the Allston Depot parcel. A new pedestrian bridge over I-90 will be constructed on a different alignment that will not cross the Allston Depot parcel.

2.3.6.2 Archaeological Resources

The archaeological sensitivity of the Project's Direct APE has been assessed through an examination of the Massachusetts Historical Commission's site files, prior surveys of the general area, soil-boring logs, and documentary and cartographic sources. An Archaeological Sensitivity and Disturbance Assessment of the proposed APE was conducted on behalf of MassDOT in 2019. The assessment concluded that no terrestrial archaeological sensitivity can be assigned to the APE. The City Archaeologist for Boston reviewed the study, found it to be "detailed and thorough," and has no archaeological concerns with the Project as currently proposed.

The Board of Underwater Archaeological Resources (BUAR) has evaluated Project information sent by MassDOT and noted that there are no recorded underwater archaeological resources within the proposed APE. The BUAR suggested that soil borings in the river might provide information as to whether elements of archaeologically sensitive geological features associated with the former confluence of Smelt Brook and the Charles River may have been preserved. MassDOT will conduct soil borings in the river if it is determined that the Project will include construction of a new structure in the river. It is anticipated that the Project will not affect any potentially significant terrestrial archaeological resources based on the results of previous archaeological surveys in the area, the historic filling and development of the riverfront area, and the extensive disturbance and contamination related to railroad, industrial, and interstate construction and use within the Direct APE. Further archaeological assessment may be necessary as the extent of work near or within the Charles River is determined.

2.3.7 Pedestrian and Bicycle

As discussed in the sections above, stakeholder input on pedestrian and bicycle access, in particular the design of the Project to allow for better future connections to the river, has been added to the overall goals for the Project and incorporated into the Project's Purpose and Need statement (see Section 2.1). The 3L Re-alignment Alternative, outside of the Throat Area, would provide robust pedestrian and bicycle accommodations. For all three Throat Area options, bicycle and pedestrian access would be provided on the PDW Path between the GJR Bridge and the River Street intersection. Under all Throat Area options, a portion of the path will be separated to provide a path for bicycles and a path for pedestrians. The paths would also be widened from existing conditions. For all three Throat Area options, the existing SFR outbound exit ramp to River Street will be a single lane ramp that will primarily serve the right turn movement into Cambridge and allow for an improved PDW Path.

Franklin Street Pedestrian and Bicycle Bridge Replacement. The existing pedestrian and bicycle bridge crossing the Turnpike and railroad tracks does not currently meet ADA/MAAB accessibility standards due to slopes exceeding 5%. Three options were explored for the replacement bridge location and ramp configurations: (1) the building at 7 Braintree Street at the corner of Franklin Street formerly known as the Ace Tickets Building; (2) the parking lot at 19-25 Braintree Street; and (3) a bridge in roughly the same location as the existing with an accessible ramp along the edge of the former Allston Depot property.

The desire line for this bridge is along the Franklin Street axis and the option at the Ace Ticket Building, which made the most direct physical and visual connection, was selected as the preferred location. To accommodate the bridge and ramps at this location, the building would need to be demolished. A series of sub-options was explored that identified the trade-offs between land takings and a condensed or expanded ramp and stair configuration (see further analysis and discussion in the 2017 DEIR). The more condensed ramp configurations would require more turns, which are not optimal for bicyclists, but minimize the property takings. The more linear, expanded ramp configurations would minimize the number of turns but require more of the adjacent property to be used. Alternative options, such as a spiral configuration, will be further explored as the Project moves forward.

In addition, MassDOT will continue to advance development of a shared use path from Franklin Street to Agganis Way and the Charles River Reservation into the design of the Project's Build Alternative.

The existing Franklin Street pedestrian and bicycle is bridge across I-90 provides an important connection between North Allston and Allston Village.

Future Agganis Way-Esplanade Connection. All three Throat Area options can accommodate a future pedestrian and bicycle bridge connecting between Agganis Way and the Esplanade. MassDOT will continue to advance development of this connection for potential inclusion into the Project's Build Alternative. The recent construction of cycle tracks along Commonwealth Avenue by the City makes Agganis Way a natural desire line to connect with the PDW Path along the Esplanade. A connection at this location would also offer broader access to Nickerson Field and Agganis Arena, two of the larger sports venues in the area.

The pedestrian and bicycle bridge options at Agganis Way are similar on the river side of the corridor and utilize a sloped walk (typically at 4.5%) heading northward along the Charles connecting with the PDW Path and the newly created open space. The length of the sloped walk will vary by Throat Area option. A continuous slope is preferred for bicyclists and users rather than a shorter but steeper ramp with flat areas every 30 feet. Additionally, all three options include a stair connecting in the opposite direction toward the narrower Throat Area. Conditions on the Agganis Way side of the corridor differ by option. There are several constrains at Agganis Way that all options address:

- An 18.5-foot clearance above the top of rail must be maintained over the tracks.
- Any support structures must maintain a 10-foot setback from track centerlines.
- Service access to Nickerson Field must be maintained.
- The scoreboard needs to be maintained—although its location can be adjusted.

These constraints limit the width and configuration of the bridge approach ramps.

Modified Highway Viaduct Option. This Throat Area option places the bridge below the highway viaduct, at an elevation slightly above Agganis Way, while maintaining an 18.5-foot clearance over the railroad tracks. This bridge extends the Agganis Way desire line with minimal elevation changes but introduces characteristics of a tunnel. The design challenges associated with moving pedestrians and bicyclists through an enclosed space would need to be carefully addressed to create a welcoming environment.

Modified At-Grade Option. A switchback ramp at the end of Agganis Way is necessary to minimize impacts on BU property to create an 18.5-foot clearance over the railroad tracks. These switchback turns are not desirable for a bicycle path. Additionally, the constrained land area available for the ramp, to maintain service access to Nickerson Field, would narrow the width of the bridge and access drive at the switchback. A straight ramp extending along Agganis Way is a potential alternative to the switchback ramp but would require close coordination with BU due to property impacts and to assure adequate service access to Nickerson Field.

SFR Hybrid Option. This Throat Area option would also require a switchback ramp and, due to the height of the SFR viaduct, it would be significantly longer. This longer ramp would also narrow the width of the bridge and access drive at the switchback. Also, due to the height of the viaduct, the bridge would need to be located eastward from the Agganis Way desire line.

2.3.8 Highway and Streets

2.3.8.1 Traffic Operations Study

The traffic analysis presented in the DEIR will be updated for the SDEIR. The analysis will include updated traffic and safety analysis based on updated traffic counts and crash data, and new Central Transportation Planning Staff (CTPS) modeling conducted since the DEIR. (CTPS is the state entity that provides integrated regional transportation analyses.) However, some aspects of the traffic assessment (e.g., the study limits) will be similar to what was documented in the DEIR. The following sections provide an overview of the study area and analysis scenarios to be used to evaluate the proposed interchange improvements from a traffic operations perspective. A summary of some of the preliminary results is also provided below. Full details of the traffic and safety analyses will be presented in the SDEIR.

Study Area

The traffic study area for the SDEIR filing will be the same as was used to evaluate traffic in the DEIR. In Boston, the traffic study area includes I-90, Cambridge Street (an urban arterial), Western Avenue and Soldiers Field Road (an historic parkway). In Cambridge, the study area includes Memorial Drive, from River Street to JFK Street. The existing traffic network to be evaluated includes the following roadway facilities and intersections, with agency jurisdiction noted for each facility/location:

Freeways

- I-90 eastbound main line (MassDOT)
- I-90 westbound main line (MassDOT)

Ramps

- I-90 eastbound on-ramp (MassDOT)
- I-90 eastbound off-ramp (MassDOT)
- I-90 westbound on-ramp (MassDOT)
- I-90 westbound off-ramp (MassDOT)

Local/Regional Roadways

- Soldiers Field Road (Mass. Department of Conservation & Recreation — DCR)
- Memorial Drive (DCR)
- Cambridge Street (City of Boston)
- North Harvard Street (City of Boston)
- Western Avenue (City of Boston)
- Harvard Avenue (City of Boston)
- Linden Street (City of Boston)

Signalized Intersections

1. Cambridge Street at Harvard Avenue (City of Boston)
2. Cambridge Street at Lincoln Street (City of Boston)
3. Cambridge Street at North Harvard Street (City of Boston)
4. Cambridge Street at Windom Street (City of Boston)
5. Cambridge Street at I-90 off-ramps/Soldiers Field Road (DCR)
6. River Street at Memorial Drive (in Cambridge, DCR)
7. Western Avenue at North Harvard Street (City of Boston)
8. Western Avenue at Hague Street/Batten Way (City of Boston)
9. Western Avenue at Soldiers Field Road (DCR)
10. Western Avenue at Memorial Drive (in Cambridge, DCR)
11. North Harvard Street at Soldiers Field Road Eastbound Ramps (DCR)
12. North Harvard Street at Soldiers Field Road Westbound Ramps (DCR)
13. North Harvard Street at Memorial Drive/JFK Street (in Cambridge, DCR)

Unsignalized Intersections

14. Cambridge Street at Linden Street (City of Boston)
15. Cambridge Street at Sorrento Street (City of Boston)
16. Cambridge Street at Seattle Street (City of Boston)
17. North Harvard Street at Spurr Street (City of Boston)

Analysis Scenarios

The SDEIR traffic evaluation will be comprised of a similar set of analysis scenarios as was evaluated in the DEIR. Those scenarios are as follows:

- Existing Conditions (2019)
- 2040 Design Year No Build scenario
- 2040 Design Year Build scenario
- 2030 Opening Year Build scenario

The existing conditions analysis will be updated from 2015 to 2019. The Design Year planning horizon will remain 2040. However, the Opening Year planning horizon has been shifted from 2025 to 2030 to better reflect the Project's current permitting/ design/construction schedule.

Analysis Tools

The analytical tools used by MassDOT to evaluate existing and future traffic operations are the same as were employed for the DEIR analysis, although the various software packages have been updated to newer versions. These are the Synchro software for intersection Level of Service (LOS) analysis; the SimTraffic micro-simulation software for estimating vehicular queues and assessing signal coordination along roadway corridors; and the HCS software to evaluate traffic operations on the I-90 mainline and at ramp junctions on I-90 and SFR. However, there will be a change in the modeling software used by CTPS for the SDEIR. The updated CTPS modeling will be performed using the TransCAD modeling package. For the DEIR, CTPS used the EMME modeling software. For the SDEIR safety analyses, the Interactive Highway Safety Design Model will be used to forecast future crashes/crash rates.

2.3.8.2 Existing Conditions

Traffic Volumes

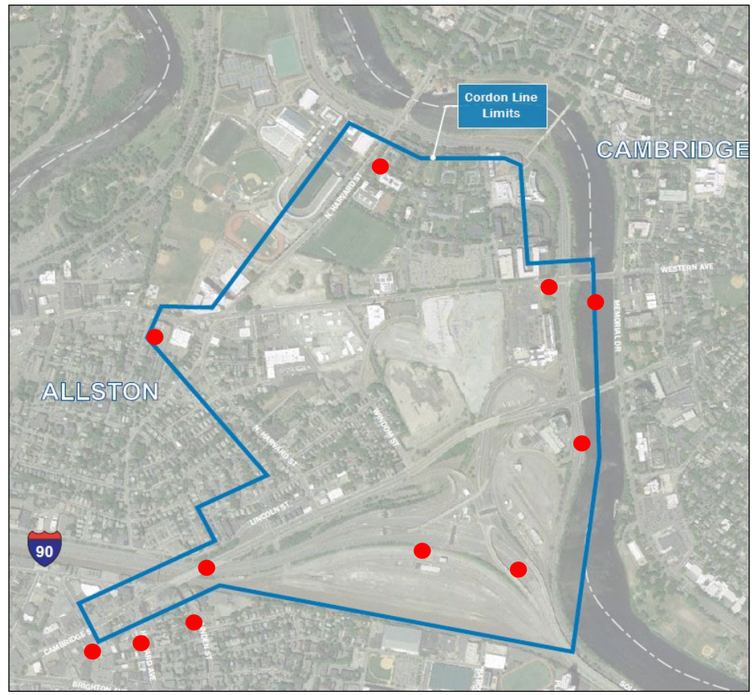
The traffic data for the 2015 Existing Conditions analysis presented in the DEIR were collected from several sources over the three-year time of 2012 to 2014. Considering the age of the data, MassDOT conducted new traffic counts at study intersections and on key study roadways within the study area, including the I-90 ramps, in 2018 and 2019. The various types, sources and time period of the traffic data to be used in the SDEIR are as follows:

- I-90 All Electronic Tolling (AET) data (2019)
- AET Gantry 12 (west of Allston interchange near Everett Street overpass)
- AET Gantry 13 (east of Allston interchange near the Commonwealth Avenue overpass)
- Automatic Traffic Recorder (ATR) data on the I-90 ramps and local streets (2018)
- Automatic Traffic Recorder (ATR) data on SFR and Memorial Drive (2019)
- Peak hour turning movement and vehicle classification counts at local intersections (2018)
- Peak hour pedestrian counts at local intersections at crosswalk crossings (2018)
- Peak hour bicycle counts at local intersections (2018)

The data collected in 2018 were increased by 0.25% per year to reflect an Existing Conditions analysis year of 2019. The count data was also seasonally adjusted to reflect average annual conditions.

Volume Changes since the DEIR

MassDOT conducted a comparison of the updated 2019 existing conditions volumes with the DEIR 2015 volumes to identify how traffic at the interchange and on local roadways in the study area changed over those four years. In order to quantify the changes in the study area, a "Cordon Line" analysis was performed of traffic volumes entering the Project study area (see Graphic 2.3.8-1). Eleven (11) entry points were included in the analysis. The cordon line limits and the traffic entry points (red dots) are illustrated in the following graphic.



Graphic 2.3.8-1: Study Area Cordon Line

Table 2.3.8-1 provides a summary of the AM and PM peak hour cordon line volume changes that occurred between 2015 and 2019. As indicated in the table, overall, volumes entering the study area have decreased by approximately 1.1 percent in the AM peak hour and increased by approximately 3.4 percent in the PM peak.

Table 2.3.8-1: 2019 vs. 2015 Cordon Line Comparisons

Entering Roadway	AM Peak			PM Peak		
	2015	2019	Change	2015	2019	Change
I-90 EB off ramp	1,275	1,019	-25%	1,135	1,222	8%
I-90 WB off ramp	1,330	1,415	6%	1,475	1,528	4%
SFR WB off ramp to Cambridge St.	336	469	40%	724	477	-34%
SFR EB off ramp to Western Ave.	913	904	-1%	669	596	-11%
Western Ave Bridge WB	1,282	1,458	14%	1,075	1,839	71%
N. Harvard Street SB, s/SFR ramps	436	488	12%	456	387	-15%
Western Ave EB, w/Spurr St.	573	522	-9%	618	527	-15%
Lincoln Street EB, n/Cambridge St.	208	272	31%	237	235	-1%
Cambridge Street EB, w/Harvard Ave.	685	453	-34%	586	423	-28%
Harvard Ave NB, s/Cambridge St.	663	676	2%	420	407	-3%
Linden Street NB, s/Cambridge St.	537	475	-12%	547	571	4%
Total Entering Volume	**8,238**	**8,151**	**-1.1%**	**7,942**	**8,212**	**3.4%**

Notes: EB = eastbound, WB = westbound, NB = northbound, SB = southbound, SFR = Soldiers Field Road

MassDOT also examined how the I-90 ramp volumes (both on- and off-ramps) changed from 2015 to 2019. That data is shown in Table 2.3.8-2. The data indicates that, although the overall volumes decreased by 1.5 percent in the AM peak, volumes on three of the four ramps increased by between 2 and 6 percent. Only the eastbound off-ramp showed a decrease (-25 percent).

In the PM peak, ramp volumes decreased by approximately 9.3 percent overall, with much of the decrease accounted for on the westbound on-ramp which saw a 22 percent decrease. The volumes on the eastbound and westbound off-ramps were found to have increased since 2015 in the PM peak (by 8 percent and 4 percent, respectively). The most significant changes from 2015 (decreases) occurred in traffic to/from the west (eastbound off-ramp in the AM peak and westbound on-ramp in the PM peak).

Table 2.3.8-2: 2019 vs. 2015 I-90 Ramp Volume Comparisons

Entering Roadway	AM Peak			PM Peak		
	2015	2019	Change	2015	2019	Change
I-90 EB on-ramp	1,585	1,651	4%	1,480	1,206	-8%
I-90 EB off-ramp	1,275	1,019	-25%	1,135	1,222	8%
I-90 WB on-ramp	1,135	1,160	2%	1,300	1,067	-22%
I-90 WB off-ramp	1,330	1,415	6%	1,475	1,528	4%
Total Volume	**5,325**	**5,245**	**-1.5%**	**5,390**	**5,023**	**-9.3%**

Notes: EB = eastbound, WB = westbound

2.3.8.3 Safety

The safety analysis for local intersections and the I-90 highway mainline will also be updated with all new data for the SDEIR. The safety analysis for the SDEIR will also be expanded to include crash analysis for future Design Year conditions (No Build and Build) on I-90. The DEIR presented only an existing conditions analysis.

The crash data for the SDEIR analysis will be based on the four most recent years of crash data available from MassDOT: 2015 — 2018. The data presented in the DEIR was from the four-year period of 2011 – 2014.

Intersections

The intersection safety analysis will evaluate a total of 17 locations (14 in Boston and 3 in Cambridge). The intersection crash analysis will also be broken down into three roadway corridors: Cambridge Street/River Street, Western Avenue and North Harvard Street/JFK Street. Note: the SDEIR safety analysis for intersections located in Boston also includes data from Boston Police Department (BPD) and Boston Emergency Medical Services (EMS).

I-90 Mainline

For the SDEIR, MassDOT will evaluate I-90 mainline crash data between the Everett Street overpass west of the Allston interchange and the BU Bridge/Commonwealth Avenue overpass east of the interchange (approximately 1.6 miles). These limits include the existing I-90 viaduct area as well as the portion of the highway that is influenced by the exchange of volumes at the on- and off-ramps at the Allston interchange.

2.3.8.4 CTPS Modeling Assumptions

Land Use

The future land use assumptions for the Project study area that were used in the CTPS modeling for the DEIR were based on CTPS's interpolation of land use forecasts contained in Harvard University's 2013 Institutional Master Plan (IMP). These land use projections were developed by CTPS through consultation with Harvard and MassDOT.

In the CTPS model there were four Traffic Analysis Zones (TAZ) for which land use projections were made:

- TAZ 238: Harvard Athletic Field area (north of Western Ave and west of North Harvard Street).
- TAZ 244: Harvard Business School area (north of Western Ave and east of North Harvard Street).
- TAZ 245: Harvard's proposed Enterprise Research Campus — ERC (between Western Ave and Cambridge Street).
- TAZ 246: Beacon Park Yard – BPY (between Cambridge Street and the re-aligned I-90 mainline/West Station/air rights development).

For the SDEIR, the future land use assumptions developed by the Metropolitan Area Planning Council (MAPC), in consultation with the City of Boston, Harvard University, CTPS and MassDOT, will be utilized. These new land use assumptions were developed by MAPC for the same four TAZs as in the DEIR. Data provided by MAPC for input into the CTPS model for these TAZs included increases in population, households and employment for each TAZ. MAPC also developed assumptions regarding the types of land uses expected to be developed in each TAZ, as well as the approximate amount of square feet (sf) for each land use type. Additionally, MAPC provided CTPS with data on expected growth in employment, households and population within the region.

2040 No Build

For the 2040 No Build scenario, MAPC estimated that approximately 4 million sf of new development will occur within the study area, located in TAZ 238, TAZ 244 and TAZ 245. This represents an approximate increase of 1 million sf as compared to the approximate 3 million sf assumed for 2040 No Build in the DEIR.

2040 Build

MAPC land use assumptions for the Build scenario predicted approximately 4 million sf of development to occur by 2040 within the BPY. This would bring the total amount of new development estimated for the area to approximately 8 million sf, or about 1 million more sf than was assumed in the DEIR. MassDOT will continue to work with the City of Boston and the landowner to develop an access scheme that supports viable development and does not compromise interchange or local road operations.

2030 Build

Development projected by MAPC to occur by 2030 is primarily located in TAZs 244 and 245 (Harvard Business School and ERC). A total of approximately 2 million sf is expected to occur by the Project's opening year, 1.4 million of which is expected in the ERC.

Additional information pertaining to the MAPC No-Build and Build land use assumptions provided to CTPS for the four study area TAZs can be found in Appendix D.

Transit

Following is a brief summary of transit assumptions included in the CTPS model for the various analysis scenarios. The transit services and infrastructure noted below reflect changes assumed from the existing conditions. More details pertaining to these assumptions, and the transit analysis performed for the Project will be provided in the SDEIR.

2040 No Build

Commuter Rail

- South Station Expansion
- Other non-Project Worcester Line station & signal improvements

Bus Service

- CTPS Short-Term Transit Study Recommendations
- Harvard-Barry's Corner Shuttle Bus service (operated by Harvard)
- MBTA Bus Route 64 Better Bus improvements

2040 Build

Commuter Rail

- West Station service that satisfies the MBTA Service Delivery Policy for commuter rail operations (3 peak direction trains in AM peak period; 4 peak direction trains in PM peak period; 1 train every 3 hours in each direction during all other periods); allowing for increased service as demand increases
- South Station Expansion
- Other non-Project Worcester Line station & signal improvements

Bus Service

- CTPS Short-Term Transit Study Recommendations
- Harvard - West Station Shuttle
- Kendal/Central - West Station Shuttle
- Ruggles/LMA - West Station Shuttle
- MBTA Bus Route 64: route altered to include stop at West Station
- MBTA Bus Route 66: some peak hour buses re-routed through West Station

2030 Build

Commuter Rail

- West Station service that satisfies the MBTA Service Delivery Policy for commuter rail operations (3 peak direction trains in the AM peak period; 4 peak direction trains in the PM peak period; 1 train every 3 hours in each direction during all other periods)
- South Station Expansion
- Other non-Project Worcester Line station & signal improvements

Bus Service

- CTPS Short-Term Transit Study Recommendations
- Harvard - West Station Shuttle
- Kendal/Central - West Station Shuttle
- Ruggles/LMA - West Station Shuttle
- MBTA Bus Route 64: route altered to include stop at West Station
- MBTA Bus Route 66: some peak hour buses re-routed through West Station

Highway/Streets

2040 No Build

There are no changes in the 2040 No Build roadway network from those assumed in the modeling and analysis for the DEIR. The No Build network is essentially the existing roadway infrastructure with the addition of Stadium Way. The assumed alignment of Stadium Way would be from Cambridge Street to North Harvard Street, with traffic signals assumed at those intersections and at the intersection with Western Avenue.

2040 Build

The roadway network assumed in the CTPS model for the 2040 Build analysis case is MassDOT's preferred interchange improvement option: the 3L Re-alignment Alternative. This roadway network is described in Section 2.2.2.1 and illustrated on Figure 2.2.2-1.

2030 Build

The 2030 Opening Year roadway network in the CTPS model is the 3L Re-alignment Alternative with the following differences:

- No Stadium Way north of Cambridge Street
- No Cattle Drive north of Cambridge Street

2.3.8.5 Throat Area

Three Throat Area options are being evaluated as part of the overall 3L Re-alignment Alternative:

- Modified Highway Viaduct Option
- SFR Hybrid Option
- Modified At-Grade Option

From a traffic forecasting perspective, the I-90 and SFR volume projections for the Throat Area are unaffected by which option is ultimately identified as the preferred option. The physical and geometric differences between the options are not significant enough to influence the highway assignments from the CTPS model for the 2030 and 2040 Build scenarios.

I-90 Traffic Volumes

Existing Volumes

2019 existing volumes on I-90 for the Throat Area are based on data collected from MassDOT's All Electronic Tolling (AET) Gantry #13, which is located east of the Allston Interchange at the Commonwealth Avenue overpass. MassDOT reviewed eastbound and westbound hourly volume data from Gantry 13 and found that the last week of April/first week of May was representative of "average annual" conditions on I-90. This time period was also selected for analysis as it coincides with the other traffic counts performed by MassDOT at the Allston interchange ramps and the local study area roadway network in 2018.

I-90 Eastbound

Review of the 2019 data indicates that the peak hourly volume in the eastbound direction on this segment of I-90 occurs between 7:00 and 8:00 AM. Typically, this volume peaks at around 6,600 to 7,000 vehicles per hour (vph), or approximately 1,650 to 1,750 vehicles per hour per lane (vphpl). The maximum recorded hourly volume for the year of 2019 was 7,040 vph (1,760 vphpl).

The recorded peak volumes are well below the "ideal" or "theoretical" per lane capacity of 2,000 to 2,300 vphpl that are typically assumed when analyzing traffic operations on freeway segments. There are a number of factors such as vertical and horizontal curvature, shoulder widths, number of heavy vehicles and the influence of up or downstream ramps (i.e., interchange spacing) which can reduce the ideal capacity on a highway. Thus, the "practical" or "site-specific" per lane capacity can be much less than the ideal capacity given the unique set of circumstances associated with any particular highway segment. This is the case in the eastbound direction of I-90 in the Throat Area, where the practical hourly capacity is approximately 1,700 vphpl.

Investigating further, MassDOT also reviewed speed data from April 2019 that was collected on an hourly basis at AET Gantry 13 and calculated the average hourly speeds. Those speeds were then plotted against the observed hourly volumes. The volume vs. speed plots indicated that when the hourly volumes on this segment of I-90 start to approach the segment's practical capacity, the per lane vehicular density increases to a point where vehicular speeds start to drop – often dramatically. Once the speeds dropped, then the number of vehicles that were able to be processed through that point on the highway also dropped – often dramatically as well.

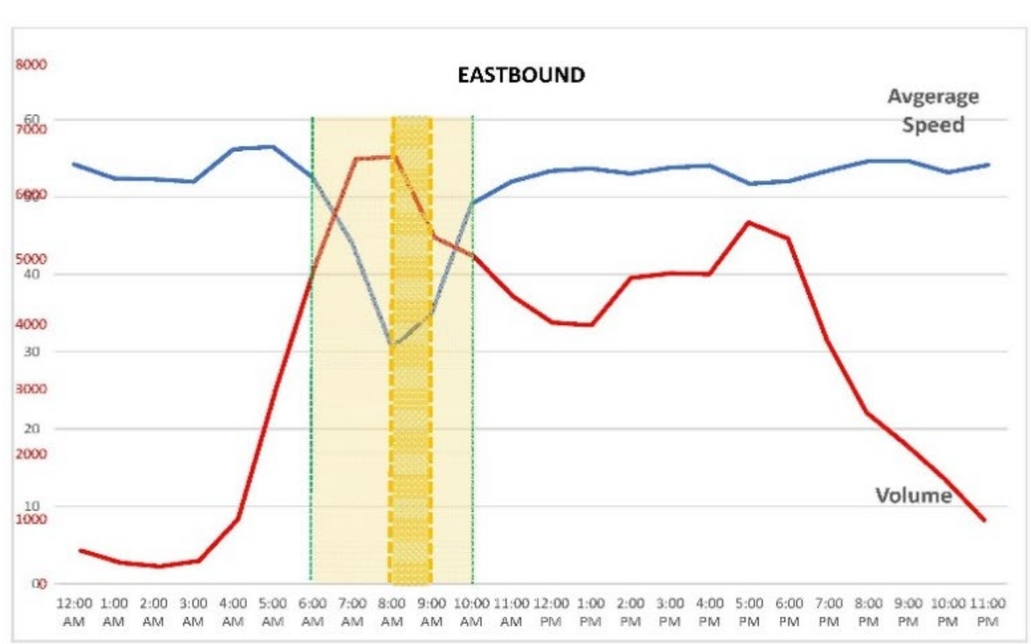
During the AM peak period, for example, the tipping point where speeds dropped dramatically was found to be when the volumes reached approximately 1,600 vphpl. The plots also showed that speeds initially began to drop at an even lower volume – an "inflection point" at approximately 1,250 to 1,300 vphpl. The speed vs. volume analysis confirms the conclusion that the practical capacity of I-90 eastbound in the Throat Area is well below the typical ideal highway capacity of 2,000 to 2,300 vphpl. In fact, in the Throat Area the practical capacity on I-90 is approximately 15 to 25 percent less than the ideal capacities.

I-90 Westbound

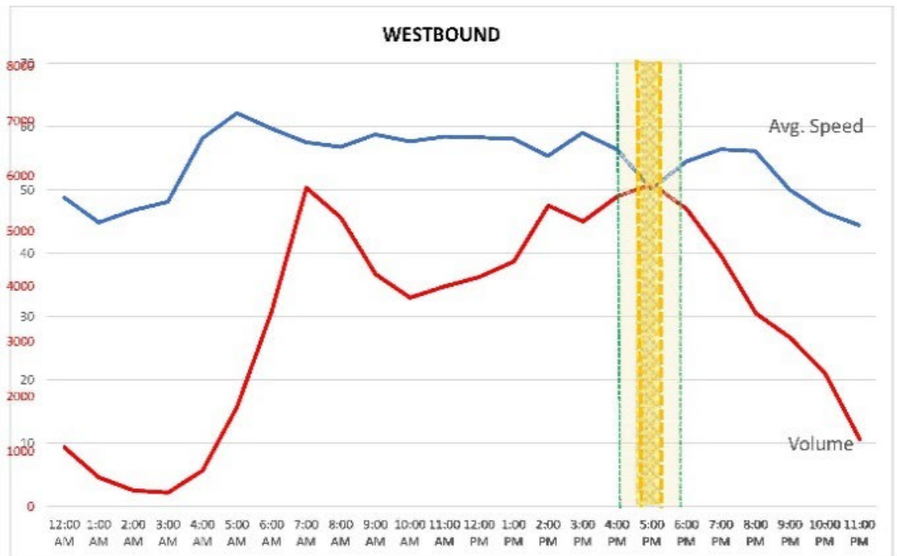
In the westbound direction, volumes were found to peak between 5:00 and 6:00 PM in the 5,900 to 6,200 vph range. This equates to approximately 1,475 to 1,550 vphpl. The maximum observed hourly volume in the westbound direction for 2019 was 6,200 vph (1,550 vphpl). The sample speed vs. volume plots for the westbound direction from the last week in April/first week of May 2019 indicate that the inflection point where speeds started to drop occurred when the highway density reached approximately 1,400 vphpl.

The following charts present sample speed vs. volume plots for the eastbound direction for April 30, 2019 and the westbound direction for May 1, 2019 (see Graphic 2.3.8-2). Additional volume and speed data from Gantry 13 are provided in Appendix E.

	Avgerage Speed	Volume	Volume per Lane
12:00 AM	54	514	*129*
1:00 AM	52	328	*82*
2:00 AM	52	270	*68*
3:00 AM	52	356	*89*
4:00 AM	56	1001	*250*
5:00 AM	56	3077	*769*
6:00 AM	52	4967	*1242*
7:00 AM	44	6546	*1637*
8:00 AM	30	6581	*1645*
9:00 AM	35	5338	*1335*
10:00 AM	49	5047	*1262*
11:00 AM	52	4430	*1108*
12:00 PM	53	4025	*1006*
1:00 PM	54	3983	*996*
2:00 PM	53	4712	*1178*
3:00 PM	54	4785	*1196*
4:00 PM	54	4773	*1193*
5:00 PM	52	5568	*1392*
6:00 PM	52	5320	*1330*
7:00 PM	53	3747	*937*
8:00 PM	55	2640	*660*
9:00 PM	55	2151	*538*
10:00 PM	53	1616	*404*
11:00 PM	54	984	*246*



	Avg. Speed		Volume	
12:00 AM	49	12:00 AM	1078	*270*
1:00 AM	45	1:00 AM	531	*133*
2:00 AM	47	2:00 AM	296	*74*
3:00 AM	48	3:00 AM	257	*64*
4:00 AM	58	4:00 AM	658	*165*
5:00 AM	62	5:00 AM	1816	*454*
6:00 AM	60	6:00 AM	3554	*889*
7:00 AM	58	7:00 AM	**5791**	*1448*
8:00 AM	57	8:00 AM	5246	*1312*
9:00 AM	59	9:00 AM	4222	*1056*
10:00 AM	58	10:00 AM	3795	*949*
11:00 AM	58	11:00 AM	4000	*1000*
12:00 PM	58	12:00 PM	4172	*1043*
1:00 PM	58	1:00 PM	4452	*1113*
2:00 PM	55	2:00 PM	5467	*1367*
3:00 PM	59	3:00 PM	5179	*1295*
4:00 PM	56	4:00 PM	5639	*1410*
5:00 PM	50	5:00 PM	**5851**	*1463*
6:00 PM	55	6:00 PM	5405	*1351*
7:00 PM	56	7:00 PM	4553	*1138*
8:00 PM	56	8:00 PM	3509	*877*
9:00 PM	50	9:00 PM	3064	*766*
10:00 PM	46	10:00 PM	2424	*606*
11:00 PM	44	11:00 PM	1224	*306*



Graphic 2.3.8-2: The two charts above show sample speed vs. volume plots for the eastbound direction for April 30, 2019 and the westbound direction for May 1, 2019.

2040 Design Year Volumes

Preliminary I-90 peak hour traffic forecasts for the Throat Area from the CTPS modeling for the 2040 No Build and Build scenarios are summarized in Table 2.3.8-3 on the following page. The table also includes the per lane volumes as well as the existing 2019 volumes for comparison purposes. The data indicates that traffic on this segment of I-90 is projected to grow by approximately an average of 6 percent in the AM peak hour (approximately 0.3 percent per year) from the 2019 existing conditions to the 2040 Build condition. In the PM peak hour, the average growth (eastbound and westbound) is projected to be approximately 20 percent, or approximately 0.95 percent per year.

As also shown in the table, the only volume that is forecasted to exceed the "practical" per lane capacity on this segment of I-90 is the eastbound volume in the AM peak hour in the 2040 Build condition (1,820 vphpl). Because this projected volume exceeds the practical capacity of the highway, this traffic cannot be processed in the peak period, and will "spread" to hours outside this period. In this case, approximately 300 vehicles out of the forecasted 7,270 vehicles would be processed in adjacent hours, or roughly 4 percent of the total forecasted volume.

I-90 Lane Requirements

Throughout the course of the Project's public review process, including comments received on the Project's DEIR, it has been suggested that MassDOT consider reducing the number of travel lanes on I-90 through the Throat Area as a means to reduce the potential impacts to the Charles River and the Charles River Reservation; most specifically, as a way to reduce the resource impacts associated with the Modified At-Grade Option. The cross-sectional modification most often suggested in the DEIR comments was reducing the number of travel lanes in the westbound direction from 4 lanes to 3 lanes starting at the Copley Square on-ramp.

The genesis of this idea (versus reducing lanes in the eastbound direction) came from the public's review of existing I-90 traffic data collected by MassDOT at AET Gantry #13. However, it is imperative that a decision of this magnitude by MassDOT must be based on an evaluation of future 2040 design year volumes, not current (pre-Covid) traffic volumes. Analysis based on future I-90 volumes is consistent with standard professional transportation engineering practices, good planning principles and the methodologies employed to inform the rest of the Project's design. With this in mind, MassDOT has evaluated the implications on traffic operations if such a lane reduction on I-90 westbound were implemented as part of the Project. Operational analyses using the HCS software found that during both the 2040 Build AM and PM peak periods (6:00 to 9:00 AM and 4:00 to 7:00 PM), the highway would be over capacity and function at LOS F (congested conditions with reduced speeds). The congested conditions would occur, at a minimum, during these weekday peak period hours.

As shown in Table 2.3.8-3, the future westbound peak period volumes are forecast to be 6,365 vph in the AM peak and 6,750 vph during the PM peak. With a 4-lane section, the per lane volumes will be 1,590 vphpl (AM) and 1,690 vphpl (PM). Comparing these volumes against the more conservative (higher) observed "practical" per lane capacity of 1,700 vphpl from the eastbound barrel of I-90, the volumes will be less than the per lane capacity during both peak periods. If the highway were reduced to 3 lanes, however, then per lane volume in the AM and PM peak periods would be 2,120 vphpl and 2,250 vphpl, respectively. These volumes would exceed the highway's capacity by approximately 25 and 32 percent. Even if diversions in the 10%-15% range from I-90 westbound were assumed for this analysis (which would have undesirable impacts on local streets), the traffic volumes would still exceed the capacity of a 3-lane section by approximately 6%-12% in the AM peak and by 12%-19% in the PM peak. A summary of the volume, per lane capacity and traffic operational data is provided in Table 2.3.8-4. Note: CTPS modeling for the 2040 No Build and Build scenarios assumed a per lane capacity on I-90 eastbound and westbound in the Throat Area of 1,750 vphpl.

Table 2.3.8-3: Throat Area I-90 Westbound Peak Hour Volumes

	AM Peak			PM Peak		
	2019 Existing	2040 No Build	2040 Build	2019 Existing	2040 No Build	2040 Build
Highway Volumes						
I-90 eastbound	7,040	7,160	7,270	5,250	5,670	6,435
I-90 westbound	5,785	6,030	6,365	5,720	6,370	6,750
Per Lane Volumes						
I-90 eastbound	1,760	1,790	1,820	1,315	1,420	1,610
I-90 westbound	1,445	1,510	1,590	1,430	1,590	1,690

Table 2.3.8-4: 2040 Build Throat Area I-90 Westbound Peak Hour Volumes and Operations

	AM	PM
2040 Build volumes	6,365	6,750
per lane capacity	1,700	1,700
4-Lane Scenario		
per lane volume	1,590	1,690
operations	LOS D	LOS E
volume-to-capacity ratio	0.94	0.99
3-Lanes Scenario		
per lane volume	2,120	2,250
operations	LOS F	LOS F
volume-to-capacity ratio	1.25	1.32

MassDOT also examined the impact reducing the number of travel lanes would have on the existing (2019) traffic operations. This analysis represents a hypothetical scenario in which no traffic growth occurred on this segment of I-90 between now and 2040.

Massachusetts Highway Department

AET13_WB: Monthly Hourly Volume for April 2019

Location ID:	AET13_WB	**Seasonal Factor Group:**	U1-Boston
County:	Suffolk	**Daily Factor Group:**	
Funcatlonl Class	1	**Axle Factor Group:**	U1-Boston
Location:	MASSACHUSETTS TURNPIKE	**Growth Factor Group:**	

At or Above 3 Lane Capacity (assuming capacity of 1,700 vphpl)

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	TOTAL	Hours/Day	
1	980	602	239	236	681	1856	3412	5514	5235	4137	3820	3710	3558	3770	4887	4903	5501	6141	4949	4030	3082	2449	2616	1443	77703	6	Monday
2	742	442	287	221	571	1701	3410	5647	5451	3927	3548	3826	3761	4337	5419	5088	5598	6082	5496	4400	3433	2825	2034	1480	79727	7	Tuesday
3	672	404	190	251	563	1596	3238	5515	5420	4008	3765	3778	3998	4159	5444	5289	5719	6093	5218	4554	3810	3184	2108	1486	80438	7	Wednesday
4	883	446	279	244	726	1677	3271	5694	5402	3989	3684	3780	3910	4407	5544	5055	5129	5806	5241	4694	4134	3738	2521	1660	81914	7	Thursday
5	1114	642	360	289	633	1650	3169	4885	4997	3933	3812	3848	4307	4815	5549	5252	5386	5930	4698	4055	3597	3133	3198	2405	81557	5	Friday
6	1432	1093	764	388	475	943	1564	2242	2936	3389	3833	4124	4314	4801	4993	4971	5143	4794	4189	3680	3286	3249	3467	2610	72680	3	Saturday
7	1951	1371	1132	473	418	670	1026	1418	1885	2681	3503	3837	4227	4712	4791	4875	4611	4330	3913	3607	2962	2580	2494	1274	64742	0	Sunday
8	865	563	405	263	718	1729	3230	5238	5174	3971	3547	3712	3752	4032	5245	4954	5472	6191	5107	4140	3051	2439	1850	1516	77144	7	Monday
9	1058	560	298	317	610	1746	3403	5671	5313	3824	3547	3822	4121	4357	5333	5237	5692	5781	4632	4364	3528	3025	2387	1504	80110	6	Tuesday
10	935	426	304	302	801	1793	3344	5740	5503	4163	3855	3928	4074	4093	5591	5136	5192	5747	5358	4678	3865	3273	2618	1774	82592	7	Wednesday
11	989	563	341	261	668	1885	3578	5878	5501	4210	3805	4016	4130	4584	5517	5193	5388	5962	5509	4837	4067	3949	4184	2543	87338	7	Thursday
12	1212	698	435	297	687	1915	3482	5422	5302	4338	4351	4256	4708	5236	5465	5217	5065	5603	5114	4265	3561	3134	3147	2405	85815	8	Friday
13	1568	1044	784	406	532	1031	1743	2468	3056	3822	4077	4385	4435	4208	4360	4743	4884	5154	4825	4368	3711	3280	3506	3290	75680	1	Saturday
14	1787	1463	1180	473	439	658	1146	1534	1825	2576	3284	3962	4049	4272	4364	4905	5404	5014	4287	3580	3169	2539	2024	1542	65357	3	Sunday
15	1136	567	433	349	671	1562	3176	3778	3877	3270	3225	3168	2755	2715	3388	3649	4337	4858	4422	3578	2917	2397	1850	1343	63421	0	Monday - Holiday
16	723	462	317	342	653	1901	3410	5430	5437	4339	4156	4025	4168	4455	5472	5050	5157	5563	4817	4368	3397	2648	1992	1485	79757	6	Tuesday - School Vac.
17	554	321	224	205	533	1854	3347	5357	5242	4136	3810	3854	3884	4424	5572	5079	5065	5332	4809	4431	3605	3273	2977	1408	79296	6	Wednesday - School Vac.
18	836	479	279	309	673	1821	3481	5297	5262	4188	4090	4136	4311	4661	5419	4994	5063	5080	4815	4474	3576	2921	2767	1677	80599	6	Thursday - School Vac.
19	1318	866	393	315	637	1691	3275	4828	4868	4425	4230	4437	4842	4812	5541	4904	4785	4738	4496	3822	3184	3044	3479	2535	81485	2	Friday - School Vac.
20	1727	1273	999	514	407	845	1341	1903	2513	3341	4030	4179	4245	4420	4469	4843	4278	4188	3786	3083	2723	2701	2538	2408	66754	0	Saturday
21	1577	1084	907	350	319	509	850	1141	1567	2602	3619	4103	4542	4792	4610	4274	4355	4085	4007	3484	3101	2607	1766	1273	61504	0	Sunday
22	796	489	304	245	705	1977	3558	5486	5391	4190	3947	3985	3961	4328	5142	4512	4978	5401	4756	4226	2980	2620	1991	1086	77054	5	Monday
23	570	448	335	183	514	1748	3532	4885	5485	4036	3944	4032	4309	4654	5752	5367	5820	5364	5168	4342	3571	3279	3158	1826	82328	6	Tuesday
24	1001	505	291	231	582	1594	3546	5742	5353	4264	4002	4121	4224	4562	5525	5042	5401	5430	4708	4510	4025	3370	2647	1830	82506	6	Wednesday
25	942	545	365	296	697	1845	3610	5635	5304	3917	3658	4032	4342	4541	5511	5005	5047	5377	4959	4866	4015	3507	3805	2674	84495	7	Thursday
26	1197	768	546	356	688	1902	3376	5298	5115	4438	4202	4259	4464	5106	5489	5098	5135	5359	4452	4195	3287	3033	3002	2391	83155	7	Friday
27	1871	1122	1162	590	522	940	1745	2411	3066	3459	4056	4280	4517	4642	4888	4947	4729	4441	3950	3861	3530	3068	3047	2832	73676	1	Saturday
28	2446	1610	1128	521	435	666	1090	1462	2041	2875	3700	4121	4534	4556	4598	4289	4774	4243	3712	3313	2917	2288	1930	2017	65266	0	Sunday
29	886	477	345	269	729	1932	3612	5574	5302	4089	4095	3829	3938	2934	1269	972	1648	2166	5688	4335	3212	2715	2148	1512	63676	3	Monday
30	780	447	375	266	538	1710	3350	5619	5374	4146	3794	3745	3898	4430	5432	5145	5666	5969	5342	4191	3648	2836	2626	1554	80852	7	Tuesday

5338 Volume > than 3 Lane capacity 5047 Volume within 5% of 3 Lane capacity

Graphic 2.3.8-3: I-90 Westbound: Potential Hours of Congestion with 3 Lanes (Existing Volumes)

Traffic operational analysis of the existing volumes using the HCS software found that I-90 westbound would function at LOS F in both the AM and PM peak hours if only 3 travel lanes were provided.

It is important to note that the 2040 Build volumes shown in Table 2.3.8-4 take into account the transit improvements proposed in the study area, including West Station and additional commuter rail service during the peak periods. During the PM peak period, for example, an additional commuter rail train has been assumed on the Worcester Line, increasing the number of trains during the peak period from 3 to 4. A high capacity train on the Worcester Line that the MBTA operates during peak periods is a 9-coach bi-level train. This train set has a seating capacity of approximately 1,620 passengers. These passengers are potential drivers that otherwise might be traveling westbound on I-90 during the PM peak. Thus, the forecasted volume of 6,750 noted in Table 2.3.8-4 reflects a reduction in future traffic demands on I-90 westbound because of the increased commuter rail service capacity assumed in the analysis. Additionally, MassDOT reviewed hourly volumes from Gantry 13 for the sample month of April 2019 to assess the number of hours per day I-90 westbound would be congested if the lanes were reduced in the Throat Area (see Graphic 2.3.8-3). Again, using the more conservative (higher) observed per lane capacity of 1,700 vphpl from the eastbound barrel, the capacity for the highway with 3 lanes would be approximately 5,100 vph. In the chart above, the hourly volumes highlighted in RED are those volumes greater than 5,100 vph (i.e., over capacity). The volumes shaded in YELLOW

are those hours where the volumes are within 5 percent of the capacity threshold (i.e., volumes approaching capacity). The chart also includes a tally of the number of hours per day I-90 westbound would be congested (Red + Yellow) if 3 lanes were assumed today. The data shows that on a typical weekday the hours of congestion would range between 5 and 8 hours, with an average of approximately 6 hours of congestion per day.

As the results of the above analyses clearly indicate, there would be severe operational deficiencies that would impact tens of thousands of drivers a day should the number of lanes on I-90 westbound be reduced in the Throat Area. Consequently, MassDOT has concluded that would be an unacceptable condition and that reducing the number of lanes on I-90 westbound is not a feasible option and will not be considered as part of this Project. Additionally, the analysis results show that a lane reduction on I-90 would result in operations that would not meet the traffic operations screening criteria for the Project, as described in Section 2.1.3 above.

Soldiers Field Road Traffic Volumes

MassDOT also evaluated the possibility of reducing lanes on SFR as an alternative to lane reductions on I-90. Currently, SFR provides two travel lanes per direction through the Throat Area. Table 2.3.8-5 provides a summary of existing and future peak hour traffic volumes on the segment of SFR between the ramps at Cambridge Street/River Street (Cambridge Street South in the 2040 Build scenario) and University Road. The table also presents the per lane volumes on this segment of SFR with the current four-lane cross-section.

Table 2.3.8-5: Throat Area SFR Peak Hour Volumes

	AM Peak			PM Peak		
	2019 Existing	2040 No Build	2040 Build	2019 Existing	2040 No Build	2040 Build
Parkway Volumes						
SFR eastbound	3,165	3,285	3,525	2,465	2,975	3,505
SFR westbound	2,315	2,445	2,890	3,355	3,390	3,555
Per Lane Volumes						
SFR eastbound	1,585	1,645	1,765	1,235	1,490	1,755
SFR westbound	1,160	1,225	1,445	1,680	1,695	1,780

Existing peak hour volumes range between approximately 2,300 vph (AM westbound) and 3,300 vph (PM westbound). This equates to per lane volumes that ranges between 1,150 and 1,680 vphpl. The per lane capacity on SFR is approximately 1,800 vphpl. Future Build volumes are forecast to range between approximately 2,900 and 3,500 vph, or approximately 1,450 and 1,780 vphpl.

For the 2040 Build scenario, MassDOT performed capacity analysis on this segment of SFR. The results of that analysis are presented in Table 2.3.8-6. The results show that this segment of SFR is projected to function at LOS E or better in both peak periods, and in both the peak and off-peak directions, with volume-to-capacity (v/c) ratios ranging between 0.82 and 1.00.

However, if a lane were to be removed from either direction, the resulting per lane volumes would be in the 2,900 to 3,550 range. Operations would be LOS F (over capacity) in both directions in both peak periods. In three of the four analysis instances, the volumes would be essentially double the capacity of a single lane. This is evidenced by the fact that three of the four v/c ratios are in excess of 1.95.

Table 2.3.8-6: 2040 Build Throat Area SFR Peak Hour Volumes and Operations

	AM Peak		PM Peak	
	Eastbound	Westbound	Eastbound	Westbound
2040 Build volumes	3,525	2,890	3,505	3,555
per lane capacity	1,800	1,800	1,800	1,800
2-Lane Scenario				
per lane volume	1,765	1,445	1,755	1,780
operations	LOS E	LOS D	LOS E	LOS E
volume-to-capacity ratio	1.00	0.82	0.99	0.99
1-Lane Scenario				
per lane volume	3,525	2,890	3,505	3,555
operations	LOS F	LOS F	LOS F	LOS F
volume-to-capacity ratio	1.96	1.61	1.95	1.98

Even if the existing traffic volumes are considered for this analysis, the net result would be the same: SFR would function over capacity (LOS F with v/c ratios in excess of 1.00) in both peak hours if either direction on SFR were reduced to one lane. In the AM peak, the v/c ratios with a single lane would be 1.76 eastbound and 1.29 westbound. In the PM peak, the v/c ratios would be 1.37 eastbound and 1.86 westbound.

The result of reducing SFR from two to one lane in either direction would be catastrophic operationally. There would be many hours of congestion each day, with users having to endure long delays. Perhaps more importantly, there would in all likelihood be significant diversions onto parallel roadways such as Memorial Drive in Cambridge or Commonwealth Avenue in Boston. These would be unacceptable impacts, and consequently, MassDOT has concluded that lane reductions on SFR are not feasible and this idea has been dismissed from further consideration as part of the Project.

2.3.9 Rail Operations

Other than the operational updates provided by the Modified Flip, as described in Section 2.2.2.3, and the updated construction phasing presented in 2.3.22, proposed rail operations have not changed since the publication of the DEIR.

Aspirational Service

In addition to what was reviewed in the DEIR, additional analyses were completed to test the Project Area rail infrastructure against an aspirational, high-frequency future build on the Worcester Main Line. Such a future service would offer Worcester Line Service to each station approximately every 15 minutes, and would include a mix of express, zone express, local, and urban rail trains originating from Worcester, Framingham, and Riverside. Up to 180 daily trains would run under this modeled scenario and on-time performance. While significant rail infrastructure outside of the Project Area and additional equipment would be needed to implement this service, none of the Throat Area options are anticipated to impede such a future aspirational service. The aspirational service plan would not go into effect until after the CTPS modeling horizon year of 2040.

2.3.10 Air Quality/Greenhouse Gas

A screening-level air quality analysis was performed to compare the potential air quality impacts of Alternative 3L with those presented in the DEIR for Alternative 3K. The three Alternative 3L Throat Area options include:

- Modified Highway Viaduct
- Modified At-Grade
- SFR Hybrid

The three Alternative 3K Throat Area variations presented in the DEIR include:

- Highway Viaduct/Rail At-Grade (HV)
- Rail Viaduct/Highway At-Grade (formerly Amateur Planner Concept (AMP))
- Highway/Rail At-Grade (formerly A Better City Concept (ABC))

Project-related air quality impacts are those caused by changes in emissions as a result of changes in activity levels of sources associated with the 3L Re-alignment Alternative. These sources include motor vehicle traffic on I-90 and local roadways, including intercity bus services, and locomotives operating along the WML, and the Modified Flip West Station and BPY layover facilities.

As part of the screening-level air quality analysis, the DEIR mesoscale air emissions analysis performed for the Alternative 3K was updated for the three 3L Re-alignment Alternative Throat Area options based on the most recent traffic volumes and vehicle speeds for the 2040 Build alternative. The updated mesoscale air quality analysis includes criteria pollutants, volatile organic compounds (VOCs), and greenhouse gas as carbon dioxide (CO_2). For the locomotive and rail activities associated with the Modified Flip West Station and BPY, there are no significant changes in assumptions regarding

rail activity. Therefore, the locomotive and rail emissions calculated as part of the DEIR remain the same for this screening-level analysis.

The air dispersion modeling analyses conducted for the DEIR have not been updated for this screening-level air quality analysis. The air dispersion modeling analyses performed for the DEIR included carbon monoxide (CO) and fine particulate matter ($PM_{2.5}$) hot spot intersection analyses, and a nitrogen dioxide (NO_2) modeling analysis. These modeling analyses were conducted to demonstrate compliance with the Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS). The 3L Alternative Throat Area options do not present significant changes to the modeling analyses already performed; therefore, an update to the air dispersion modeling was not performed for the NPC. In addition, since the release of the DEIR, the CO intersection modeling analysis is no longer required since the Boston air quality control region is no longer considered a "maintenance area" for CO and the area is now in attainment with all NAAQS.

Although air dispersion modeling was not performed, an analysis was performed to ensure compliance with the NAAQS. The changes in $PM_{2.5}$ and NO_2 emissions for each of the 3L Alternative Throat Area options were used to calculate the potential change in predicted concentration levels based on Alternative 3K Throat Area options maximum predicted concentrations presented in the DEIR to assess compliance for the 3L Alternative Throat Area options. A more refined air quality analysis will be performed as part of the SDEIR. The more refined air quality analysis will also include an update of the existing conditions (changed from 2015 to 2019) and 2040 No Build alternatives based on changes in traffic volumes and vehicle speeds.

A summary of the methodology and results of the screening-level air quality analysis for the three 3L Alternative Throat Area options with the Modified Flip West Station in 2040 is presented below. The 3L Alternative air quality impacts are compared to those presented for the three Alternative 3K Throat Area variations in the DEIR.

2.3.10.1 Applicable Regulations

This section summarizes the applicable federal and state air quality regulations for this Project.

Federal

Under the authority of the Clean Air Act (CAA), as amended, U.S. EPA established a set of NAAQS for various 'criteria' air pollutants. These standards are intended to protect the public health and welfare. Primary NAAQS are established at levels intended to protect public health, including sensitive population groups, with an adequate margin of safety. Secondary NAAQS are set at levels designed to protect the public by accounting for the effects of air pollution on vegetation, soil, materials, and other aspects of the general welfare. Currently, there are NAAQS for seven criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), coarse and fine particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). States can develop ambient standards provided that they are at least as stringent as the federal standards. The NAAQS are summarized in Table 2.3.10-1. The Massachusetts ambient air quality standards (MAAQS) are identical to the NAAQS.

The CAA mandated that U.S. EPA designate geographic regions in which measured ambient concentrations of air pollutants have exceeded the NAAQS as nonattainment areas. Areas of the country that have measured pollutant concentrations that are less than the NAAQS are designated attainment areas. Areas that have attained the standards after a period of nonattainment and that have plans in place to reduce emissions are classified as maintenance areas.

The Project is located in Suffolk County, which is part of the Metropolitan Boston Intrastate air quality control region (AQCR). In 2004, all of Massachusetts was designated as a Serious Nonattainment Area with respect to the 1997 8-hour ozone standard of 0.08 parts per million (ppm). However, all air quality monitors now show that Massachusetts meets the 1997 ozone standard statewide. In 2008, U.S. EPA updated the 8-hour ozone standard to 0.075 ppm and in 2011 all of Massachusetts, except for Dukes County (Martha's Vineyard), was designated as attainment areas. In December 2015, U.S. EPA reduced the 8-hour ozone standard to 0.070 ppm, for which no Massachusetts AQCRs have been designated as nonattainment areas.

Table 2.3.10-1: Massachusetts and National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS (µg/m³)
SO_2	1-hour[P] 3-hour[S] Annual[P] (Arithmetic Mean)	196[a] 1,300[b] 80
CO	1-hour[P] 8-hour[P]	40,000[b] 10,000[b]
NO_2	1-hour[P] Annual[P/S] (Arithmetic Mean)	88[c] 100
PM_{10}	24-hour[P/S]	150
$PM_{2.5}$	24-hour[P/S] Annual[P] (Arithmetic Mean) Annual[S] (Arithmetic Mean)	35[d] 12[e,f] 15
O_3	8-hour[P/S]	137[g]
Pb	Rolling 3-Month Avg.[P/S]	0.15

P = primary standard; S = secondary standard.

a 99th percentile 1-hour concentrations in a year (average over three years).

b One exceedance per year is allowed.

c 98th percentile 1-hour concentrations in a year (average over three years).

d 98th percentile 24-hour concentrations in a year (average over three years).

e Three-year average of annual arithmetic means.

f As of January 15, 2013, the U.S. EPA lowered the PM2.5 annual primary standard from 15 ug/m3 to 12 µg/m3.

g Three-year average of the annual 4th-highest daily maximum 8-hour ozone concentration must not exceed 0.070 ppm (137 ug/m3) (effective December 28, 2015) and the annual PM10 standard was revoked in 2006.

Since the DEIR, the Metropolitan Boston Intrastate AQCR has been re-designated from a maintenance area for CO, to an attainment area. The AQCR is also designated as in attainment or unclassifiable for all the other criteria pollutants, including, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and Pb. Regarding ozone, although all of Massachusetts is in attainment with all current NAAQS, Massachusetts is still considered a maintenance area for the revoked 1997 8-hour ozone standard, as a result of the South Coast II Court Decision[6].

Massachusetts, through its State Implementation Plan (SIP), specifies target dates for achieving compliance with the NAAQS, and identifies specific emission reduction goals for nonattainment or maintenance areas. The Transportation Conformity Rule requires federally funded highway and transit projects to conform with the purpose of the SIP, to ensure that federal activities do not cause or contribute to new or worse air quality violations. In accordance with the Transportation Conformity Rule, the Boston MPO prepared a conforming Long-Range Transportation Plan (LRTP), in which the I-90 Allston Multimodal Project's emissions are explicitly included in the emissions inventory; therefore, preparation of a regional level emissions inventory is not required[7]. However, a Project-level conformity analysis, similar to the one performed for the DEIR, will still be necessary to satisfy Transportation Conformity requirements in the SDEIR.

Massachusetts

Massachusetts General Laws Chapter 61 through 63, together with the regulations contained in the Code of Massachusetts Regulations at 301 C.M.R. 11.01 through 11.17, is known as the Massachusetts Environmental Policy Act (MEPA). The air quality review threshold regulations are located in 301 CMR 11.03 (8). MEPA, which is administered by the EOEEA, mandates that whenever a state agency is involved in a project, and the action by the state agency is likely to cause significant environmental impacts, the agency's proposed actions are subject to public review and comment. The agency is required to consider ways to minimize or mitigate those environmental impacts, including consideration of alternatives to the proposed action.

2.3.10.2 Air Emissions Inventory

This section describes the methodology and results of the air emissions inventory for the 3L Re-alignment Alternative and how it compares to Alternative 3K described in the DEIR. This includes both roadway and the unchanged locomotive air emissions.

Mesoscale Air Quality Analysis

An emission inventory is a listing, by source, of the amount of air pollutants discharged into the atmosphere for a given time period (typically one year). Using the same approach as in the DEIR, project-related emissions inventories for the air quality study area were prepared for VOCs, oxides of nitrogen (NO_X), CO, PM_{10}/$PM_{2.5}$, SO_2 and greenhouse gases in the form of CO_2 for the 3L Re-alignment Alternative Throat Area options. For the locomotive and rail activities associated with the Modified Flip West Station and BPY, there are no significant changes in assumptions regarding rail activity. Therefore, the emissions calculated as part of the DEIR remain the same.

The motor vehicle and bus emission factors were calculated using the U.S. EPA's MOVES computer program (MOVES2014b). Regulations require that motor vehicles meet increasingly stringent (i.e., lower) emission limits for all criteria pollutants with each new model year. The MOVES2014b model was executed using MOVES input files

[6] Transportation Conformity Guidance for the South Coast II Court Decision, U.S. EPA, EPA-420-B-18-050, November 2018.

[7] Long-Range Transportation Plan of the Boston Region Metropolitan Planning Organization, Destination 2040 prepared by the Central Transportation Planning Staff to the Boston Region Metropolitan Planning Organization, August 2019.

provided by MassDEP. The MOVES input files allow credit to be taken for an enhanced motor vehicle inspection and maintenance (I/M) program with Massachusetts specific I/M cut points, Stage II (refueling) emission controls, and reformulated gasoline.

MassDEP guidance in Guidelines for Performing Mesoscale Analysis of Indirect Sources (May 1991) was followed to perform the roadway mesoscale analysis. Vehicle miles traveled (VMT) on each roadway link were calculated by multiplying the average daily traffic volumes by the roadway link length. VMT for each link were then multiplied by the MOVES predicted VOC, NO_X, CO, PM_{10}, $PM_{2.5}$, SO_2 and CO_2 emission factors for the appropriate vehicle speeds to determine the annual emissions for each roadway link. Idling emissions of each pollutant were also calculated for the intersections that are included in the microscale analyses for each modeled scenario in the DEIR. Mesoscale study areas are defined in accordance with MassDEP guidance to include the roadway segments that will potentially experience an increase of 10% in traffic due to the Project and which currently operate at LOS D, E or F, or will degrade to LOS D, E or F in the future. The 3L Alternative will include new signals and intersection lane additions, road extensions, and road widening, The 3L Alternative will not directly generate any new traffic but will alleviate traffic congestion and improve transportation access to potential development and redevelopment. The entire traffic study area was included in the mesoscale study area.

Moving Vehicle Emissions. Table 2.3.10-2 summarizes the moving vehicle annual emissions for each air pollutant, for each option. **The pollutant emissions for the three Throat Area options are the same since there is no significant change in the number of VMTs between each option**. This is a simplified assumption for this screening-level analysis.

Table 2.3.10-2: Mesoscale Moving Vehicles Emissions Summary (tons/yr)

Project Alternative	VOC	NO_X	PM_{10}	$PM_{2.5}$	CO	SO_2
2040 Build (3L-Modified Highway Viaduct)	2.62	7.64	0.55	0.49	167.65	0.33
2040 Build (3L-Modified At-Grade)	2.62	7.64	0.55	0.49	167.65	0.33
2040 Build (3L-SFR Hybrid)	2.62	7.64	0.55	0.49	167.65	0.33

Idling Vehicle Emissions. Idling emissions of VOC, NO_X, CO, PM_{10}, $PM_{2.5}$ and SO_2 were also calculated for the intersections that are included in the microscale analysis in the DEIR. The predicted traffic delay for each turning movement, as determined from the LOS analysis, for the same peak hour modeled for the microscale analysis, was used to determine the idling time for each vehicle at each intersection. The idling times were multiplied by the idle emission factor for each pollutant and the corresponding peak-hour traffic volumes to calculate the peak-hour idling emissions. The calculated peak-hour idling emissions were scaled to average daily values using a K-factor of 10. Table 2.3.10—3 shows the calculated total idling emissions for the 2040 Build alternative for each air pollutant. The total roadway moving and idling emissions for the 3L Alternative Throat Area options is presented in Table 2.3.10—4.

Table 2.3.10-3: Mesoscale Idling Vehicles Emissions Summary (tons/yr)

Project Alternative	VOC	NO_X	PM_{10}	$PM_{2.5}$	CO	
2040 Build (3L-Modified Highway Viaduct)	0.77	1.01	0.15	0.13	8.87	0.09
2040 Build (3L-Modified At-Grade)	0.77	1.01	0.15	0.13	8.87	
2040 Build (3L-SFR Hybrid)	0.77	1.01	0.15	0.13	8.87	0.09

Table 2.3.10-4: Mesoscale Moving and Idling Vehicles Emissions Summary (tons/yr)

Project Alternative	VOC	NO_X	PM_{10}	$PM_{2.5}$	CO	SO_2
2040 Build (3L-Modified Highway Viaduct)	3.39	8.65	0.70	0.62	176.55	0.42
2040 Build (3L-Modified At-Grade)	3.39	8.65	0.70	0.62	176.55	0.42
2040 Build (3L-SFR Hybrid)	3.39	8.65	0.70	0.62	176.55	0.42

Locomotive Air Quality Analysis

As stated above, for the locomotive and rail activities associated the Modified Flip West Station and BPY, there are no significant changes in assumptions regarding rail activity. Therefore, the emissions calculated as part of the DEIR remain the same. A summary of the locomotive activity assumed in the DEIR is presented below. Table 2.3.10—5 presents the diesel locomotive emissions for the 2040 Build Alternative for all rail operations on the WML for non-MBTA services and BPY layover area, and West Station only. **The diesel emissions for the three Throat Area operations are the same for the rail operations and West Station**.

Table 2.3.10-5: Locomotives Emissions Summary (tons/yr)

Project Alternative	VOC	NO_X	PM_{10}	$PM_{2.5}$	CO	SO_2
2040 Rail Operations	0.44	4.10	0.09	0.09	4.73	0.019
2040 West Station	0.23	2.17	0.05	0.05	2.50	0.011
2040 Rail and West Station Operations	0.67	6.27	0.14	0.14	7.23	0.030

3L Alternative Total Annual Emissions

The 3L Alternative Throat Area options also include rail operations on the WML and BPY layover area and Modified Flip West Station. Table 2.3.10-6 presents the total emissions, in tons per year, for VOC, NO_X, CO, PM_{10}, $PM_{2.5}$, and SO_2 from both motor vehicles and locomotives for the 3L Alternative Throat Area options in 2040.

Table 2.3.10-6: Motor Vehicle and Locomotives Emissions Summary (tons/yr)

Project Alternative	VOC	NO_X	PM_{10}	$PM_{2.5}$	CO	SO_2
2040 Build (3L-Modified Highway Viaduct)	4.06	14.92	0.84	0.76	183.78	0.45
2040 Build (3L-Modified At-Grade)	4.06	14.92	0.84	0.76	183.78	0.45
2040 Build (3L-SFR Hybrid)	4.06	14.92	0.84	0.76	183.78	0.45

Greenhouse Gas Emissions

This section addresses Greenhouse Gas (GHG) transportation emissions generated for the 3L Re-alignment Alternative in 2040. The Massachusetts EEA GHG Policy requires MassDOT to calculate and compare the GHG emissions for stationary sources (buildings) and mobile sources (transportation components) to a baseline case to determine GHG savings. The Policy requires that the analysis focus mainly on the primary GHG, carbon dioxide (CO_2). While there are other GHGs, CO_2 is the predominant contributor to global warming, and emissions can be calculated for CO_2 with readily accessible data. The GHG Policy also requires MassDOT to identify, evaluate, and discuss other measures that could reduce GHG emissions and to quantify the impact of proposed mitigation in terms of energy savings and GHG emissions. Per MEPA's request, a separate GHG analysis for West Station was presented in a separate technical appendix in the DEIR.

The CO_2 emissions inventory in the Project Area was developed for motor vehicles on affected roadways, and existing and future railroad locomotive operations. The motor vehicle and locomotive CO_2 emissions were developed using the same roadway and rail network used for the criteria pollutant emissions inventory discussed above.

Table 2.3.10-7 presents the total CO_2 emissions, in tons per year, from both motor vehicles and locomotives for the 3L Alternative. **As described above, 2040 Build CO_2 emissions are the same for each Throat Area option since there is no significant change in vehicle-miles traveled between the three options.**

Table 2.3.10-7: Motor Vehicle and Locomotive CO_2 Emissions Summary (tons/yr)

Alternatives	Moving Vehicles	Idling Vehicles	Rail Operations	West Station	Total Sources
2040 Build*	47,541.44	12,401.49	3,738.52	1,215.89	64,896.85

2040 Build CO2 emissions are the same for each Throat Area option since there is no significant change in vehicle-miles traveled between the three options.

Comparison of the 3K and 3L Total Annual Emissions

Table 2.3.10-8 presents a comparison of the 3L Alternative and 3K Alternative total annual emissions. Since there are no differences in air emissions between the three Throat Area options for either the 3L Alternative or 3K Alternative, Table 2.3.10-8 provides a single set of emissions for each alternative. The table reveals that the pollutant emissions for the 3L Alternative are approximately 1.5 to 10.6 percent lower than the 3K Alternative. This is primarily due to lower VMTs for the 3L Alternative. Furthermore, the 2040 Build total annual emissions for Concept 3L will be approximately 6 to 70 percent lower than the 2019 Existing total annual emissions. A full analysis of roadway and rail emissions will be covered in the SDEIR.

Table 2.3.10-8: Comparison of the Concept 3L and Concept 3K Emissions Summary (tons/yr)

Project Alternative	VOC	NO_X	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2
2040 Build Concept 3L	3.83	14.19	0.79	0.71	168.64	0.42	60,693.79
2040 Build Concept 3K	4.18	14.84	0.86	0.77	171.14	0.47	66,152.81
Percent Change	-8.4%	-4.4%	-8.1%	-7.8%	-1.5%	-10.6%	-8.3%

2.3.10.3 Air Dispersion Modeling Comparison

As part of the DEIR, air dispersion modeling analyses were performed to assess the potential $PM_{2.5}$ "hot spot" and nitrogen dioxide (NO_2) impacts from the Project. The analyses focused on the emissions from the diesel trains operating at West Station and BPY and motor vehicles on roadways in the vicinity of West Station. There is no update for the air dispersion modeling analyses conducted for the DEIR as part of this air quality analysis. Instead, as a screening-level evaluation, the change in $PM_{2.5}$ and NO_X emissions presented in Section 2.3.10.2 were used to calculate the change in maximum predicted $PM_{2.5}$ and NO_2 concentrations based on the 3K Alternative Throat Area options predicted $PM_{2.5}$ and NO_2 in 2040.

As shown in Table 2.3.10-8, the $PM_{2.5}$ and NO_X emissions were 7.8 and 4.4 percent lower, respectively, for the 3L Alternative compared to the 3K Alternative. These percent changes in emissions were directly applied to the 3K Alternative predicted concentrations to calculate the 3L Alternative maximum predicted $PM_{2.5}$ and NO_2 concentrations. Table 2.3.10-9 and Table 2.3.10-10 present the predicted maximum $PM_{2.5}$ and NO_2 concentrations for both the 3L Alternative and 3K Alternative Throat Area options. The 3L Alternative generates slightly lower $PM_{2.5}$ and NO_2 maximum predicted impacts than the 3K Alternative for all three Throat Area options. Both alternatives comply with the applicable $PM_{2.5}$ 24-hour and annual NAAQS and NO_2 one-hour and annual NAAQS. A more refined air dispersion modeling analysis will be performed for the 3L Alternative Throat Area options as part of the SDEIR.

2.3.10.4 Conclusions

A screening-level air quality analysis was performed for the 3L Alternative Throat Area options with Modified Flip West Station. The results of this analysis show that the 3L Alternative will likely have lower air quality impacts than Concept 3K. A more refined air quality analysis of the 3L Alternative will be conducted for the SDEIR.

Table 2.3.10-9: Maximum Predicted 24-Hour and Annual $PM_{2.5}$ Concentrations

Alternative	Averaging Period	Maximum Predicted Impact (µg/m³)	Background Concentration (µg/m³)*	Total Impact (µg/m³)	NAAQS (µg/m³)
2040 Build (3K-HV)	24-Hour	0.20	15.7	15.9	**35**
	Annual	0.10	6.8	6.9	
2040 Build (3K-AMP)	24-Hour	0.20	15.7	15.9	**35**
	Annual	0.10	6.8	6.9	
2040 Build (3K-ABC)	24-Hour	0.20	15.7	15.9	**35**
	Annual	0.10	6.8	6.9	
2040 Build (3L-Modified Highway Viaduct)	24-Hour	0.18	15.7	15.8	**35**
	Annual	0.9	6.8	6.7	
2040 Build (3L-Modified At-Grade)	24-Hour	0.18	15.7	15.8	**35**
	Annual	0.9	6.8	6.7	
2040 Build (3L-SFR Hybrid)	24-Hour	018	15.7	15.8	**35**

**Background concentrations are based on three years (2014-2016) of MassDEP monitoring data.*

Table 2.3.10-10: Maximum Predicted 1-Hour and Annual NO_2 Concentrations

Alternative	Averaging Period	Maximum Predicted Impact (µg/m³)	Background Concentration (µg/m³)*	Total Impact (µg/m³)	NAAQS (µg/m³)
2040 Build (3K-HV)	1-Hour	26.4	95.9	122.4	**188**
	Annual	2.08	33.4	35.5	**100**
2040 Build (3K-AMP)	1-Hour	29.4	95.9	125.4	**188**
	Annual	2.27	33.4	35.7	**100**
2040 Build (3K-ABC)	1-Hour	29.0	95.9	124.9	**188**
	Annual	2.18	33.4	35.6	**100**
2040 Build (3L-Modified Highway Viaduct)	1-Hour	25.2	95.9	121.1	**188**
	Annual	1.99	33.4	35.4	**100**
2040 Build (3L-Modified At-Grade)	1-Hour	27.7	95.9	123.6	**188**
	Annual	2.08	33.4	35.5	**100**
2040 Build (3L-SFR Hybrid)	1-Hour	28.1	95.9	124.0	**188**
	Annual	2.17	33.4	35.6	**100**

**Background concentrations are based on three years (2014-2016) of MassDEP monitoring data.*

2.3.11 Noise and Vibration

This section summarizes the results of a preliminary noise and vibration analysis that evaluated changes in noise and vibration conditions with the 3L Alternative compared to existing conditions and the 3K Alternative evaluated in the DEIR[8]. In general, differences among the Throat Area options have relatively small effects to the noise conditions at receptors that are farther from the corridor including Magazine Beach, Cambridgeport, and buildings at BU which are set back from the corridor. The differences with the Throat Area options would have a greater effect on the noise conditions at receptors relatively close to the corridor such as the PDW Path and BU buildings close to the corridor.

All the 3L Throat Area options include modifications which help to reduce noise conditions at nearby receptors compared to existing conditions. Similar to the 3K Throat Area options evaluated in the DEIR, the 3L Throat Area options would substantially reduce (i.e., 10 to 15 dBA) noise where SFR would be depressed and realigned farther from the PDW Path near the interchange with the proposed Cambridge Street South.

Approaches to further reduce noise throughout the study area, such as introducing acoustic shielding from parapet walls, snow fences and noise barriers, will be evaluated during the SDEIR for all Throat Area options.

Modified Highway Viaduct Option. The 3L Modified Highway Viaduct option would reduce noise levels by up to 3 dBA at the PDW Path compared to the 3K Highway Viaduct variation due primarily to shifting SFR farther away. Similar to existing conditions, the 3L Modified Highway Viaduct option would reduce noise from I-90 on the PDW Path by reducing the line-of-sight to traffic on the elevated structure.

The width of the viaduct with the 3L Modified Highway Viaduct option is narrower than the 3K Highway Viaduct variation with the reduction of shoulder widths, but slightly wider than the existing viaduct. By bringing traffic sources (i.e., travel lanes) closer to the median and edges of the viaduct, parapet walls or snow fences on the viaduct will tend to be more effective at reducing noise compared to the 3K Highway Viaduct variation.

Noise levels at Magazine Beach and Cambridgeport would typically be similar (i.e., within 1 dBA) under the 3L Modified Highway Viaduct option compared to the 3K Highway Viaduct variation and would generally not approach or exceed the FHWA's Noise Abatement Criteria (i.e., 67 dBA for residential and park land uses). Similar to existing conditions and the 3K Highway Viaduct variation, the 3L Modified Highway Viaduct option would have I-90 elevated which allows for more efficient sound propagation at receptors farther away such as Magazine Beach and Cambridgeport. However, the contribution of noise from I-90 is relatively low at these more distant receptors compared to the contribution of noise from local roadways (e.g., Memorial Drive) which are much closer. Therefore, the overall difference in noise from I-90 being elevated is relatively low (i.e., generally less than 3 dBA).

Modified At-Grade Option. The 3L Modified At-Grade option would reduce noise levels by up to 3 dBA at the PDW Path compared to the 3K-ABC variation due primarily to relocating the PDW Path approximately 20 feet farther away from SFR into the Charles River on piers. The WML tracks would extend up to 7 feet beyond the existing right-of-way on to BU resulting in an increase in noise and vibration levels at the College of Fine Arts building. This configuration would have a minor effect on noise conditions at most receptors in BU which are set back from the corridor. However, vibration levels would slightly increase, and noise levels would increase approximately 2 dBA at the College of Fine Arts building which is relatively close to the WML tracks.

Unlike the 3K-ABC variation which elevated SFR eastbound to reduce noise from I-90 to receptors north of the corridor, the 3L Modified At-Grade option would keep SFR eastbound and SFR westbound generally at the same elevation. This modification would not offer the same noise reduction that would have been offered by SFR eastbound under the 3K ABC variation.

Noise levels at Magazine Beach and Cambridgeport would be similar (i.e., within 1 dBA) with the 3L Modified At-Grade option compared to the 3K ABC variation. Noise levels would approach or exceed the FHWA's Noise Abatement Criteria at the closest portions (i.e., shoreline) of Magazine Beach.

SFR Hybrid Option. The 3L SFR Hybrid option would be substantially different than other alignments previously evaluated. The 3L SFR Hybrid option would realign I-90 westbound along the north side of the Throat Area closer to the PDW Path. I-90 eastbound would be located underneath a viaduct structure which would carry SFR eastbound and westbound. I-90 westbound and eastbound would be depressed up to approximately 6 feet below the elevation of the PDW Path. Relocating I-90 closer to the PDW Path would tend to increase noise levels, while depressing it would tend to decrease noise levels. The elevated SFR would tend to reduce noise at receptors on the PDW Path where the elevated structure blocks the line-of-sight to traffic.

Overall, noise levels from the 3L SFR Hybrid option would be similar or slightly quieter on the PDW Path (i.e., 1 to 2 dBA) compared to the 3K Highway Viaduct or 3K-ABC variation, and substantially quieter (i.e., 5 to 8 dBA) than existing conditions. Similar to the 3L Modified At-Grade option, the WML tracks would extend up to 7 feet beyond the existing right-of-way on to Boston University, resulting in an increase in noise and vibration levels at the College of Fine Arts building for the 3L SFR Hybrid option. Noise levels would be similar with the 3L SFR Hybrid option at other receptors in Boston University compared to other 3L Throat Area options.

Noise levels at Magazine Beach and Cambridgeport with the 3L SFR Hybrid option would typically be 1 to 2 dBA quieter than the 3L Modified Highway Viaduct and 3K Highway Viaduct option. Noise levels with the 3L SFR Hybrid option would generally not approach or exceed the FHWA's Noise Abatement Criteria (i.e., 67 dBA for residential and park land uses).

Modified Flip Layout. The Modified Flip would locate West Station to the north side of BPY (south of I-90) and would also include an express track along the existing WML alignment for commuter rail and Amtrak trains to bypass West Station for through movements. Noise from trains stopping at West Station would be substantially quieter compared to existing train movements for residences in the area of Pratt Street and Wadsworth Street. However, the majority of train operations that would not stop at West Station would be on the proposed express track closer to residences. The layover yard would be shifted to the south (compared to the railyard layout in the DEIR) which is closer to residences in the area of Pratt Street and Wadsworth Street; however, this would cause a minor increase in noise from trains idling at the yard and movements into and out of the yard. Overall, noise levels at residences in the area of Pratt Street and Wadswsorth Street would be slightly quieter (i.e., 1 to 2 dBA) with the Modified Flip, prior to mitigation, compared to existing conditions.

Trains would be relocated closer to the anticipated North Allston development area with the Modified Flip, but this would not substantially increase noise conditions for future noise-sensitive developments since the rail station would be separated from the development area by I-90, which would be a predominant source of noise along with noise from other local roadways.

Malvern Street Transitway. The Malvern Street Transitway would provide a roadway connection to the south from West Station for restricted access by buses and non-motorized transport (i.e., bicyclists and pedestrians) via a new ramp and bridge. Noise from buses on the Malvern Street Transitway has the potential to cause noise impact to adjacent residences on Ashford Street and Sawyer Terrace and the planned residential tower at 76 Ashford Street. Potential noise impact and the need for mitigation in the area near the Malvern Street Transitway will be further analyzed in the SDEIR.

[8] The preliminary noise and vibration analysis is based on the same traffic volumes and train operations assumed in the DEIR to provide a comparison of the potential changes due to physical changes in the Project between the 3K and 3L Alternatives. The SDEIR will include a detailed noise and vibration analysis using updated traffic volume and train operations information.

2.3.12 Wetlands and Waterways

As described in the DEIR, the Charles River is located along the northern and eastern Project limits and contains natural resources that are protected under the Massachusetts Wetlands Protection Act (MA WPA) and under the U.S. Clean Water Act and Rivers and Harbors Act. State and federal wetlands and waterways jurisdictions are based on elevations of the water surface of the Charles River. For the purposes of this NPC, unless otherwise noted, all elevations are expressed in North American Vertical Datum of 1988 feet (NAVD88). There are three state wetland resource areas associated with the river including Land Under Water (LUW) (area below elevation 0); Bank underlying an anadromous/catadromous fish run (Bank) (area between elevation 0 and 2), and Bordering Land Subject to Flooding (BLSF) (area between elevation 2 and 4). See Figure 2.3.12-1 for existing state wetland resource areas. The federal wetland and waterway resources of the Charles River, regulated by the U.S. Army Corps of Engineers (USACE), are defined as Non-tidal federal Navigable Waters of the United States (WUS) (area below elevation 2). State Chapter 91 Waterways Jurisdiction is defined as Ordinary High Water (OHW), the landward limit of flowed tidelands, which is also the area below elevation 2. The historically filled tidelands adjacent to the Charles River above elevation 2 are also within Chapter 91 Jurisdiction. See Figure 2.3.12-2 for existing state Chapter 91 resource areas.

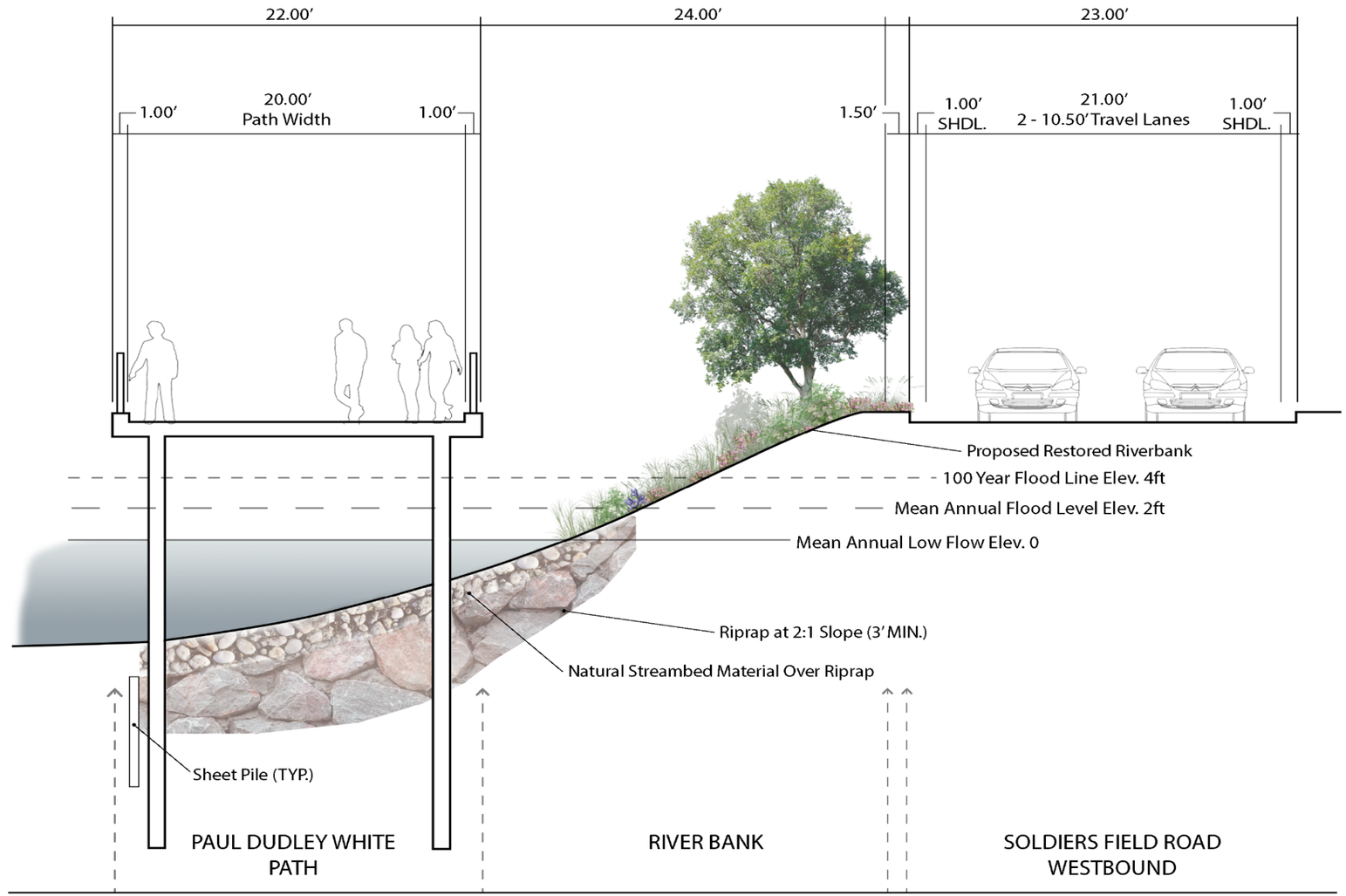
2.3.12.1 Wetlands

Modified Highway Viaduct Option. Alterations to state wetlands that would occur from the Modified Highway Viaduct option are limited to the construction of outfalls and riverbank enhancement. It is expected that some form of energy dissipation will be required where the outfalls discharge into the river. The final configuration of the energy dissipation structures has not been developed yet but it is expected that construction of these measures will permanently alter approximately 500 to 1000 square feet (sf) of Land Under Water and approximately 100 linear feet (lf) of Bank. No permanent fill within BLSF is proposed under this option. The alterations to state wetland resource areas associated with outfall construction are common across all Throat Area options currently under consideration. See Figure 2.3.12-3 for wetland impacts associated with the Modified Highway Viaduct.

Minor temporary alterations to Land Under Water, Bank and BLSF would be required to implement riverbank improvements upon Project completion. The riverbank will be reconstructed and improved in place with native species. It is anticipated that no fill in the river will be required to implement these improvements. It should be noted that some form of riverbank improvement is proposed in the Throat Area under all options.

Modified At-Grade Option. The Modified At-Grade option would place infrastructure at-grade in the Throat Area and would place both structures and fill within the wetland resource areas of the Charles River. The PDW Path boardwalk will be located within the Charles River and will be supported by approximately 250 piles resulting in an approximate 500 sf alteration of Land Under Water from the placement of piles. The path would be approximately 22 feet wide and offset approximately 24 feet riverward of existing OHW. Both ends of the walkway transition from pile supported structures to solid fill where the walkway returns to the shoreline. In these areas approximately 200 lf of Bank and 620 cubic feet (cf) of BLSF (flood storage) would be permanently altered.

The Modified At-Grade option would require solid fill in state wetland resources as a result of the construction of SFR and shoreline restoration in the Throat Area. A small portion of SFR will be located within state wetland resource areas resulting in a permanent alteration of 300 cf of BLSF with no alteration to Bank or LUW proposed.



Graphic 2.3.12-1: Modified At-Grade Shoreline Restoration Current Option 1

Due to the proximity of SFR to the river in the Modified At-Grade option, the existing riverbank cannot be restored in place. A retaining wall could be used at the riverward edge of SFR to accommodate the proposed grade change between the roadway and the river but while it would minimize impacts to state wetlands, the resulting vertical wall would have no habitat or natural resource value and would not screen the roadway from the proposed PDW path users. To address this, the Modified At-Grade option proposes fill in the river adjacent to the roadway. The fill would be used to create a naturalized shoreline and provide some buffer for path users from the proposed roadways.

The fill associated with shoreline improvements would extend into the river approximately 30 feet from the OHW line. The fill would permanently alter approximately 35,000 sf of LUW, 1,300 lf of Bank and 1,000 cf of BLSF (flood storage).

The design of the shoreline treatment for the Modified At-Grade option is still under development and is expected to evolve based on input from regulatory agencies and Project stakeholders. Due to the proximity of SFR to the river, all potential shoreline options will require some fill in the Charles River in order to be constructed. There are several factors influencing the design of the shoreline treatment including reducing wetland and waterways impacts to the Charles River, providing ecological benefits to the River, providing a stable shoreline, minimizing impacts to historic resources,

minimizing impacts to river users, and improving the PDW Path and park user experience. The current shoreline option (Graphic 2.3.12-1) is the basis for the impacts described in this NPC. This option proposes a 2:1 planted slope which transitions to a riprap slope below the waterline for shoreline stability. The plantings under this option are predominantly upland species and the riprap below the waterline is overlain with natural streambed material to provide ecological and biological benefits.

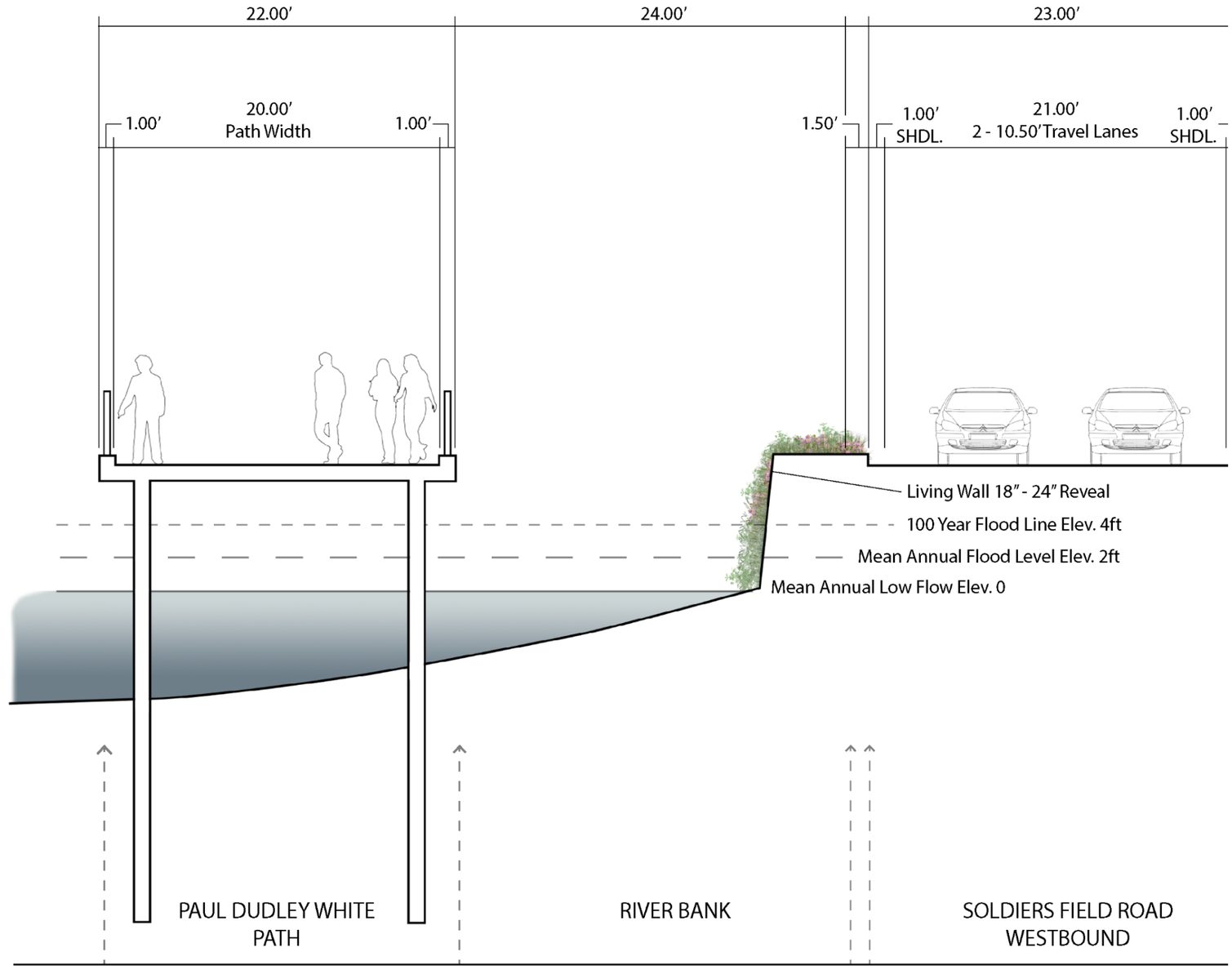
Option 2 shown on Graphic 2.3.12-2 is an example of a wall option that could include various treatments depending on the desired outcome. The example shown is a living wall which minimizes fill in the river but does not provide the same ecological benefits or aesthetics as other potential wall options. Other wall options could include a granite seawall that replicates existing granite walls along the river in keeping with the historic character of the Charles River Basin. Any of the wall options could be enhanced by providing a wetland planting shelf along the base of the wall to increase wetland biodiversity adding natural substrate below the water line to provide enhanced ecological benefits. Option 3 (Graphic 2.3.12-3) is another example of a living wall that incorporates a planted slope and provides an extensive planted buffer between the PDW path and SFR. This option would require more fill in the river than other options and therefore, would be more difficult to permit. MassDOT looks forward to working with regulatory agencies and Project stakeholders to develop a solution that strikes a balance between the desires of the Project stakeholders and constraints of the environmental permitting process.

Under the Wetlands Protection Act, there are provisions for the permitting of Ecological Restoration projects such as those proposed under the shoreline improvement component of the Project. In order to be eligible for permitting under this provision, the Project's primary purpose would need to be the restoration of or other improvement of the natural capacity of the resource areas to protect and sustain the interests identified in the Massachusetts Wetlands Protection Act when such interests have been degraded or destroyed by anthropogenic influences. A determination will need to be made by the State and Local wetland permitting agencies to determine if the Project's primary purpose is the restoration of wetlands and whether the use of fill in existing wetland resource areas is an acceptable method of performing the restoration.

Impacts to existing Bank wildlife habitat functions are required to be mitigated under the Modified At-Grade option. Mitigation would be required for Bank impacts and the flood storage within BLSF. Bank wildlife habitat impact thresholds are outlined in the Wetlands Regulations under 310 CMR 10.54(4)(a)(5) and require that impacts of more than 50 lf of bank found to be significant to the protection of wildlife habitat, shall be deemed to impair its capacity to provide important wildlife habitat functions. Impacts beyond the 50 lf threshold may be permitted if alterations to wildlife habitat characteristics are restored onsite or replicated offsite. The majority of Bank impacts would be mitigated in place through the proposed shoreline restoration. The restoration itself would require impacts to Land Under Water. Impacts to BLSF (flood storage) would be mitigated onsite at either end of the Throat Area through the removal of existing upland to create compensatory flood storage of the same volume and at the same elevation of the affected flood plain.

See Table 2.3.12-1 for impacts associated with the Modified At-Grade option for each resource area. See Figure 2.3.12-4 for wetland impacts associated with the Modified At-Grade.

SFR Hybrid Option. Permanent impacts to federal and state wetland resource areas associated with the SFR Hybrid option are expected to be similar to the Modified Highway Viaduct option described above. The SFR Hybrid would result in approximately



Graphic 2.3.12-2: Modified At-Grade Shoreline Restoration Option 2 – living wall with minimal fill

500-1,000 sf. Of permanent impacts to Federal Waters of the U.S. and state wetland resource areas due to construction of outfalls. An alternatives analysis for construction of the SFR Hybrid option was conducted and concluded that the temporary relocation of SFR and the PDW Path into the Charles River on a temporary trestle is required as the only feasible means of enabling construction of the Throat Area under the SFR Hybrid option while maintaining traffic. The preferred construction alternative would be a panelized structure with retained fill approaches, approximately 81 feet wide and offset approximately 30 feet north of the existing shoreline within the Throat Area. In addition, a portion of I-90 would be relocated into the Charles River during construction. The bridge portion of the trestle would be supported by approximately 188 piles that would impact approximately 400 sf of Land Under Water. The solid fill approaches/abutments at either end of the bridge section would alter approximately 51,000 sf of Land Under

Water, 1,350 lf of Bank and 4,800 cf of BLSF (Flood Storage). Temporary I- 90 would impact approximately 200 sf of Land Under Water, 625 lf of Bank and 2,900 cf of BLSF.

The temporary (8-10 years) impacts associated with the SFR Hybrid option would exceed the impact thresholds for inland bank under 310 CMR 10.54(4)(a)(5) and therefore would require mitigation for bank impacts. This option would also require compensatory flood storage mitigation for temporary fill in BLSF resource areas and would exceed the BLSF wildlife habitat functions threshold described in 310 CMR 10.57(4)(a)(3). Under state regulations, alterations of wildlife habitat characteristics beyond permissible thresholds may be permitted if alterations of wildlife habitat are restored onsite or replicated offsite. Under the SFR Hybrid option, the wildlife habitat functions for Bank and BLSF of the Charles River can be enhanced upon construction completion to meet this standard. Due to an available alternative with less wetland impact a wetland variance may be required.

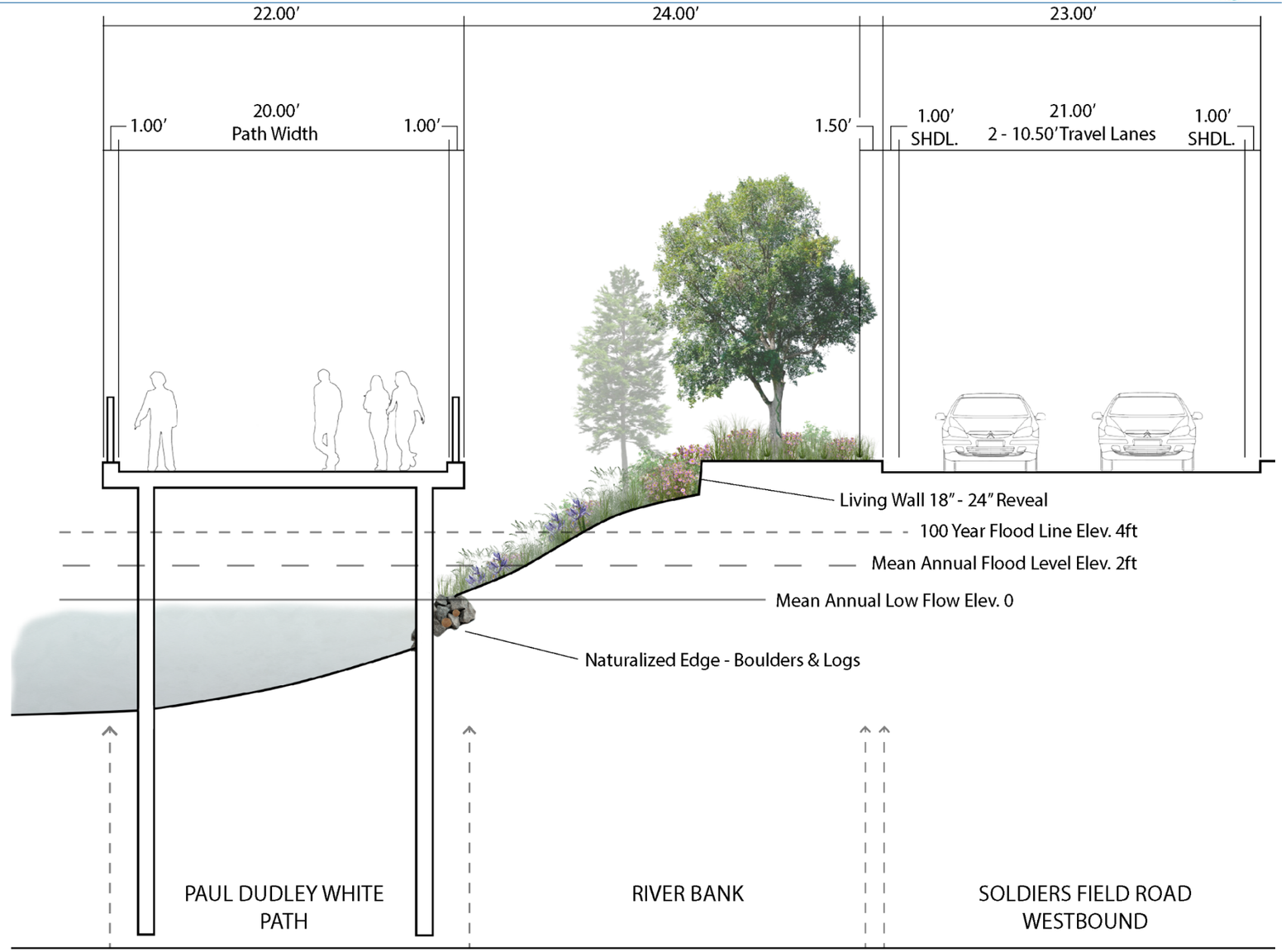
See Figure 2.3.12-5 and Table 2.3.12-1 for impacts associated with the SFR Hybrid option for each resource area.

2.3.12.2 Waterways and Harbor Lines

Waterways

MGL Chapter 91, the Massachusetts Public Waterfront Act ("Chapter 91") (310 CMR 9.00) is the Commonwealth's primary tool for protection and promotion of public use of its tidelands and other waterways. Chapter 91 is administered by MassDEP's Waterways Regulation Program. Chapter 91 requires that a Chapter 91 license or permit be obtained for any activity located in, under, or over flowed tidelands, filled tidelands, Great Ponds (i.e. ponds having a surface area of 10 acres in size) and certain non-tidal rivers and streams located throughout the Commonwealth. The Chapter 91 Regulations define jurisdictional non-tidal rivers and streams as "those that are unaffected by the actions of the ocean's tide and for which public funds have been expended for stream clearance, channel improvement, or any form of flood control or prevention work, either upstream or downstream within the river basin."

The Project is considered a Nonwater-Dependent Infrastructure Facility. As such it must meet the Standards for Nonwater-Dependent Infrastructure Facilities at 310 CMR 9.55. An Infrastructure Facility is a facility that produces, delivers or otherwise provides electric, gas, water, sewage, transportation or telecommunication services to the public. (See 310 CMR 9.02.) The regulations provide that Infrastructure Facilities need not meet the standards for: "Conservation of Capacity for Water-Dependent Use" (310 CMR 9.51), "Utilization of Shoreline for Water-Dependent Purposes" (310 CMR 9.52), and "Activation of Commonwealth Tidelands for Public Use" (310 CMR 9.53). Instead, pursuant to 310 CMR 9.55, a proposal for an Infrastructure Facility shall include "mitigation and/or compensation measures as deemed appropriate by the [DEP] to ensure that all feasible measures are taken to avoid or minimize detriments to the water-related interests of the public."



Graphic 2.3.12-3: Modified At-Grade Shoreline Restoration Option 3 – living wall with maximum diversity

The Waterways Regulations at 310 CMR 9.55(1) list six potential water-related interests of the public that should be evaluated in connection with the permitting of an Infrastructure Facility:

(a) protection of maritime commerce, industry, recreation and public access;

(b) protection, restoration and enhancement of living marine resources;

(c) attainment of water quality goals;

(d) reduction of flood and erosion-related hazards on lands subject to the 100-year storm event or to sea level rise, especially those in damage-prone or natural buffer area
(e) protection and enhancement of public views and visual quality in the natural and built environment of the shoreline;

(f) preservation of historic sites and districts, archaeological sites, and other significant cultural resources near waterways.

In addition, the Waterways Regulations at 310 CMR 9.55(2) define the requirements for open space and recreation. All nonwater-dependent use projects consisting of infrastructure facilities on tidelands or Great Ponds shall take reasonable measures to provide open spaces for active or passive recreation at or near the water's edge, wherever appropriate. Such measures may be provided by any means consistent with the need to avoid undue interference with the infrastructure facilities in question, and to protect public health, safety or the environment.

Modified Highway Viaduct Option. Impacts to waterways from the Modified Highway Viaduct option are not expected to be different from the impacts described in the DEIR for 3K-HV. The Modified Highway Viaduct option would likely be considered a Non-Water Dependent Infrastructure Facility per 310 CMR 9.55 and will likely require a Ch. 91 Non-Water Dependent License. The Modified Highway Viaduct option will result in approximately 500-1,000 sf. of permanent impacts to Federal Waters of the U.S. resource areas and State Ch. 91 flowed tidelands due to construction of outfalls. Impacts associated with outfall construction are common across all Throat Area options currently under consideration. Construction period impacts to flowed tidelands from the Modified Highway Viaduct option are also limited to impacts associated with construction of outfalls. There will be limited encroachment into the Charles River for equipment placement. See Table 2.3.12-1 for impacts associated with the Modified Highway Viaduct option for flowed tidelands.

Modified At-Grade Option. Impacts to waterways from the Modified At-Grade option are expected to be different from the impacts described in the DEIR for 3K-ABC. The Modified At-Grade option proposes both fill and structures in the flowed tidelands of the Charles River. Impacts from structures include a pile supported PDW Path supported by approximately 250 piles for a direct impact of 500 sf. The walkway will occupy approximately 29,000 sf of flowed tidelands and the bottom of the walkway will be located approximately 4 feet above OHW so navigation under the structure will be limited. Approximately 43,000 sf of solid fill is proposed in flowed tidelands in association with the proposed shoreline restoration. As discussed in the wetland section, this fill could be significantly reduced through the use of a retaining wall but the improvements to the natural resources of the river would not be realized. Other potential preliminary concepts for shoreline treatments associated with the Modified At-Grade option, such as retaining walls and wetland plantings, are shown in Graphics 2.3.12-2 and 2.3.12-3 and will be further explored in the SDEIR. The Modified At-Grade option would likely be considered a Non-Water Dependent Infrastructure Facility per 310 CMR 9.55 and likely require a Ch. 91 Non-Water Dependent License or Variance.

DEP has determined that in certain situations fill or structures categorically do not meet the statutory tests for approval under M.G.L. c. 91 or are otherwise not in keeping with the purposes of the Waterways Regulations. A project is eligible for licensing only if it is restricted to fill or structures in defined geographic areas which accommodate the uses outlined in the Categorical Restriction on Fill and Structures section of the Waterways Regulations (310 CMR 9.32). Pile supported structures to accommodate public pedestrian access on flowed tidelands are allowed provided that it is not reasonable to locate such structures above the high water mark or within the footprint of existing pile-supported structures or pile fields.

A determination will need to be made by the DEP Waterways Program as to whether the fill associated with shoreline improvements is water- or non-water dependent. If the fill is deemed water dependent, fill or structures for water-dependent use located below the high water mark are permitted provided that, in the case of proposed fill, reasonable measures are taken to minimize the amount of fill, including substitution of pile-supported or floating structures and relocation of the use to a position above the high water mark. If the fill is considered nonwater-dependent, a Chapter 91 Waterways Variance would likely be required. See Table 2.3.12-1 for impacts associated with the Modified At-Grade option for waterway resource areas. See Figure 2.3.12-6 for impacts to waterway resource areas associated with the Modified At-Grade.

SFR Hybrid Option. The SFR Hybrid option would result in permanent impacts to flowed tidelands due to outfall construction. The SFR Hybrid option also requires construction of a temporary structure in the Charles River to enable construction of the Project within the Throat Area while maintaining traffic under this option. In general, temporary structures do not require licensing under Ch. 91 if they will only be in place for between six months and a year. Beyond that time licensing of the structure or fill would be required. The temporary trestle required to construct this alternative is expected to be in place for 8-9 years and therefore would require licensing under Ch. 91. As a non-water-dependent fill and structure within flowed tidelands, the temporary trestle does not meet the Categorical Restriction on Fill and Structures provisions of the Waterways Regulations and would likely require a Waterways Variance. See Figure 2.3.12-7 and Table 2.3.12-1 for impacts associated with the SFR Hybrid option for waterway resource areas.

Harbor Lines

State harbor lines are legislatively established lines beyond which no structure may extend into a waterbody and have been used to guide maritime development since 1837. The earliest harbor lines were established a fair distance from the shore to guide littoral landowners when building structures out into the harbor. They were intended to promote general commercial prosperity because of the diverse economic opportunities associated with maritime development. While it was understood that allowing encroachments up to the harbor line would impede free navigation, this was outweighed by the greater overall benefit associated with the increased affluence of the citizenry. It was also noted that the need to promote economic prosperity should be balanced by a concern to protect the harbor.

As described above, the Massachusetts Public Waterfront Act (“Chapter 91”), along with its Regulations (310 CMR 9.00), is the Commonwealth's primary tool for protection and promotion of public use of its tidelands and other waterways. Under 310 CMR 9.35(2)(a), no structure can extend seaward of a state established harbor line unless authorized by the State Legislature. MassDEP cannot, on its own authority, permit structures beyond the harbor line; however, it can recommend legislative action to authorize the project either as an exception to or as a modification of the harbor line. In making its recommendation, MassDEP will seek an appropriate balance between encouraging water-dependent development while protecting the essential functions, such as general navigation and flood control, of the water resource as is consistent with the historical establishment of harbor lines in Massachusetts. Each request for authorization of a structure which extends beyond a state harbor line will be evaluated on a case-by-case basis in accordance with applicable regulatory standards.

State harbor lines in the Project Area are shown on Figure 2.3.12-2. Because existing infrastructure extends beyond State harbor lines, all options currently under consideration would require an act of the Legislature for approval.

2.3.13 Floodplain

Impacts to Bordering Land Subject to Flooding (BLSF) for each Throat Area option currently under consideration are described in Section 2.3.12. The current 100-year flood elevation is 4.0 NAVD88 and the 50-year flood elevation is 3.2 NAVD88. The Federal Emergency Management Agency (FEMA) has issued a preliminary draft updated floodplain map. Impacts to the floodplain and BLSF as they relate to the preliminary draft map will be further analyzed in the SDEIR. Based on the current effective FEMA floodplain map (FIRM panel effective date September 25, 2009, Flood Insurance Study effective date March 16, 2016), the 50-year flood and 100-year flood are contained within the banks of the Charles River (see Figure 2.3.13-1). The entire Project Area, including the Throat Area, is bordered to the north by the Charles River. Currently, the Charles River Dam provides flood control of the Charles River within the Project Area and would provide flood control for any of the Throat Area options currently under consideration. There are no direct impacts to I-90 from flood waters under any of the Throat Area options. Future storm surges associated with sea level rise are also examined for potential flooding and resiliency impacts. See Section 2.3.19 for a discussion of Climate Change Vulnerability and Resiliency impacts associated with each Throat Area option. Updated modeling results of all Throat Area options under consideration will be provided in the SDEIR.

Modified Highway Viaduct Option. The Modified Highway Viaduct option is expected to have similar floodplain and resiliency impacts as the Highway Viaduct variation described in the DEIR (3K-HV). Under the Modified Highway Viaduct option, I-90 would be elevated and resilient to storm surges associated with sea level rise. With regards to potential flood mitigation, the area between the Charles River, the source of flooding, and I-90 is open space where flood mitigation could be accomplished by creating a berm or structure between the river and the highway.

Modified At-Grade Option. The Modified At-Grade option is expected to result in similar flooding and resiliency impacts as the at-grade option described in the DEIR (3K-ABC). The Modified At-Grade option would depress sections of I-90 below the water table. As described in Section 2.3.12 there are minor impacts to the floodplain from fill associated with shoreline restoration under the Modified At-Grade option. The potential for current and future flood mitigation under this option will be further explored in the SDEIR.

FHWA Refinement

Over the course of the NEPA environmental review process for the Project, FHWA has flagged concerns regarding the design of the Modified At-Grade and its ability to adhere to 23 CFR 650 Subpart A – Location and Hydraulic Design of Encroachments on Floodplains. As currently designed, the Modified At-Grade option includes a depressed section under the Grand Junction Rail bridge. FHWA has determined it is located within a floodplain because a 50-year rainfall event has the potential to result in pluvial flooding of that portion of I-90. MassDOT is continuing to coordinate with FHWA and is committed to refining the Modified At-Grade option to address the regulations and minimize impacts to floodplains.

SFR Hybrid Option. In this option, I-90 would be depressed below the water table, vulnerable to storm surge and more vulnerable to high intensity rainfall events. Both of these vulnerabilities would be exacerbated by sea level rise. The potential for current and future flood mitigation under this option will be further explored in the SDEIR.

Table 2.3.12-1: Preliminary Review: Summary of Wetlands and Waterways Impacts

Environmental Factors	Modified HV	SFR Hybrid	Modified At-Grade
State Wetland Resource Alterations (Roadway/Path)	No temporary or permanent impacts	**Temporary:** Land Under Water: I-90 Fill: 200 sf Trestle Fill: 50,100 sf Piles: 400 sf Inland Bank: I-90: 625 lf Trestle: 1,350 lf Bordering Land Subject to Flooding: I-90: 2,900 cf Trestle: 7,700 cf **Permanent:** No permanent impacts	**Temporary:** Temporary impacts expected to have similar footprint as permanent. See permanent impacts. **Permanent:** Land Under Water: Indirect Shading, PDW Pile Supported Walkway: 28,200 sf Piles: 500 sf (250 piles) Shoreline Restoration: 35,000 sf Inland Bank: PDW Walkway: 200 lf Shoreline Restoration: 1,300 lf Bordering Land Subject to Flooding: PDW Walkway: 620 sf/ 620 cf Shoreline Restoration: 1,000 sf/ 1,000 cf SFR Solid Fill – 300 sf/ 300 cf
State Wetland Resource Alterations (Stormwater Discharge Pipes)	**Permanent:** 500-1,000 sf	**Permanent:** 500-1,000 sf	**Permanent:** 500-1,000 sf
Federal Inland Waters of the U.S. Impacts (Roadway/Path)	No temporary or permanent impacts	**Temporary:** I-90 Fill: 1,900 sf Trestle Fill: 58,400 sf Piles: 400 sf **Permanent:** No permanent impacts	**Temporary:** Temporary impacts expected to have similar footprint as permanent. See permanent impacts. **Permanent:** Indirect Shading, PDW Pile Supported Walkway: 43,000 sf Piles: 500 sf (250 piles) Shoreline Restoration: 43,000 sf
Federal Inland Waters of the U.S. Impacts (Stormwater Discharge Pipes)	**Permanent:** 500-1,000 sf	**Permanent:** 500-1,000 sf	**Permanent:** 500-1,000 sf
Chapter 91 Waterways Flowed Tideland Impacts (Roadway/Path)	No temporary or permanent impacts	**Temporary:** I-90 Fill: 1,900 sf Trestle Fill: 58,400 sf Piles: 400 sf **Permanent:** No permanent impacts	**Temporary:** Temporary impacts expected to have similar footprint as permanent. See permanent impacts. **Permanent:** PDW Pile Supported Walkway: 29,000 sf Piles: 500 sf (250 piles) Shoreline Restoration: 43,000 sf
Chapter 91 Waterways Flowed Tideland Impacts (Stormwater Discharge Pipes)	**Permanent:** 500-1,000 sf	**Permanent:** 500-1,000 sf	**Permanent:** 500-1,000 sf
Chapter 91 Waterways Filled Tideland Impacts (Roadway/Path)	Conversion of large areas of non-water dependent roadway use to water dependent (WD) public park use	Conversion of large areas of non-water dependent roadway use to water dependent (WD) public park use	Conversion of large areas of non-water dependent roadway use to water dependent (WD) public park use

2.3.14 Navigation

The elevation below Ordinary High Water (OHW) (el. 2 feet NAVD88) in the Charles River is considered navigable under both federal and state regulations. Section 9 and Section 10 of the federal Rivers and Harbors Act of 1899 require that structures constructed below OHW in Waters of the United States (WUS) be approved/permitted by either the United States Coast Guard (USCG) (Section 9) or the United States Army Corp of Engineers (USACE) (Section 10). The state Chapter 91 Waterways Regulations identify the water sheet below OHW as flowed tidelands subject to navigation and permitting under the Chapter 91 regulations.

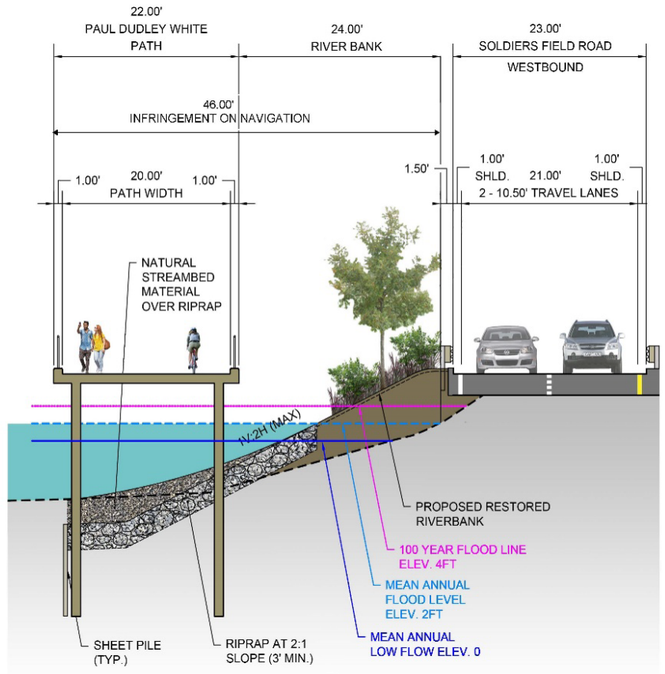
The Project elements associated with MassDOT's Preferred Interchange Alternative, including rail operations and West Station, would not be located within the navigable waterway. One new discharge pipe would be constructed in the river, but it would have no long-term effect on navigation as it would not extend into the navigable waterway. Therefore, there would be no impacts to navigation associated with the I-90 Urban Interchange portion of the Project.

Modified Highway Viaduct Option. Construction of the Modified Highway Viaduct option would not result in permanent impacts to navigation in the Charles River. There would be minor localized impacts to navigation during construction due to construction of outfalls. No portion of the Project would be located within the navigable waterway permanently.

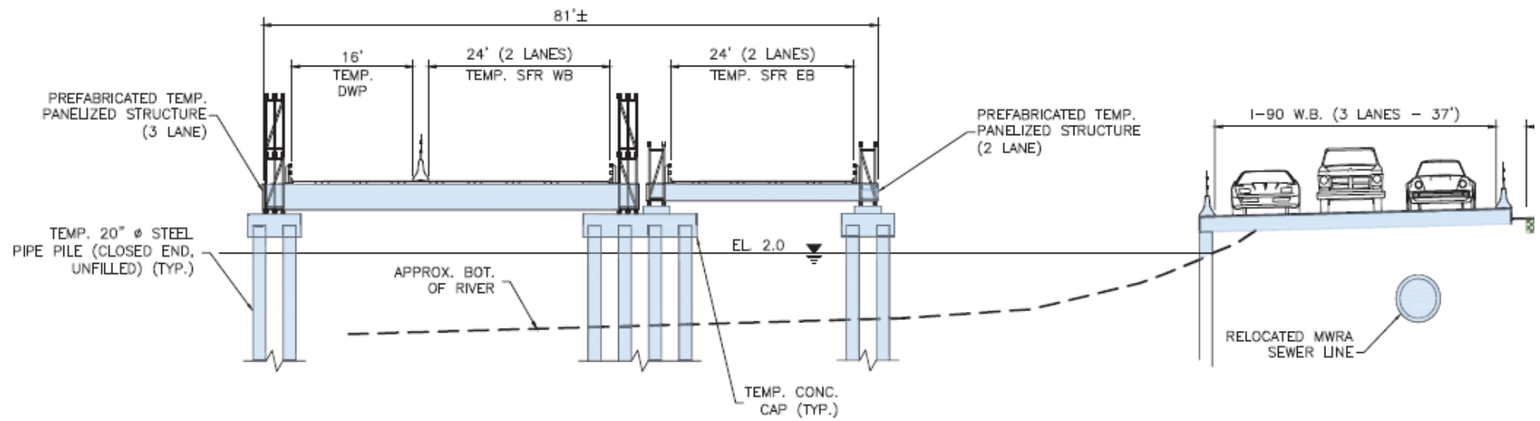
Modified At-Grade Option. The Modified At-Grade option would locate both structures and fill within the navigable waterway riverward of OHW. Under this option the PDW Path would be relocated onto a pile supported structure into the river. The structure would permanently extend approximately 46 feet into the navigable waterway beyond the OHW line. The landward edge of the structure would be located approximately 24 feet offshore with the space between the shoreline and structure partially occupied with fill in the river associated with shoreline improvements. The construction of the walkway and associated fill would likely be performed from the waterway by barge, and associated equipment may require temporary occupation of additional portions of the navigable waterway. Temporary closures of portions of the river along the bank may be required for safety purposes during construction. The Modified At-Grade option impacts are shown in Graphic 2.3.14-1.

SFR Hybrid Option. The final configuration of the SFR Hybrid option would not result in permanent impacts to navigation in the Charles River. Construction period impacts result from a temporary relocation of SFR into the Charles River that is proposed as the only feasible means of enabling construction of the Throat Area of the Project to proceed under the SFR Hybrid option while maintaining all modes of transportation. It is expected that the temporary trestle would be required during construction of the Project for approximately 8 to 10 years.

The total length of the trestle within the river is approximately 2,300 feet and the trestle is predominantly straight and parallel to the shoreline. The total width of the Charles River bank-to-bank just beyond the upstream end of temporary SFR is approximately 580 feet and the downstream bank-to-bank width just beyond the limits of temporary SFR is approximately 450 feet. The temporary encroachment provides between approximately 470 to 340 feet clearance for boating activities on the river. See Graphic 2.3.14-2.



Graphic 2.3.14-1: Modified At-Grade Throat Area Option Navigation Impacts



Graphic 2.3.14-2: SFR Hybrid Throat Area Option Navigation Impacts

2.3.15 Fisheries

Coordination with the National Marine Fisheries Service (NMFS) indicates the Project is not located within designated essential fish habitat and there are no ESA-listed species in the Project Area. Therefore, essential fish habitat and ESA consultations would not be required for this Project.

Modified Highway Viaduct Option. As described in the DEIR for the Highway Viaduct variation (3K-HV), the Modified Highway Viaduct option is not expected to impact the Charles River fisheries resources.

Modified At-Grade Option. The Modified At-Grade option may result in permanent impacts to fisheries within the Charles River. The PDW Path within the river would impact the banks underlying the anadromous/catadromous fish run and associated fisheries habitat provided by the vegetated bank. Construction of the boardwalk and associated fill for the riverbank enhancements under the Modified At-Grade option would require in-water work that may result in temporary impacts to fish habitat during construction. To avoid disturbance to the anadromous fish run, restrictions on the time of year of construction activity would be required. Permanent impacts to fish habitat would result from the elimination of feeding areas for anadromous/catadromous fish during transit as they migrate up and down stream. This option does allow for post-construction bank and shoreline restoration along with wetlands creation along the bank of the Charles River to mitigate impacts caused during construction of the Project within the Throat Area. Concepts for shoreline treatments and mitigation for adverse impacts will be further explored in the SDEIR.

SFR Hybrid Option. The SFR Hybrid option may result in temporary impacts to fisheries within the Charles River. Construction of a temporary trestle within the Charles River to maintain traffic during construction would impact the banks underlying the anadromous / catadromous fish run and associated fisheries habitat provided by the vegetated bank. Time of year construction activity would likely be required. The SFR Hybrid option does allow for post-construction bank and shoreline restoration along with wetlands creation along the bank of the Charles River to mitigate impacts caused during construction of the Project within the Throat Area. Potential mitigation for adverse impacts will be further explored in the SDEIR. Permanent impacts to fisheries resources within the Charles River are not expected.

2.3.16 Threatened and Endangered Species and Wildlife

Modified Highway Viaduct, Modified At-Grade and SFR Hybrid Throat Area Options. Impacts to Threatened and Endangered Species have not changed since publication of the DEIR. The presence or absence of species, including plants, animals, and birds, is determined by reviewing federal and state databases and conducting field surveys if the likelihood of a species may be present in the Project Area. A review of the NHESP Natural Heritage Atlas (15th Edition, 2021) indicated that there are no state mapped Priority or Estimated Habitats for threatened, endangered, or special concern species in the Project Area. Therefore, the Project would have no impacts on federal or state threatened and endangered species as none are present in the Project Area.

The entire Project Area, with the exception of the area east of SFR along the Charles River, is a highly disturbed transportation corridor. As such, impacts to wildlife from the Project with any Throat Area option would be minimal. Under all Throat Area options currently under consideration, there will be no operational impact on wildlife resources in the Project Area. There will be no permanent loss of habitat, no change in habitat quality, and no change in the opportunity for wildlife to cross Project Area roadways.

2.3.17 Stormwater Management and Water Quality

Stormwater management is subject to the design and management requirements of four public entities: City of Boston (Boston Water and Sewer Commission), MassDOT, MBTA and the Department of Conservation and Recreation. Much of the land within the Project Area is owned by Harvard University and further coordination with Harvard University will be required as the stormwater management approach is further developed, especially with respect to the undeveloped parcels. In general, stormwater management for the Project will be contingent on discussions with these public entities and the landowner.

2.3.17.1 Stormwater Management: 3L Re-alignment Alternative

Highway. Proposed impervious area has changed since the DEIR. Water quality impacts and stormwater mitigation for the 3L Alternative with each Throat Area option are discussed in section 2.3.17.3. Similar to the 3K Preferred Alternative with variations presented in the DEIR, the Project qualifies as redevelopment under the Massachusetts Stormwater Standards because it results in a decrease in impervious cover under proposed conditions. MassDOT's Preferred Interchange Alternative, with all three Throat Area options, would meet the Massachusetts Stormwater Standards on a project-wide level, however, each Throat Area option would result in a different level of feasible treatment.

The general stormwater treatment methodology has been updated from the DEIR to prioritize the use of low impact green infrastructure, such as rain gardens and bioretention areas in as many locations as possible. Underground infiltration BMPs will be used after low impact stormwater treatment has been maximized to meet the required targets for peak rate attenuation, recharge, and water quality treatment including TSS, Nitrogen, Phosphorus, Metals and Pathogens removal. Underground infiltration BMPs will be designed to minimize groundwater mounding and avoid mobilization of existing contaminants.

Rail Operations and West Station. The Modified Flip Layout would not alter the stormwater treatment plan for the rail yard; however, it does now include the new Malvern Street Transitway. Stormwater on the transitway would be collected by a closed drainage network and flow south towards Malvern Street. At the base of the transitway connection to Malvern Street, underground stormwater treatment chambers located beneath the pavement are proposed to detain and infiltrate the stormwater.

2.3.17.2 Stormwater Management: Throat Area Options

Modified Highway Viaduct Option. The Modified Highway Viaduct option would create more open space on the river side than the 3K-HV variation that was presented in the DEIR, resulting in greater opportunity to treat stormwater in the Throat Area as shown in Figure 2.3.17-1. A stormwater treatment basin was added on the eastern edge of the Throat Area between the GJR rail line and SFR to treat runoff from SFR. That basin can be either a bioretention or an infiltration basin. Rain garden planters were also added within the park to treat stormwater runoff from the PDW Path.

Similar to the 3K-HV variation, stormwater runoff from I-90 would be treated underneath the viaduct in an infiltration swale. The 3L-Modified HV option would allow approximately 97% of impervious area within the Throat section to be treated prior to discharging to the Charles River.

Modified At-Grade Option. The Modified At-Grade option would allow treatment of the stormwater runoff from SFR at a new bioretention or infiltration basin located on the eastern edge of the Throat Area between the GJR line and SFR as shown in Figure 2.3.17-2. Given the proposed cross section through the Throat Area for this option, there is no space available to add the rain garden planters for the path system that were included in the Modified Highway Viaduct option.

The proposed profile and grading of I-90 for this option precludes the opportunity to treat stormwater runoff from the interstate roadway. The Modified At-Grade option would require pumping to drain the I-90 roadway because the drainage system would be below the elevation of the Charles River. The Modified At-Grade option would allow approximately 35% of impervious area within the Throat section to be treated prior to discharging to the Charles River. Stormwater treatment challenges remain for the permanent boardwalk facility and will be addressed in the SDEIR.

SFR Hybrid Option. The SFR Hybrid option would create enough open space within the Throat Area to provide stormwater treatment for runoff from the PDW Path and SFR as shown in Figure 2.3.17-3. Similar to the Modified Highway Viaduct option, rain garden planters would be designed to treat path runoff and a bioretention or infiltration basin will be designed to treat runoff from SFR. The proposed profile and grading of I-90 for this option precludes the opportunity to treat stormwater runoff from the interstate roadway. The 3L-SFR Hybrid option requires pumping to drain the I-90 roadway because the drainage system will be below the elevation of the Charles River. The SFR Hybrid option allows approximately 52% of impervious area within the throat section to be treated prior to discharging to the Charles River.

Stormwater Management Project-wide Conformance for Throat Area Options. Supporting calculations for conformance with the Massachusetts Stormwater Standards and the Phosphorus TMDL will be provided in the SDEIR document. Based on the current level of design, approximate existing and proposed cover type areas were calculated for the 3L Alternative with the three Throat Area options as summarized in Table 2.3.17-1. The Malvern Street Transitway added 0.5 acres of impervious cover to the total Project Area under existing and proposed conditions for all three Throat Area options. Distribution of proposed impervious and pervious cover was updated to reflect the 3L Re-alignment Alternative for the three Throat Area options.

Table 2.3.17-1: Existing and Proposed Cover Type Areas (acres)

Cover Type	3L-Modified HV		3L-Modified At-Grade		3L-SFR Hybrid	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
Impervious	78.9	77.6	78.9	77.6	78.9	77.7
Pervious	62.8	64.1	62.8	64.1	62.8	64.0
Total	**141.7**	**141.7**	**141.7**	**141.7**	**141.7**	**141.7**

Proposed stormwater treatment that has been added to the Project since the DEIR includes rain garden planters along Cambridge Street and the PDW Path and stormwater treatment basins within the Throat Area to treat SFR runoff when feasible. The additional stormwater treatment in the Throat Area and maximization of low impact green infrastructure within the street grid would increase the level of proposed stormwater treatment attained by the Project. In conclusion, the Project will be designed in accordance with state and federal stormwater regulations. Water quality treatment targets will be met at a project-wide level as allowed by the regulations. The SDEIR will include analysis of the proposed stormwater treatment system for the 3L Re-alignment Alternative with the three Throat Area options. Calculations and existing data used to support this analysis will also be provided with the SDEIR.

2.3.18 Utilities

Modified Highway Viaduct Option. Utilities associated with the Modified Highway Viaduct option would be as described for the DEIR Highway Viaduct (3K-HV) variation. Fiber optic communication conduits would require relocation from the existing viaduct to new underground conduits and the existing MassDOT stormwater pump station at the viaduct's easterly abutment would be retained. Relocation of any major utilities would not be required since the rail, I-90 and SFR infrastructure remain in similar horizontal and vertical locations as existing conditions.

The proposed I-90 viaduct foundations and existing viaduct foundation modifications will require spanning over some sections of the existing 58-inch by 63-inch MWRA sewer, some of which is pile-supported. Proposed viaduct foundations for the Eastbound On-Ramp will be situated to avoid impacting the existing 32-inch by 48-inch brick sewer and the existing BWSC 7-foot by 7-foot Salt Creek Culvert. The MWRA's existing concrete encased 64-inch steel water main crossing under the I-90 viaduct from Buick Street to the Charles River would not be impacted under the Modified Highway Viaduct. Figure 2.3.18-1 illustrates the major utilities.

Modified At-Grade Option. Utilities impacts associated with the Modified At-Grade option would be similar to the DEIR At-Grade (3K-ABC) variation with the addition of impacts to BSWC and MWRA drain and sewer pipes. Since the DEIR, further research of existing utilities within the Project Area and on-site utility investigations have shown there is a 60-inch BWSC drainpipe that laterally bisects the Throat Area just north of the Commonwealth Avenue bridge over I-90. Under the Modified At-Grade (and SFR Hybrid) Throat Area options, there is a need to lower the I-90 profile grade to accommodate the proposed GJR bridge that rises in profile from West Station to the east within the Throat Area to pass over I-90 and SFR and connect to the existing GJR bridge over the Charles River. Therefore, the MassDOT pump station under the existing viaduct at the easterly bridge abutment would need to be reconstructed in a different location. Because a portion of I-90 is in a depressed section and below the water table, highway runoff would need to be directed to the relocated MassDOT pump station. Alternatives to relocate the drain pipe include installation of a siphon or connecting the relocated drain pipe to a new BWSC or relocated MassDOT pump station and discharge to the Charles River. This major utility relocation would likely be accomplished using a jack and bore technique to advance the new pipe under active transportation lines.

Depressing I-90 to accommodate the proposed GJR bridge over I-90 would also impact the 58-inch by 63-inch and 60-inch MWRA sewer requiring, at a minimum, partial relocation of the sewer pipe. Under the Modified At-Grade option, I-90 would be realigned to straighten the highway and remove the reverse horizontal curves. The straightened I-90 is located directly over the MWRA sewer pipes within the Throat Area, placing access manholes within travel lanes. Structures are typically placed in shoulder areas or locations outside the travel way due to safety concerns of a manhole cover dislodging and becoming airborne and for ease of access so lane closures are not required to access manholes. Further investigation and coordination with MWRA would be necessary to determine condition of sewer pipes and alternatives to maintain sewer service under the Modified At-Grade (and SFR Hybrid) option. There is also an 18-inch BWSC sewer that laterally bisects the Throat Area parallel to the 60-inch BWSC drainpipe that would need to be relocated along an alignment outside the depressed portion of I-90 to maintain flow by gravity. Alternatives for relocation of the BWSC drain and sewer and MWRA sewer pipes will be included in the SDEIR.

Similar to the Modified Highway Viaduct option, the MWRA's existing concrete encased 64-inch steel water main crossing under the I-90 viaduct from Buick Street to the Charles River would not be impacted and the fiber optic communication conduits would require relocation from the existing viaduct to new underground conduits. Figure 2.3.18-2 illustrates the major utility impacts.

SFR Hybrid Option. Utilities impacts associated with the SFR Hybrid option would be similar to the Modified At-Grade option, with greater impacts to the MWRA sewer pipe and the addition of impacts to the MWRA water pipe. Replacement of the DEIR 3K-AMP with the SFR Hybrid option would include elevating SFR over I-90 EB on a viaduct (bridge structure) within the limits of the Throat Area. Maximum profile grades for SFR would be used to elevate the roadway as high as possible and minimize the extent of depressing I-90; however, I-90 would need to be lowered significantly more than the Modified At-Grade option. This additional lowering of I-90 would require deeper excavations below groundwater requiring submerged concrete boat slabs and retaining walls to support I-90. As a result of the additional lowering of I-90, the existing 64-inch MWRA water pipe encased in an 84-inch steel sleeve that laterally bisects the Throat Area would require relocation below the proposed I-90 concrete boat slabs. Relocation of the MWRA water pipe would likely be accomplished using a jack and bore technique to advance the new pipe under active transportation lines. This would require large jacking and receiving pits that would introduce additional temporary impacts to Buick Street and BU property, and also increase construction duration.

This option would require full relocation of the 58-inch by 63-inch and 60-inch MWRA sewer pipes to a location out of the I-90 footprint, but because it is gravity-dependent, the profile cannot change. Consequently, the sewer must be relocated close by and parallel to the proposed I-90 depressed alignment within the created open space.

Similar to the Modified At-Grade option, the MassDOT pump station under the existing viaduct at the easterly abutment must be reconstructed in a different location and fiber optic communication conduits require relocation from the existing viaduct to new underground conduits. Because the I-90 section is below-grade and in the water table, pavement drainage must also be pumped. The BWSC 60-inch drain must be lowered in elevation and requires construction of a siphon, new BWSC pump station or connection to the relocated MassDOT pump station. These major utility relocations would require jacking pits to advance the new pipes under active transportation lines. Alternatives for relocation of the BWSC drain and sewer and MWRA water and sewer pipes will be included in the SDEIR. Figure 2.3.18-3 illustrates the major utility impacts.

MassDOT also anticipates impacts to utilities at BU near the College of Fine Arts and the parking facilities along the east side of Buick Street under the Modified At-Grade and SFR Hybrid options. Significant utilities include electrical, communications, drainage and steam. Any construction that places permanent railroad features within these BU parcels would impact the utilities. The SDEIR will provide detailed description of impacts and relocation of utilities.

2.3.19 Climate Change Vulnerability and Resiliency

Climate-related hazards are projected to pose increasing threats to the viability and resiliency of infrastructure. The 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan[9] (SHMCAP) anticipates increasing severity, duration, and/or frequency of several natural hazards as the Commonwealth experiences climate change. The Massachusetts Climate Change Clearinghouse (resilientMA.org) provides downscaled climate change projections to support climate change planning.

This section reviews the proposed alternatives in the context of current and future exposure to coastal flooding and extreme temperatures. Extreme precipitation is also a climate related hazard and is addressed in this section. While sea level rise alone is not anticipated to affect the Project Area due to the control and management of the Charles River Dam, the Project Area may experience coastal flooding due to the combined effects of sea level rise and extreme storms. Projected increases in average, maximum, and minimum temperatures over the next century may result in fewer days below freezing as well as increased incidence of extreme heat. These changes in temperature may also have impacts on the roadway as well as on the broader Project Area.

2.3.19.1 Coastal Inundation

The Massachusetts Coastal Flood Risk Model (MC-FRM) was developed to assess the potential impacts of climate-related coastal flooding on transportation infrastructure in coastal Massachusetts[10]. The model integrates up-to-date mean sea level elevations, the latest sea level rise projections developed specifically for the Commonwealth, large data sets of historical coastal storms (winds, waves, surge) in the region, and state of the science projections for future storm conditions. Using this information and an understanding of hydrodynamic processes, the model projects the chance of flooding and water levels associated with a range of probabilistic storm scenarios under current conditions and for future time horizons. See Appendix F for additional information regarding the MC-FRM and coastal inundation analyses performed for the Project.

To account for storm-induced flooding in Boston, MC-FRM evaluates the potential impacts from future hurricanes, tropical storms, and nor'easters as well as increased flow in the Charles River due to increased precipitation. The model also simulates operation (pumping and closure) of the Charles River Dam to manage upstream water levels and create extra storage for river discharge ahead of large rainfall events. MC-FRM does not incorporate stormwater runoff or piped stormwater infrastructure. Furthermore, MC-FRM flood projections are presented in relation to the ground elevation, and therefore flood depth data is used to determine if an elevated structure, such as a bridge, is vulnerable.

Coastal storm flooding probabilities are presented as a percent annual chance of occurrence; for example, a 1% chance storm event has a 1 in 100 chance of occurring each year, and can also be said to have a 1% coastal flood exceedance probability (CFEP).

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[9] MEMA & EOEEA, 2018. Massachusetts State Hazard Mitigation and Climate Adaptation Plan. Prepared by Massachusetts Emergency Management Agency and Executive Office of Energy and Environmental Affairs. Prepared for the Commonwealth of Massachusetts. September 2018.

[10] Bosma et al., 2021. Assessing the vulnerability of MassDOT's coastal transportation systems to future sea level rise and coastal storms, and developing conceptual adaptation strategies.

The sea level rise inputs for MC-FRM are derived from the Massachusetts-specific probabilistic projections[11] downscaled from global climate models.

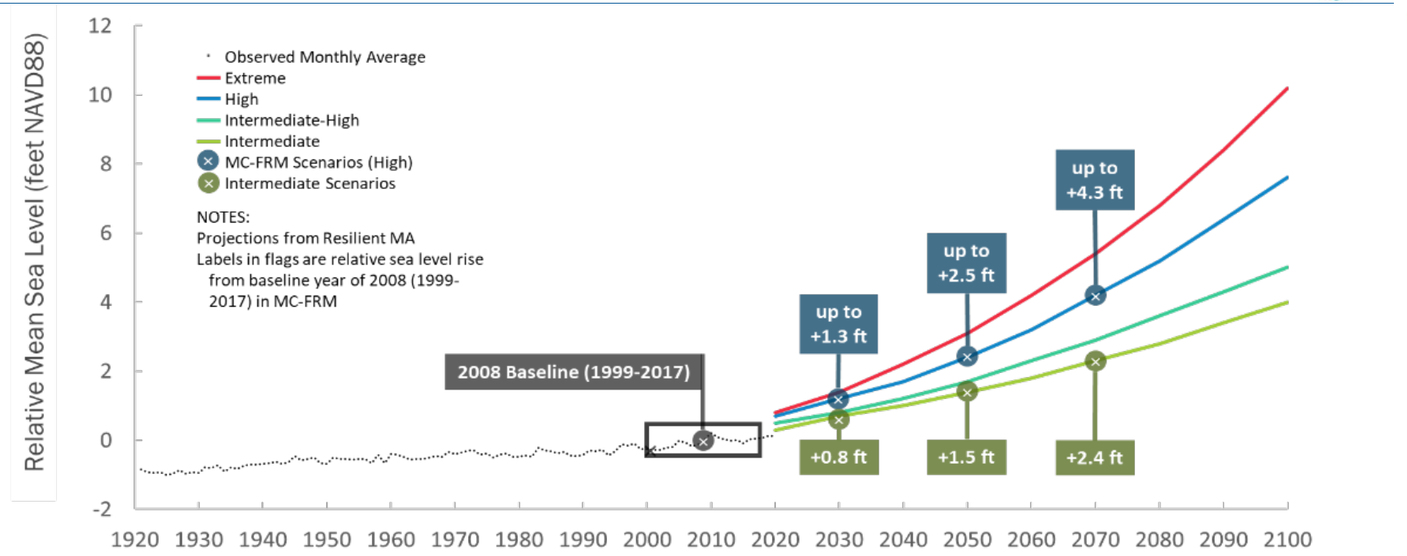
These local projections incorporate the best available information on the impacts of a range of greenhouse gas emissions, ocean thermal expansion, and ice sheet melt, and provide a range of sea level rise scenarios based on these parameters. From among four scenarios (Intermediate, Intermediate-High, High, Extreme), EOEEA selected the High scenario for planning purposes in Massachusetts. The High scenario projections are conservative in nature, in that they are very unlikely to underpredict sea level rise across a spectrum of potential greenhouse gas emissions futures that do not meet the targets of the Paris Agreement (both rising or slowly declining scenarios) even when accounting for contributions from ice sheet melt. This scenario used in MC-FRM projects mean sea level in Boston to be no more than 1.3 feet above the 2008 baseline (updated 1999-2017 tidal epoch) by 2030, no more than 2.5 feet above the baseline by 2050, and no more than 4.3 feet above the baseline by 2070 (blue line in Graphic 2.3.19-1). The extreme (maximum physically plausible) scenario was not considered in the model. For reference, the Intermediate scenario (green line in Graphic 2.3.19-1) has a 50% or higher chance of underpredicting sea level rise across the spectrum of potential greenhouse gas emissions futures when factoring in ice sheet melt, and is therefore not ideal for planning large and potentially vulnerable infrastructure projects.

MC-FRM was used to directly evaluate potential resiliency issues in the Project Area under existing conditions (i.e., No Action).

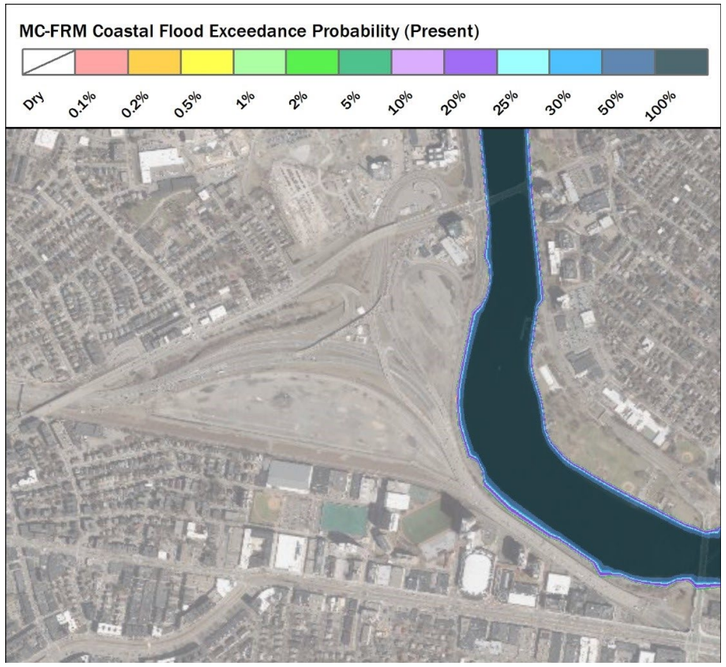
Since the Charles River Dam is not projected to be flanked or overtopped by coastal flooding under Present and 2030 conditions, MC-FRM predicts no chance of flooding in the Project Area outside of the banks of the Charles River during a 1% annual chance storm event, and only minor edge flooding from excessive river discharge in a 2030 0.1% annual chance event (Graphics 2.3.19-2 and 2.3.19-3). Potential flanking and overtopping of the Charles River Dam may cause flooding (combination coastal storm surge and river discharge) in the Project Area at the 2050 and 2070 time horizons.

Projected flanking of the Charles River Dam by coastal storm surge on the 2050 time horizon may cause flooding in the Project Area (Graphic 2.3.19-4). Under 2050 climate projections, MC-FRM predicts a 2% annual chance storm (or stronger) would produce combined coastal/riverine flooding along the banks of the Charles River, penetrating further inland near Cambridge Street. Flooding during the less likely 1% annual chance event would be more severe, extending up to about 700 feet inland. Flooding would affect the current layout of the PDW Path, SFR, and portions of the railway under I-90 at the eastern end of the Project Area, and would affect the current layout of the PDW Path, SFR, and a portion of Cambridge Street at the northern end of the Project Area. Flooding at this level would cause temporary disruption to traffic, and potentially cause permanent damage to infrastructure.

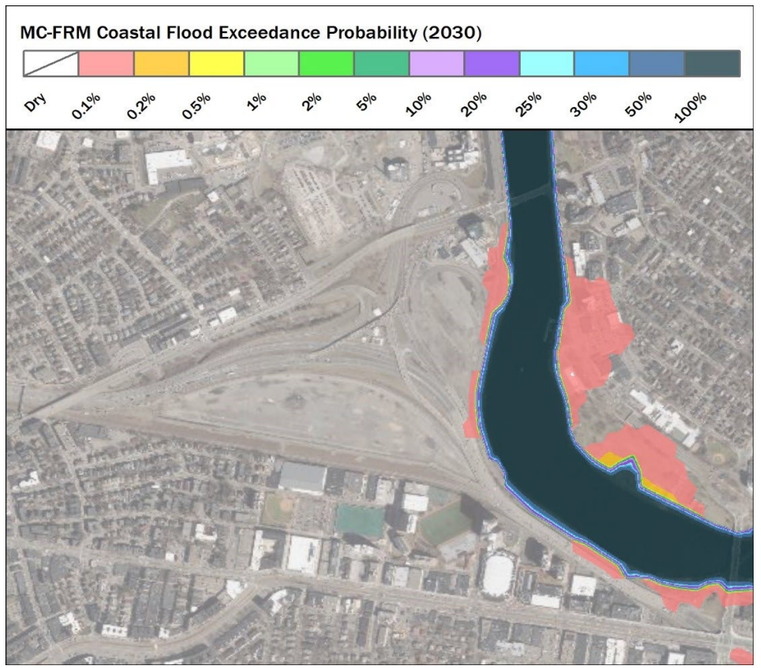
Projected flanking and overtopping of the Charles River Dam by coastal storm surge on the 2070 time horizon may cause more extensive flooding in the Project Area (Graphic 2.3.19-5). Under 2070 climate projections, MC-FRM predicts a 10% annual chance storm (or stronger) would produce combined coastal/riverine flooding along the banks of river, penetrating further inland near Cambridge Street (up to about 2,600 feet



Graphic 2.3.19-1: ResilientMA Mean Sea Level Projections for Boston



Graphic 2.3.19-2: MC-FRM Coastal Flood Exceedance Probability – Present

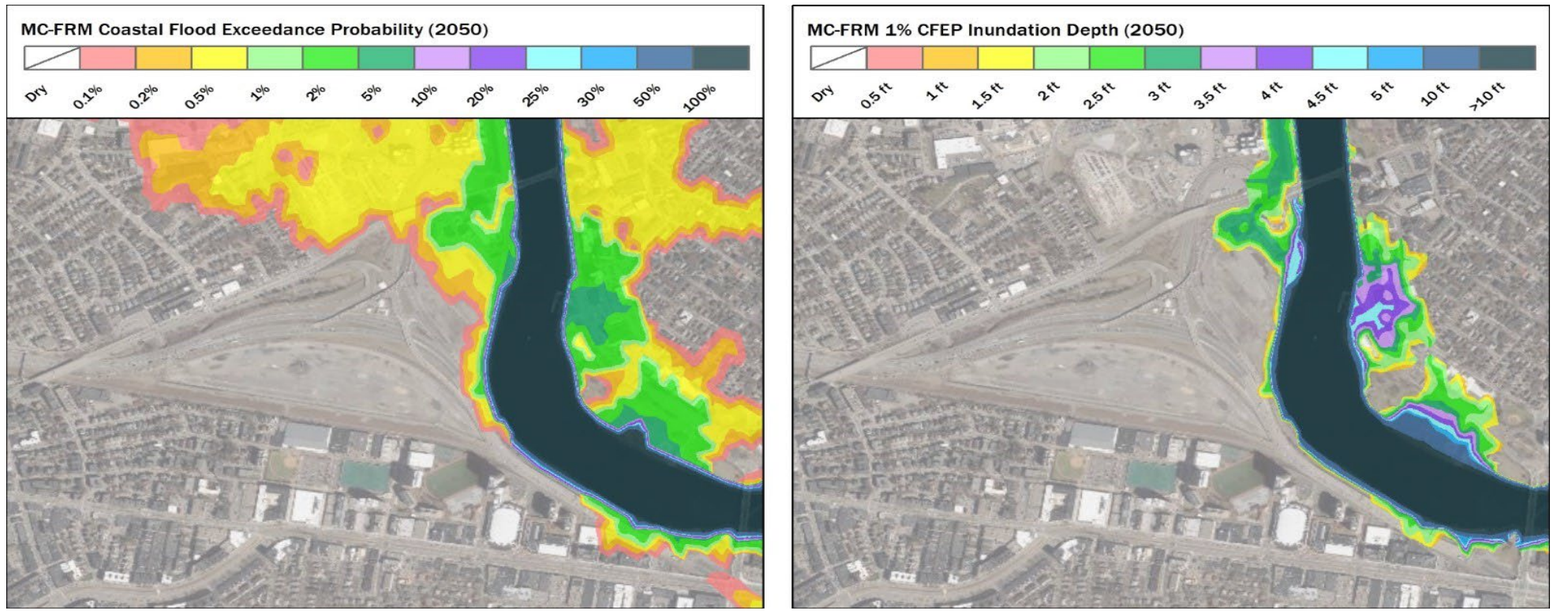


Graphic 2.3.19-3: MC-FRM Coastal Flood Exceedance Probability – 2030

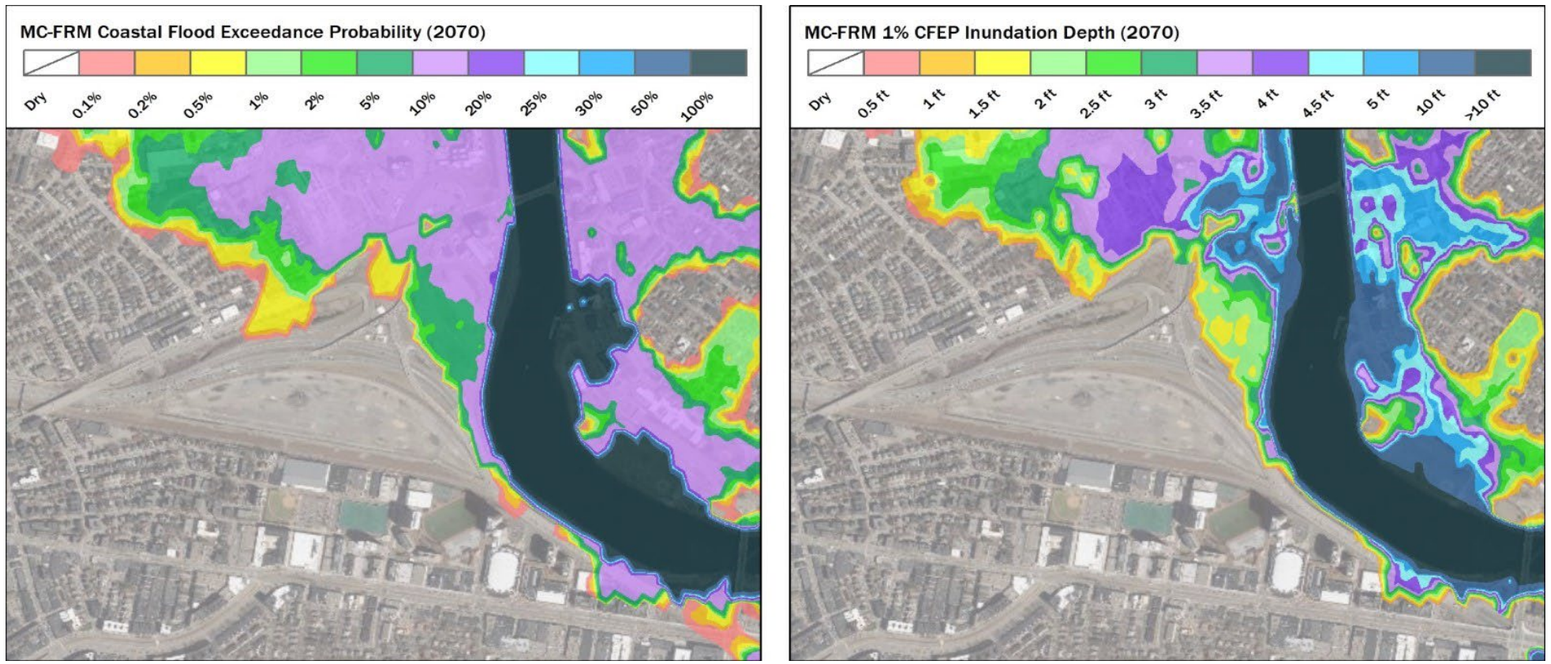
[11] DeConto and Kopp, 2017. Massachusetts Sea Level Assessment and Projections. Technical Memorandum.

land). A 1% annual chance storm event in the 2070 scenario would flood the entire length of the current PDW Path and SFR layout in the Project Area, extend across the railway under I-90 at the eastern end of the Project Area and into the BU campus, and extend further into the Cambridge Street interchange area at the northern end of the Project Area. Flooding hazards would extend up to about 3,000 feet inland. Furthermore, inundation depths would increase as high as 10 feet above SFR and adjacent development, decreasing in depth the further inland the flood extends. Flood depths of this magnitude are anticipated to cause permanent damage to infrastructure and pose a serious risk to public health and safety.

Additional MC-FRM performance modeling indicates that addressing Charles River Dam flanking and overtopping issues would eliminate the risk of flooding in the Project Area, even from the severe threat of a 1% annual chance storm under 2070 climate projections. For this analysis, adaptation design elevations were input in the model to address direct overtopping and flanking at the Charles River Dam, as well as various indirect flanking pathways for both the Charles River Dam and Amelia Earhart Dam including Draw Seven Park in Somerville, Island End River in Chelsea, MBTA Bus Depot in Charlestown, Gateway/Casino property in Everett, and Schrafft's City Center in Charlestown. Graphic 2.3.19-6 shows the results of this performance modeling, demonstrating that appropriate adaptation of the dam and local flood pathways could largely eliminate future long-term flood vulnerabilities in the Project Area and limit flood exposure in the Charles River Basin to river discharge and stormwater inundation. The U.S. Army Corps of Engineers (USACE) and Massachusetts Department of Conservation and Recreation (DCR) are currently developing a study to assess the climate resiliency of the Charles River Dam.



Graphic 2.3.19-4: MC-FRM Coastal Flood Exceedance Probability and 1% CFEP Inundation Depth – 2050



Graphic 2.3.19-5: MC-FRM Coastal Flood Exceedance Probability and 1% CFEP Inundation Depth – 2070

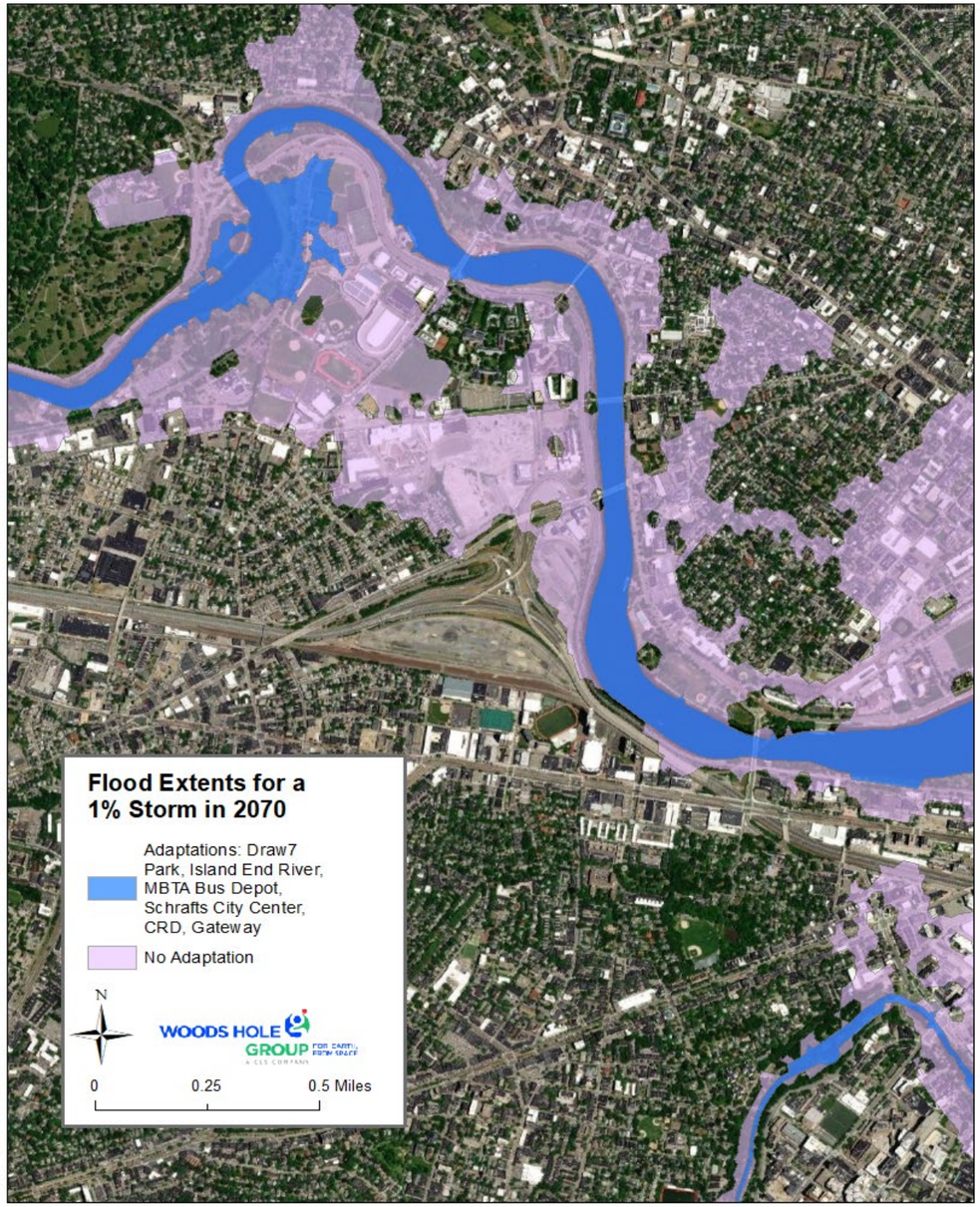
The proposed Project and Throat Area options will result in changes to road surface elevations and grading of the land in the Project Area. Final grading plans were not available for the proposed actions at the time of this analysis, so MC-FRM performance modeling was not conducted. The below review of alternatives from a coastal resiliency standpoint consisted of comparing Project elevations in plan-view and cross-section to MC-FRM projected water levels (Table 2.3.19-1) specific to 2050 and 2070 Charles River conditions. This review assumed that no action is taken to address dam overtopping or flanking pathways.

In advancing Project alternatives, reference to the Massachusetts RMAT Climate Resilience Design Standards & Guidelines (resilientma.org/rmat_home/designstandards/) should be made. The RMAT tool uses the latest climate projections to generate a preliminary climate exposure, risk rating, and recommended design standards for projects. The tool also provides guidelines and forms to help project managers integrate site suitability, regional coordination, and flexible adaptation considerations into climate resilient planning and design. For the purposes of this work, the MC-FRM model represents the best available science regarding flood hazard exposure. It is important to note that RMAT requires consideration of target design flood elevations based on flood hazards, but if they can't be feasibly met, the basis of design must explain why and aim to accommodate such hazards by incorporating flexibility, such as a phasing strategy, into design.

Table 2.3.19-1: 2050 and 2070 Water Surface Elevations

Exceedance Probability	0.1%	0.2%	0.5%	1%	2%	5%	10%	20%	25%	30%	50%	100%
2050 WSE (ft NAVD88)	11.4	10.8	10.0	9.3	——Charles River managed water level (2.1 ft. NAVD88) ——							
2070 WSE (ft NAVD88)	13.7	13.2	12.5	12.0	11.4	10.7	10.2	9.6	Charles River managed water level (2.1 ft. NAVD88)			

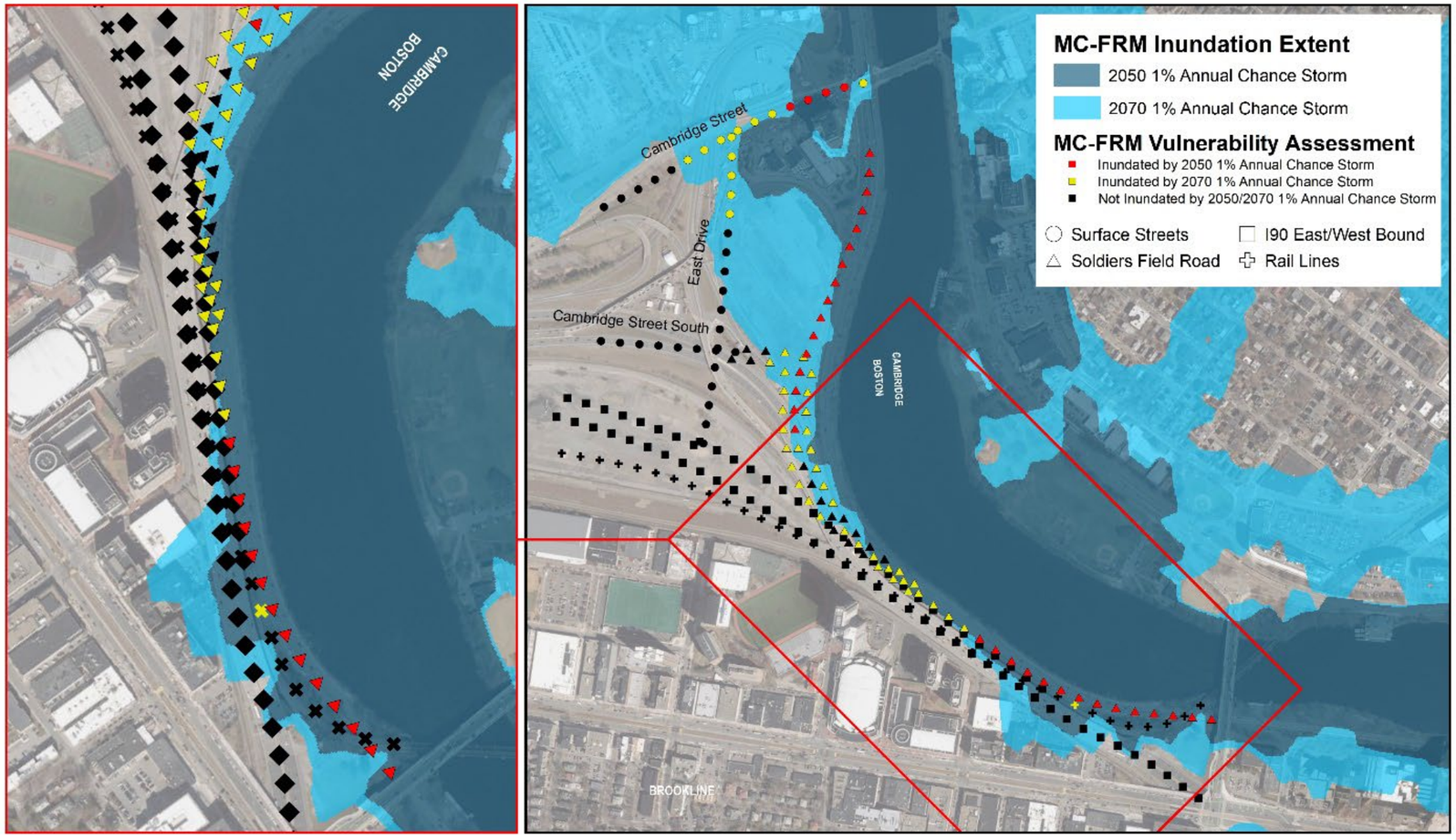
The 2050 1% annual chance water surface elevation used in this analysis is 9.3 ft NAVD88. The 2070 1% annual chance water surface elevation used in this analysis is 12.0 ft NAVD88. MC-FRM indicates flanking of the Charles River Dam during a 1% annual chance event in 2050 and during a 20% annual chance event in 2070, during which coastal storm surge would flood the Charles River Basin above the managed 2.1 ft NAVD88 water level.



Graphic 2.3.19-6: MC-FRM Adaptation Performance Modeling

Modified Highway Viaduct. Various elements of the Modified Highway Viaduct roadway layout in the Project Area are potentially vulnerable to coastal flooding under 2050 and/or 2070 conditions (Graphic 2.3.19-7 and Figures 2.3.19-1 and 2.3.19-2), when projected storm surge may flank or overtop the Charles River Dam. The proposed I-90 alignment is not vulnerable to any coastal inundation, either because it is not located in an area projected to flood (western portions), or because it is elevated on the viaduct (eastern portions) and Throat. The entire proposed PDW Path and SFR alignments are potentially vulnerable to flooding under 2050 and/or 2070 conditions due to their low elevation and adjacency to the Charles River. In the Throat Area, some portions of the GJR and WML rail lines may be impacted by direct and/or conveyed flooding under 2050 and/or 2070 conditions, but western portions of the railways are not projected to flood. Finally, some portions of the surface streets in the northern Project Area (Cambridge Street and East Drive) may flood under 2050 and/or 2070 conditions due to extended overbank flooding in the low-lying northern portion of the Modified Highway Viaduct option.

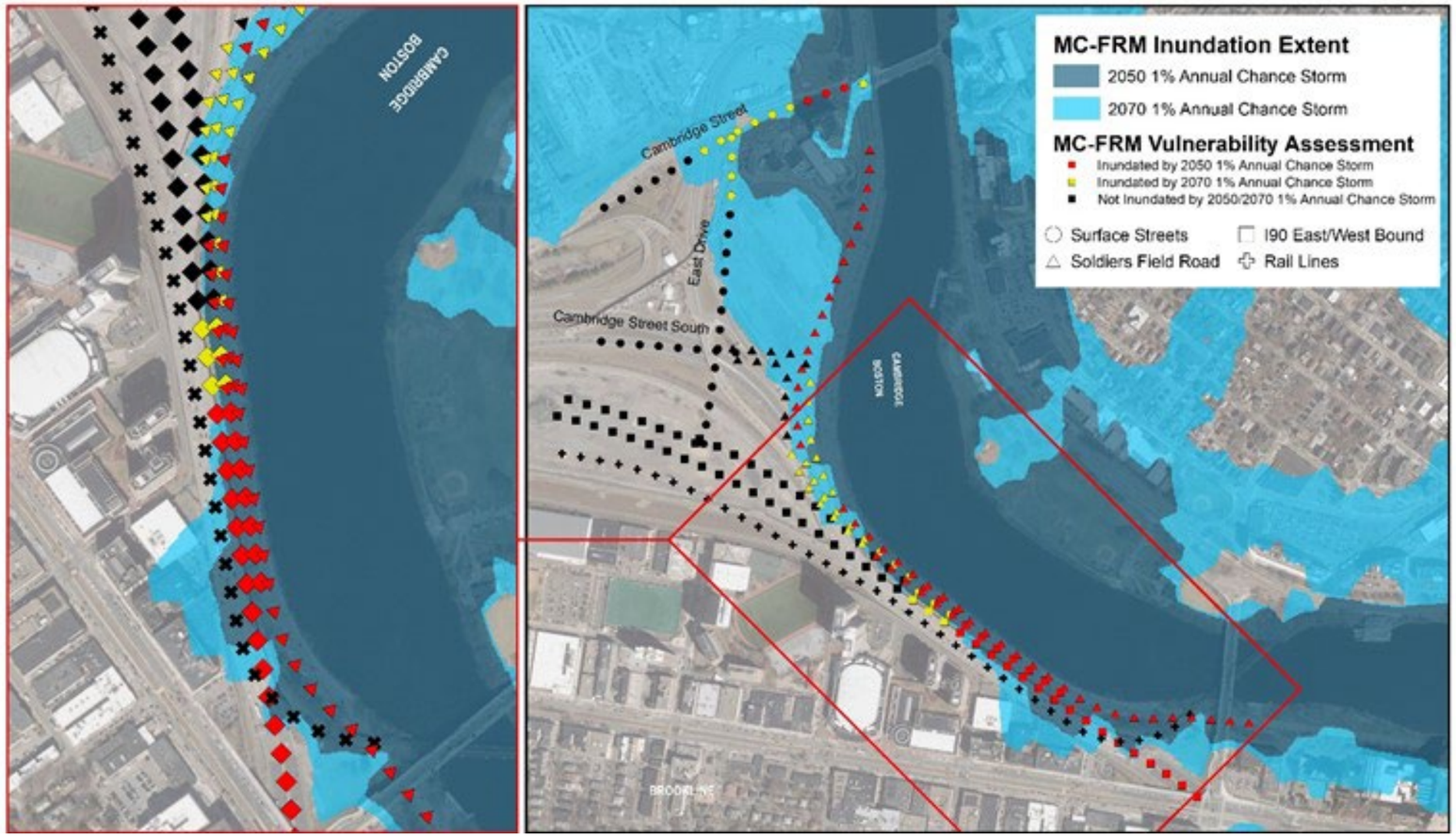
For the Modified Highway Viaduct, flood vulnerability in the Throat could be mitigated by elevating the PDW Path and associated open space, building a flood barrier in the PDW open space, or constructing a flood barrier system along the outer piers of the viaduct (which would only protect the inboard portions of the railway). In the northern portion of the Project Area, adding elevation to landscape elements and/or at-grade roadways (SFR and Cambridge Street) would enhance resilience of both the Project and future development in the vicinity.



Graphic 2.3.19-7: Modified Highway Viaduct Vulnerability – 3L Realignment Plan

Modified At-Grade. Most elements of the Modified At-Grade roadway layout that are in flood-exposed portions of the Project Area are potentially vulnerable to coastal flooding under 2050 and 2070 conditions (Graphic 2.3.19-8 and Figures 2.3.19-3 and 2.3.19-4), when projected storm surge may flank or overtop the Charles River Dam. The entire proposed PDW Path and SFR alignments, as well as eastern portions of the proposed I-90 alignment in the Throat are all potentially vulnerable to direct or conveyed coastal inundation under 2050 and 2070 conditions due to their low elevation and adjacency to the Charles River. The proposed GJR and WML rail lines are not vulnerable to coastal inundation, either because they are not located in an area projected to flood (western portions), or because they are elevated on fill (eastern portions and Throat). Finally, some portions of the surface streets in the northern Project Area (Cambridge Street and East Drive) may flood under 2050 and/or 2070 conditions due to extended overbank flooding in the low-lying northern portion of the Modified At-Grade variant.

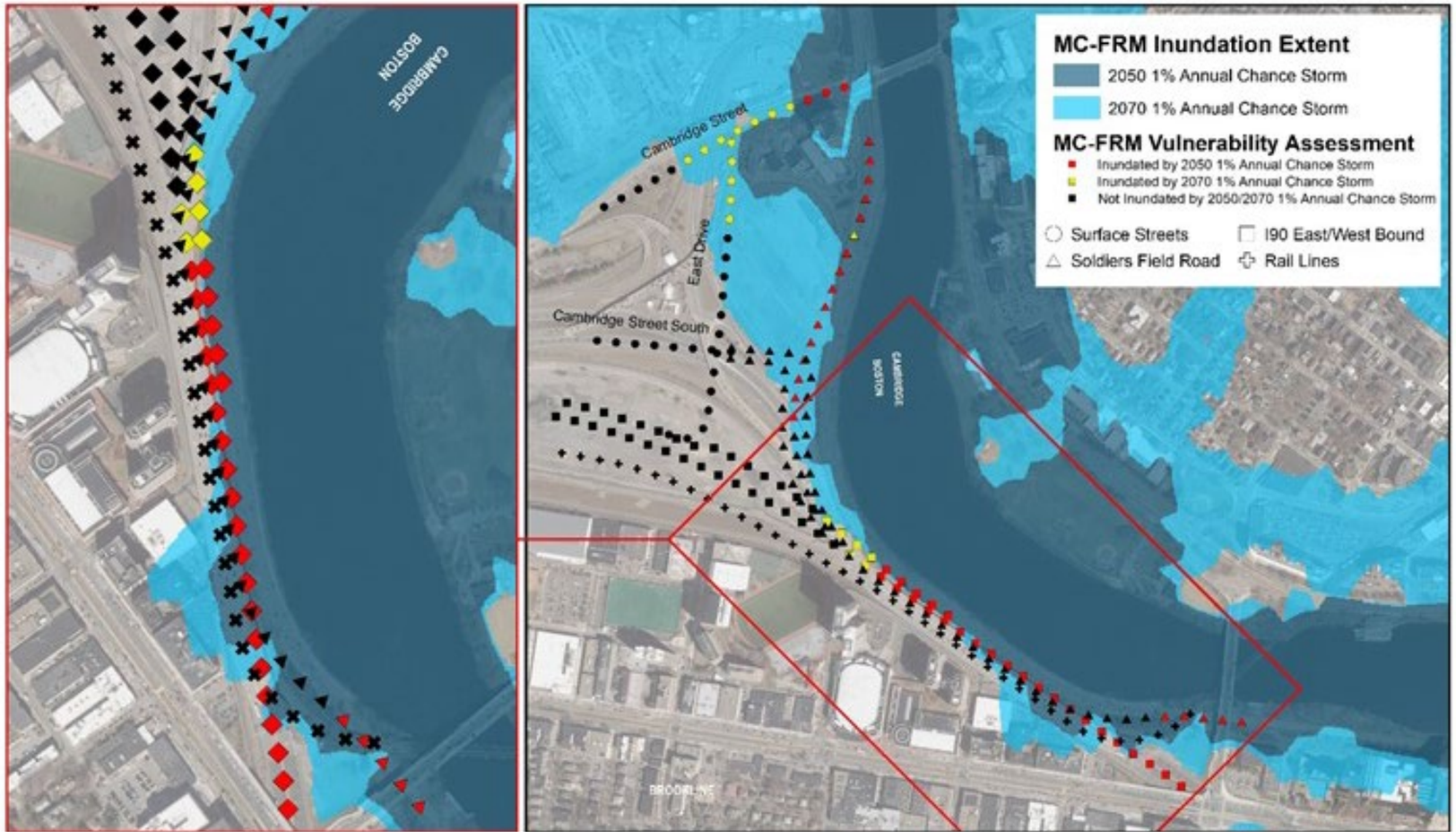
For the Modified At-Grade, flood vulnerability in the Throat could be mitigated by elevating the roadways or by constructing a flood barrier between two of the roadways (which would only protect those roadways behind the barrier) or using landscape elements where space allows. In the northern portion of the Project Area, adding elevation to landscape elements and/or at-grade roadways (SFR and Cambridge Street) would enhance resilience of both the Project and future development in the vicinity.



Graphic 2.3.19-8: Modified At-Grade Vulnerability – 3L Realignment Plan

SFR Hybrid. Various elements of the SFR Hybrid roadway layout in the Project Area are potentially vulnerable to coastal flooding under 2050 and/or 2070 conditions (Graphic 2.3.19-9 and Figures 2.3.19-5 and 2.3.19-6), when projected storm surge may flank or overtop the Charles River Dam. The proposed I-90 alignment is not vulnerable to coastal inundation in the western portions, because it is not located in an area projected to flood, but is vulnerable to 2050 and 2070 direct and conveyed flooding along eastern portions (the Throat). The entire proposed PDW Path and northern portions of SFR are potentially vulnerable to flooding under 2050 and/or 2070 conditions due to their low elevation and adjacency to the Charles River. In the Throat Area, SFR is not vulnerable to flooding (because it is elevated on a viaduct) until the at-grade portion near the BU Bridge, which is potentially vulnerable under 2050 and 2070 conditions. The proposed GJR and WML rail lines are not vulnerable to coastal inundation, either because they are not located in an area projected to flood (western portions), or because they are elevated on fill (eastern portions and Throat). Finally, some portions of the surface streets in the northern Project Area (Cambridge Street and East Drive) may flood under 2050 and/or 2070 conditions due to extended overbank flooding in the low-lying northern portion of the SFR Hybrid option.

For the SFR Hybrid, flood vulnerability to I-90 in the Throat could be mitigated if the dividing elements between PDW Path and I-90 could be constructed to sufficient elevation and floodproofing standards (or using landscape elements where space allows). In the northern portion of the Project Area, adding elevation to landscape elements and/or at-grade roadways (SFR and Cambridge Street) would enhance resilience of both the Project and future development in the vicinity.



Graphic 2.3.19-9: SFR Hybrid Vulnerability – 3L Realignment Plan

2.3.19.2 Extreme Precipitation

Precipitation projections for the Commonwealth of Massachusetts were developed by the Northeast Climate Adaptation Science Center (NECASC) and published on the Massachusetts Climate Change Clearinghouse (resilientMA).

The precipitation projections for the Charles River Basin (NECASC, 2018) indicate that the region will experience increasing annual total precipitation throughout the 21st century, occurring mostly in the Winter and Spring seasons. Compared to the observed baseline (1971-2000 average) of 46.6 inches, annual total precipitation is projected to increase 0.2 to 6.1 inches by 2050 and 0.7 to 8.2 inches by 2100. Projections also indicate potential for more frequent large precipitation events (>1 inch), especially during the Winter season. Compared to the observed baseline (1971-2000 average) of 8 days, annual frequency of large precipitation events (>1 inch) is projected to increase 1 to 3 days by 2050 and 1 to 4 days by 2100.

The Boston Water and Sewer Commission (BWSC) developed approximate stormwater flooding extents from a 10-year, 24-hour rainfall event under various climate conditions (5.6-inch, 5.8-inch, and 6-inch rainfall). The projections (from the Climate Ready Boston Map Explorer) indicate minimal stormwater flooding in the overall Build Alternative area over the near-term, medium-term, and long-term. More recently, BWSC has also developed a citywide Inundation Model which simulates various potential flooding scenarios that could occur due to storm events and sea level rise. Further consideration of this model will be provided in the SDEIR.

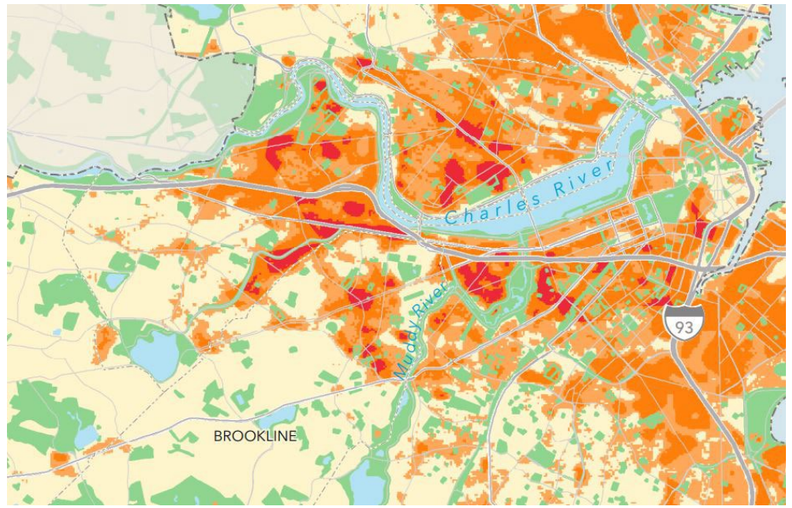
The expectation for increasing total precipitation and increasing frequency of large precipitation events have several implications for the vulnerability of the existing transportation infrastructure (MEMA & EOEEA, 2018 and Gopalakrishna et al., 2013). Roadways and railways may experience disruptions in access with increased flooding and/or winter precipitation. Transportation infrastructure and associated stormwater infrastructure may sustain damage from flooding events that exceed the design capacity.

The proposed infrastructure will be subject to similar vulnerabilities as described above, due to increased rain, snow/ice, and stormwater. As discussed in Section 2.3.17, the vulnerability assessment for the overall Build Alternative and Throat Area Options infrastructure (roadway, railway, stormwater management) will incorporate future precipitation and future flood elevations at the Charles River as tailwater conditions. Stormwater infrastructure is currently designed for the Present Day 10-yr design storm and may not be adequate for climate conditions over the useful life of the overall Build Alternative.

2.3.19.3 Heat

Temperature projections for the Commonwealth of Massachusetts were developed by the Northeast Climate Adaptation Science Center (NECASC) using the Local Constructed Analogs statistical downscaling approach based on fourteen IPCC global climate models, selected for their applicability to the Northeast US region, and medium and high greenhouse gas emissions pathways (RCP4.5 and RCP8.5).

As shown on Graphic 2.3.19-10, the temperature projections for the Charles River Basin (NECASC, 2018)[12] indicate that the Project Area will experience increasing average (1), maximum, and minimum temperatures throughout the 21st century. Compared to the observed baseline (1971-2000 average) of 49.4°F, annual average temperatures are projected to increase 2.7°F to 6.1°F by mid-century and 3.5°F to 10.7°F by end of century. Compared to the observed baseline (1971-2000 average) of 81.0°F, summer maximum temperatures are projected to increase 2.5°F to 6.9°F by mid-century and 3.6°F to 12.9°F by end of century. Compared to the observed baseline (1971-2000 average) of 18.8°F, winter minimum temperatures are projected to increase 2.9°F to 7.0°F by mid-century and 4.1°F to 10.3°F by end of century.



Graphic 2.3.19-10: Temperature Projections for Charles River Basin

The projected increases in average and maximum temperatures may result in additional extreme heat days. NECASC (2018) projects that, compared to the observed baseline (1971-2000 average) of 9 days annually above 90°F, the region will experience an additional 10 to 35 extreme heat days by mid-century and an additional 15 to 76 extreme heat days by end of century. The projected increases in average and minimum temperatures may result in fewer days below freezing. NECASC (2018) projects that, compared to the observed baseline (1971-2000 average) of 136 days annually with minimum temperatures below 32°F, the region will experience 17 to 39 fewer days below freezing by mid-century and 22 to 63 fewer days below freezing by end of century.

These climate change projections for increasing temperatures, increasing frequency of extreme heat events, and decreasing frequency of below freezing conditions have several implications for the vulnerability of the proposed roadway and railway infrastructure (MEMA & EOEEA, 2018 and Gopalakrishna et al., 2013). Increasing annual average and summer maximum temperatures may result in increasing structural impacts to pavement and bridge joints due to thermal expansion and stress. Extreme heat can also cause railroad tracks to expand, increasing the risk of train derailment. Warming winters and a shifting rain/snow line may reduce the need for snow removal (reducing winter travel hazards as well as the impacts of plowing to the roadbed) but may simultaneously increase the need for stormwater and ice management as melted snow and rain accumulate and cycle above and below freezing. If temperatures fluctuate around freezing, there is also the potential for rapid freeze/thaw cycles to damage pavement and bridge joints.

The climate change projections for increasing average and maximum temperatures, and for increasing frequency of extreme heat events, also has implications for the Project Area as a whole. Urbanized areas experience heat island effects, which may be exacerbated by climate change. Since the Project is set within a transportation corridor in a highly developed area, has little vegetation, and has a high proportion of impervious surface cover, it is highly vulnerable to urban heat island impacts. Metro Mayors data from July-August 2015 (TPL and MAPC, 2017)[13], using daytime and nighttime satellite imagery, identified the Project Area as an urban heat island hotspot where land surface temperatures average at least 1.25 degrees above the mean daily temperature (See Graphic 2.3.19-11). Additionally, a 2019 National Integrated Heat Health Information System Heat Watch Report for Boston (NIHHIS-CAPA, 2019)[14] documented the incidence and retention of high temperatures and heat index in the Project Area.

Table 2.3.19-2 compares existing landcover in the Project Area to the estimated landcover for the proposed alternatives. Impervious surface area is a primary driver of the urban heat island effect. Impervious surfaces in the urban fabric can be paved surfaces (such as roads, sidewalks and parking lots) or building surfaces (such as roofs). Since the proposed Project would alter roadways, these are the focus of this assessment.

Table 2.3.19-2: Comparison of existing landcover in the Project Area to Estimated Landcover for the Proposed Alternatives

Cover Type	Existing	3K At-Grade	3K HV	3K SFR
Impervious (acres)	78.9	77.6	77.6	77.7
Pervious (acres)	62.8	64.1	64.1	64.0

All three proposed alternatives would reduce impervious area within the Project Area from current levels. Given the relatively small reduction in impervious surface cover (1.2 to 1.3 acres depending on alternative) in the context of the Project Area, no alternative is likely to significantly reduce the urban heat island effect in the Project Area on its own. However, integration of high-albedo surfaces, street trees, and potentially increasing vegetated impervious surface area within the layout would all help to reduce heat-related impacts in the Project Area.

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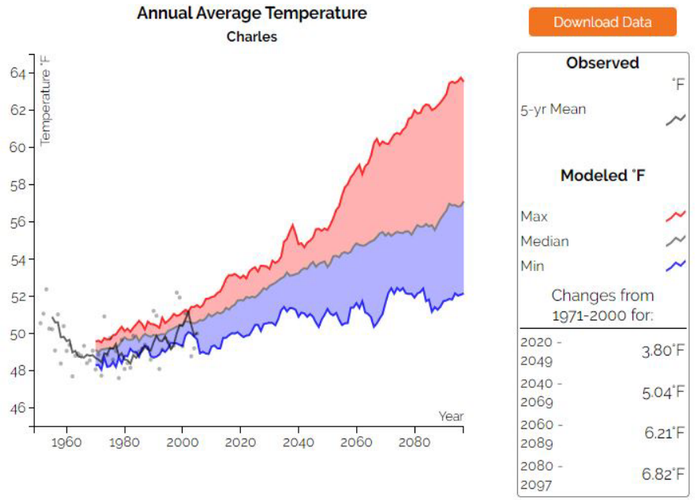
[12] National Integrated Heat Health Information System and CAPA Strategies. 2019. Heat Watch Report – Boston, Massachusetts. https://nihhis.cpo.noaa.gov/Urban-Heat-Island-Mapping/UHI-Campaigns/Campaign-Cities

[13] Trust for Public Land and Metropolitan Area Planning Council. 2017. Urban Heat Islands – Climate Smart Cities: Metro Mayors Climate-Smart Region. https://web.tplgis.org/bostonmetromayorsecure/pdfmaps/ClimateSmart_MetroBoston_Cool_Combined_34x44_20171113.pdf

[14] National Integrated Heat Health Information System and CAPA Strategies. 2019. Heat Watch Report – Boston, Massachusetts. https://nihhis.cpo.noaa.gov/Urban-Heat-Island-Mapping/UHI-Campaigns/Campaign-Cities



Graphic 2.3.19-11: Comparison of existing landcover in the Project Area to the estimated landcover for the proposed alternatives

2.3.20 Oil and Hazardous Materials

Since much of the information related to the presence of oil and hazardous materials (OHM) in the Project footprint that was presented in the DEIR is related to historic releases, the majority of which have achieved some measure of regulatory closure, much of this information remains unchanged. There have been modest advances in evaluation of ongoing investigations, but none that substantially alter known OHM conditions. Consistent with the DEIR, Project impacts to known conditions will continue to be felt largely through management of OHM impacted media during construction phase earthwork and mitigation to accommodate anticipated uses, if warranted. This has changed only insofar as current design requires disturbance in previously unanticipated areas. Since the DEIR, the 3K-AMP (Grand Junction Rail Bridge over I-90) variation has been modified to become the SFR Hybrid option, which places SFR on a bridge over I-90 instead of the GJR lines. The SFR Hybrid option has a significant amount of cut within the Throat Area and increased quantities of potentially OHM impacted materials could be encountered. Dredging required for the SFR trestle may yield significant OHM impacted material and require construction phase staging to manage and dewater dredge spoils prior to evaluation and off-site re-use or disposal.

Modifications to the Highway Viaduct and At-Grade options were fairly minor with respect to additional management of potentially OHM impacted materials. Regarding Project changes outside of the Throat Area, a few of the DEIR Preferred Interchange Alternative 3K network roadways have changed locations. West Station and rail yard locations have flipped, Malvern Street Transitway has been added, etc. and is now referred to as 3L Re-alignment Alternative. These changes would precipitate some modest changes in OHM management schemes, depending on excavation and the nature of the OHM impacts.

2.3.21 Construction Impacts

Construction staging for MassDOT's Preferred Interchange Alternative including West Station and BPY will be constructed in several stages, and the Project elements will be constructed under a contractual framework to be determined by the Project's funding participants. The three Throat Area options will generally follow the DEIR 3K preferred interchange alternative staging plans except for the temporary I-90 ramp connections to facilitate the new SFR Hybrid and Modified At-Grade options. The scope of work included in each stage will be based on maintaining three available travel lanes in each direction on I-90 and two available lanes in each direction on SFR at all times to accommodate peak traffic flow. Pedestrian and bicycle facilities along Cambridge Street and PDW Path will be maintained at all times on temporary and permanent alignments.

Each Throat Area option will provide two WML tracks when MBTA Railroad Operations construction criteria is met to ensure safe commuter rail operations throughout construction. However, a minimum of one WML track is required to maintain MBTA commuter rail service at all times. Short-term outages are expected for all three Throat Area options. The PDW Path would be maintained throughout construction on temporary and permanent alignments. Preliminary construction impact summaries to the Worcester Main Line, GJR and PDW Path, as well as construction durations, developed for the three Throat Area options are provided in Table 2.3.21-1.

At this time, single track operations are anticipated to be required during some portion of construction for each of the three Throat Area options. A full analysis will be included in the SDEIR. MassDOT anticipates that in order to build the Project, each of the Throat Area options may require a temporary reduction of a segment of the Worcester Main Line to a single track to allow construction along track areas. If single track operations are unavoidable, they would be limited to the relatively short area of the track within BPY and the Throat Area. Phases of construction that require overhead or adjacent construction or demolition (including columns and foundations), as well as periods when either the WML or the proposed Grand Junction tracks and retaining structure are built on adjusted alignments and profiles would restrict WML operations. MassDOT and MBTA will continue to work to explore options to minimize operational impacts during construction. For analysis purposes, the Project team has estimated that the single-track operation would be up to one mile in length, from a point east of Boston Landing station to the Commonwealth Ave overpass. Analysis conducted for this scenario indicates that single track operation over this corridor area would result in no significant impacts to on-time performance (OTP), though minor schedule adjustments may be implemented to maintain OTP. More detailed construction impacts to the Worcester Main Line, GJR and PDW Path, as well as construction durations, for the three Throat Area options will be updated and provided in the SDEIR. In addition, overall Project conceptual staging plans, including MassDOT's preferred interchange, the street grid, WML, GJR, West Station and BPY for the three Throat Area options will be updated and provided in the SDEIR.

Modified Highway Viaduct Option. The general sequence of construction for the Modified Highway Viaduct option would be similar to the DEIR Highway Viaduct (3K-HV) variation. Conventional bridge replacement techniques, such as temporary widening of the permanent elevated structure, would be utilized to facilitate construction of the permanent I-90 elevated structure in stages while maintaining three travel lanes in both directions. SFR traffic, two lanes in each direction, and the PDW Path would be maintained at all times, shifting in location while the permanent infrastructure is constructed. Construction complexities would be minimized since the alternative does not change the general horizontal and vertical locations of the WML, GJR, I-90, SFR and PDW Path infrastructure. Impacts to the Charles River to facilitate construction would not be required for the Modified Highway Viaduct option.

Table 2.3.21-1: Construction Impacts and Duration-Throat Area Options

Preferred Interchange 3L Project Component	Modified Highway Viaduct	Modified At-Grade	SFR Hybrid
Worcester Mainline Construction Impacts	May either be shielded, shifted and/or reduced single-track operations for certain periods of time		
Grand Junction Construction Shutdown	Remains open throughout most of the construction period.	Must be closed early on during construction and remain closed throughout much of construction.	
PDW Path Construction Impacts	Temporary intermittent closures for path relocations		
Highway Operations/Travel Lane Construction Impacts	Low (maintains existing horizontal and vertical geometry for temporary I-90 alignments)	Intermediate (requires horizontal and vertical geometry re-alignments for temporary I-90 alignments)	High (requires complex horizontal and vertical geometry re-alignments for temporary I-90 alignments)
Construction Duration	6-7 years	6-7 years	8-9 years

The DEIR indicated that to maintain service on the WML during construction, single-track operations could be required for the section of track within the Project limits, although short-term outages could be expected for all three options. The DEIR also explained that further engineering would be needed. Specific to the Highway Viaduct, the DEIR anticipated 24 months of intermittent impacts and low speed operations. The DEIR indicated that under the 3K-HV variation, the GJR bridge over SFR would not be reconstructed. Few short-term outages of the GJR would be required to build new viaduct columns adjacent to the track and to accomplish overhead construction. The Modified Highway Viaduct option still would not require long-term closure of the GJR, but may require intermittent closures for construction staging and access, as the Modified Highway Viaduct would not require construction of temporary or permanent roadways in the place of the Grand Junction tracks, as would be the case under the Modified At-Grade and SFR Hybrid options (see below). The Modified Highway Viaduct option would not take the bridge over SFR out of operation for reconstruction or alteration. A suggested general sequence of construction and a full analysis of anticipated impacts to WML and GJR during construction will be provided in the SDEIR.

Modified At-Grade Option. The general sequence of construction for the Modified At-Grade would be similar to the DEIR At-Grade (3K-ABC) variation except for the approach to construct a temporary connection from the existing viaduct to the re-aligned I-90 within the interchange. The temporary connection would carry I-90 EB and WB while the temporary at-grade I-90 WB alignment is constructed so demolition of the I-90 WB portion of viaduct could begin, allowing for the construction of the temporary at-grade I-90 EB within the demolished I-90 WB viaduct corridor. The complexities of constructing a temporary connection from the existing viaduct to the realigned I-90 warranted further study. The Modified Highway Viaduct approach to temporarily widen the existing viaduct to carry I-90 WB and allow for shifting of existing I-90 EB travel lanes to the existing I-90 WB corridor to facilitate viaduct demolition can also be applied to the

Modified At-Grade option. Three I-90 travel lanes in both directions, two SFR travel lanes in each direction and the PDW Path would be maintained throughout majority of the construction duration. Lane closures will be required to lower I-90 profile directly west of the Commonwealth Avenue bridge over I-90 and WML. Lane closures could be conducted in a similar approach to that employed during replacement of the Commonwealth Avenue bridge by implementing temporary traffic crossovers over weekends to allow for full closure of I-90 EB or WB barrels.

As the construction staging plans are being advanced, it appears the Modified At-Grade option has a greater potential to maintain four lanes for certain stages, rather than the minimum three lanes, which would improve traffic operations during construction. This option's construction of the PDW Path on a boardwalk would impact the Charles River including the relocated enhanced riverbank, as described in section 2.3.12.

The DEIR indicated that a minimum of one WML track would be provided for each Throat Area option during construction, although, short-term outages could be expected for all three options. Specific to 3K-ABC, the DEIR anticipated 24 months of intermittent impacts and 12 months of low speed operations. The DEIR also indicated that under 3K-ABC, the GJR Bridge over SFR would be reconstructed, requiring a minimum three-year closure of the GJR during construction. As indicated above and with the other Throat Area options, MassDOT anticipates the need for single track service on the WML during some portion of the construction period under Modified At-Grade.

The Modified At-Grade option would require a long-duration closure of the GJR within the construction period due to its displacement by temporary and permanent roadways and to a lesser extent in order to replace the railroad bridge over SFR. MassDOT anticipates this closure would be up to six years for the Modified At-Grade option. Access to a suitable commuter rail maintenance facility is essential to maintaining railroad operations. Typically, the MBTA would detour trains between the south side and the BET in Somerville via a 100-mile route through Worcester and Ayer. But for long term branch closure, the MBTA will have difficulty supplying the south side system with enough trains to continue reliable service. This may be addressed by advancing an MBTA project to build a new maintenance facility on the south side. The South Side Maintenance Facility (SSMF) project design kicked off in the Spring of 2021, with an expected two-year design phase. That project has not yet secured funding for construction. In the absence of a SSMF, MassDOT and MBTA would have to find another vehicle maintenance solution.

SFR Hybrid Option. The general sequence of construction for the new SFR Hybrid option would be significantly different than the DEIR 3K-AMP. Construction would include temporary I-90, SFR, WML, GJR and PDW Path alignments to facilitate demolition of the existing highway viaduct and rail infrastructure and construction of the major utility relocations, depressed I-90, SFR viaduct, elevated GJR and separated PDW Path in different horizontal and vertical locations while maintaining minimum service to all transit users. Constructing all of the transportation elements, especially the SFR viaduct and depressed I-90, in new horizontal and vertical locations will require substantially more area for temporary rail, I-90, SFR and PDW Path alignments and work zones for heavy construction equipment than is required for the Modified At-Grade and Modified Highway Viaduct options. Opportunities to create additional area for construction of temporary and permanent infrastructure are limited due to Buick Street and BU campus building infrastructure immediately south of the GJR and WML rail and the Charles River to the north.

Approximately 7 feet of BU property has already been applied to the narrow Throat Area for the Modified At-Grade and SFR Hybrid options to reduce impacts to the Charles River. Constraints at Buick St and the need to meet the track configuration below the Commonwealth Ave Bridge prohibit further incursion into the BU property. Consequently, to relocate the utilities, stage the construction, build the final Project configuration and maintain operation of all existing transportation modes in the Throat Area, some existing transportation facilities need to be temporarily relocated into the Charles River. By temporarily relocating a portion of I-90 WB, all four SFR travel lanes and the PDW Path into the Charles River, enough workspace becomes available, enabling maintenance of traffic to the greatest extent and facilitating staged construction while also shortening construction duration.

Several temporary SFR trestle and embankment alternatives were evaluated that create varying environmental impacts, cost, stormwater management and constructability characteristics. The selected alternative includes a trestle within the river with embankment (retained fill) at the east and west approaches. MassDOT recognizes this alternative results in the greatest construction duration impacts among the trestle alternatives due to the relative magnitude of temporary fill within the river. It is not as environmentally damaging as the embankment alternative, and schedule, cost, constructability and feasibility benefits of this alternative when compared to the other alternatives are the best that are possible. Construction duration environmental impacts for this option are described in Section 2.3.12. To date, many public and stakeholder comments have been received indicating there is significant concern regarding the realignment of Soldiers Field Road and the Paul Dudley White Path into the Charles River during construction due to potential adverse impacts to the Charles River. Concerns raised by the public regarding impacts to the Charles River include impacts to river users due to narrowing of the watersheet (recreational use surface area), ecological concerns, resiliency concerns, and stormwater management and water quality concerns.

SFR Hybrid conceptual staging plans are being developed to include the trestle. Three I-90 travel lanes in both directions, two SFR travel lanes in each direction and the PDW Path would be maintained throughout majority of the construction duration. Similar to the Modified At-Grade, lane closures will be required to lower I-90 profile directly west of the Commonwealth Avenue bridge over I-90 and WML. Lane closures could be conducted in a similar approach to that employed during replacement of the Commonwealth Avenue bridge by implementing temporary traffic crossovers over weekends to allow full closure of I-90 EB or WB barrels.

The DEIR indicated that a minimum of one WML track would be provided for each Throat Area option during construction, although short-term outages could be expected for all three options. Specific to 3K-AMP, the DEIR anticipated 24 months of intermittent impacts and 12 months of low speed operations. The DEIR also indicated that under AMP, the GJR Bridge over SFR would be reconstructed, requiring a minimum four-year closure of the GJR during construction. As indicated above and with the other Throat Area options, MassDOT anticipates the need for single track service on the WML during some portion of the construction period under SFR Hybrid.

Similar to the Modified-At Grade (see above), the SFR Hybrid would require closure of the GJR for the majority of the construction period due to its displacement by temporary and permanent roadways and also to replace the GLR bridge over SFR. Construction period outages of the GJR for the SFR Hybrid option are the longest of any option, estimated to be 8-9 years. A suggested general sequence of construction staging and a full analysis of anticipated impacts to the WML and GJR during construction, including anticipated cost, timing, and design of a new facility, cost of detours, and operational impacts will be provided in the SDEIR.

2.3.22 Construction Phasing

MassDOT now anticipates constructing the Project in a single phase rather than three distinct phases described in the DEIR. While MassDOT will endeavor to build West Station at the earliest possible time, the expected construction sequence is likely to push its opening near the tail end of the Project timeline. This is primarily due to its flipped, central position in the interchange Project Area. The I-90 realignment through BPY likely needs to be completed before meaningful station construction could be finished.

The BPY area would be utilized as a construction laydown area during much of the construction duration. It would also serve as access/egress for vehicles and equipment to construct the interchange and Throat Area elements. Additional details of anticipated construction phasing, including timing of West Station in the construction sequence, will be provided in the SDEIR. The Project will support concurrent or reasonably foreseeable construction of a future deck and development. It is anticipated that the preliminary engineering and appropriate environmental review and approvals / authorizations for air-rights development would be completed by others concurrent with, or prior to, the I-90 Allston Multimodal Project's state and federal environmental review and advancing the design of the interchange and West Station. Detailed cost breakdowns for each Build Alternative and option by major elements including base construction, contingency, escalation and life cycle costs will be included in the SDEIR. Estimated costs for the No Build Alternative will also be included in the SDEIR for comparative purposes.

2.3.23 Environmental Justice and Public Outreach

2.3.23.1 Environmental Justice

The identification of Environmental Justice (EJ) populations is based on census data indicating block groups with households who meet one or more of the following EOEEA Policy criteria:

- The median annual household income is at or below 65 percent of the statewide annual median household income for Massachusetts ($52,790 of $81,215 in 2019);
- Minorities comprise 40 percent or more of the population;
- 25 percent or more of households lack English language proficiency; or
- Minorities comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income ($121,823 in 2019).

Additionally, the Secretary can designate a geographic portion of a Neighborhood as an EJ population.

The Project team identified an area that extends 1 mile from the Project Area in accordance with the EOEEA Policy criteria. U.S Census block group data, via the Massachusetts 2020 Environmental Justice Populations mapping program and data, indicate there are EJ populations within the 1-mile Designated Geographic Area. The 2020 block groups that fall within this Designated Geographic Area include populations with the minority; minority and income; and minority, income, and English isolation criteria. The block groups within the Project Area and Project's current Designated Geographic Area are described in Table 2.3.23-1.

Table 2.3.23-1: 2020 Environmental Justice Block Groups

Block Group Details	Municipality	Total Population	Total Households	Total Minority Population (%)	Median Household Income ($)	Households with Language Isolation (%)	Block Group EJ Characteristics
EJ Populations within Project Area							
Block Group 2, Census Tract 8.03, Suffolk County, Massachusetts	Boston	3,213	-	47.28	-	-	Minority
Block Group 3, Census Tract 8.02, Suffolk County, Massachusetts	Boston	869	295	50.40	108,185	12.2	Minority
Block Group 4, Census Tract 8.02, Suffolk County, Massachusetts	Boston	1,636	513	52.38	124,271	3.5	Minority
Block Group 1, Census Tract 8.03, Suffolk County, Massachusetts	Boston	2,639	515	45.13	54,821	4.3	Minority and income
Block Group 2, Census Tract 8.02, Suffolk County, Massachusetts	Boston	1,369	664	47.55	50,909	10.8	Minority and income
Block Group 1, Census Tract 8.02, Suffolk County, Massachusetts	Boston	1,117	537	31.69	40,949	30.5	Minority, income and English isolation
EJ Populations within 1 mile of the Project Area							
Block Group 1, Census Tract 2.01, Suffolk County, Massachusetts	Boston	1,244	473	32.2	88,750	16.3	Minority
Block Group 1, Census Tract 5.04, Suffolk County, Massachusetts	Boston	1,353	590	46.7	73,333	5.6	Minority
Block Group 1, Census Tract 6.01, Suffolk County, Massachusetts	Boston	921	240	34.7	128,500	17.9	Minority
Block Group 1, Census Tract 7.01, Suffolk County, Massachusetts	Boston	618	356	36.7	61,023	11.5	Minority
Block Group 1, Census Tract 7.04, Suffolk County, Massachusetts	Boston	1,547	687	45.0	63,007	5.5	Minority
Block Group 1, Census Tract 101.04, Suffolk County, Massachusetts	Boston	1,256	657	34.7	109,241	-	Minority
Block Group 1, Census Tract 104.08, Suffolk County, Massachusetts	Boston	1,497	860	43.8	66,389	5.2	Minority
Block Group 1, Census Tract 810.01, Suffolk County, Massachusetts	Boston	549	278	80.5	-	24.1	Minority
Block Group 2, Census Tract 2.02, Suffolk County, Massachusetts	Boston	888	345	30.9	94,185	12.5	Minority
Block Group 2, Census Tract 4.01, Suffolk County, Massachusetts	Boston	1,266	465	26.8	87,135	1.9	Minority
Block Group 2, Census Tract 6.01, Suffolk County, Massachusetts	Boston	1,113	515	40.4	73,750	4.3	Minority
Block Group 2, Census Tract 7.01, Suffolk County, Massachusetts	Boston	553	249	51.4	-	23.7	Minority
Block Group 2, Census Tract 7.04, Suffolk County, Massachusetts	Boston	781	461	49.7	60,375	1.7	Minority
Block Group 2, Census Tract 101.03, Suffolk County, Massachusetts	Boston	1,233	43	62.0	-	-	Minority
Block Group 2, Census Tract 101.04, Suffolk County, Massachusetts	Boston	2,579	442	33.7	78,750	2.9	Minority
Block Group 2, Census Tract 102.04, Suffolk County, Massachusetts	Boston	1,566	415	35.4	76,518	-	Minority
Block Group 2, Census Tract 103, Suffolk County, Massachusetts	Boston	3,992	142	30.2	75,156	-	Minority
Block Group 3, Census Tract 2.02, Suffolk County, Massachusetts	Boston	917	325	39.8	101,573	11.4	Minority
Block Group 3, Census Tract 4.01, Suffolk County, Massachusetts	Boston	937	327	30.0	127,872	3.7	Minority
Block Group 3, Census Tract 4.02, Suffolk County, Massachusetts	Boston	1,281	431	32.2	144,821	1.4	Minority
Block Group 3, Census Tract 7.01, Suffolk County, Massachusetts	Boston	686	316	49.4	87,759	8.9	Minority
Block Group 3, Census Tract 7.04, Suffolk County, Massachusetts	Boston	1,156	604	41.8	79,338	4.8	Minority
Block Group 3, Census Tract 101.03, Suffolk County, Massachusetts	Boston	1,527	73	36.3	-	9.6	Minority
Block Group 3, Census Tract 102.03, Suffolk County, Massachusetts	Boston	1,786	1,113	49.9	68,750	15.4	Minority
Block Group 4, Census Tract 1, Suffolk County, Massachusetts	Boston	1,410	455	42.9	98,523	8.8	Minority
Block Group 4, Census Tract 6.01, Suffolk County, Massachusetts	Boston	1,085	435	38.7	62,596	20.5	Minority
Block Group 4, Census Tract 102.03, Suffolk County, Massachusetts	Boston	730	515	36.7	56,566	3.3	Minority
Block Group 5, Census Tract 7.01, Suffolk County, Massachusetts	Boston	1,836	815	37.3	83,681	7.2	Minority
Block Group 1, Census Tract 4001, Norfolk County, Massachusetts	Brookline	656	212	65.2	-	-	Minority
Block Group 1, Census Tract 4008, Norfolk County, Massachusetts	Brookline	1,003	368	39.2	127,632	19.8	Minority
Block Group 2, Census Tract 4001, Norfolk County, Massachusetts	Brookline	1,029	528	27.0	98,011	4.0	Minority
Block Group 2, Census Tract 4002, Norfolk County, Massachusetts	Brookline	3,266	1,632	39.4	87,063	12.4	Minority
Block Group 2, Census Tract 4003, Norfolk County, Massachusetts	Brookline	1,545	697	46.6	99,688	5.9	Minority

Block Group Details	Municipality	Total Population	Total Households	Total Minority Population (%)	Median Household Income ($)	Households with Language Isolation (%)	Block Group EJ Characteristics
Block Group 3, Census Tract 4001, Norfolk County, Massachusetts	Brookline	1,685	798	42.3	137,143	4.9	Minority
Block Group 3, Census Tract 4002, Norfolk County, Massachusetts	Brookline	2,055	653	30.3	127,411	6.6	Minority
Block Group 3, Census Tract 4003, Norfolk County, Massachusetts	Brookline	1,535	500	28.3	142,250	13.0	Minority
Block Group 3, Census Tract 4008, Norfolk County, Massachusetts	Brookline	2,593	1,308	28.2	66,250	12.6	Minority
Block Group 3, Census Tract 4009, Norfolk County, Massachusetts	Brookline	2,023	752	25.8	118,071	4.0	Minority
Block Group 4, Census Tract 4001, Norfolk County, Massachusetts	Brookline	1,651	773	47.7	123,359	7.9	Minority
Block Group 1, Census Tract 3528, Middlesex County, Massachusetts	Cambridge	365	157	31.5	144,750	-	Minority
Block Group 1, Census Tract 3529, Middlesex County, Massachusetts	Cambridge	1,012	440	32.7	82,262	2.3	Minority
Block Group 1, Census Tract 3530, Middlesex County, Massachusetts	Cambridge	25	18	28.0	-	-	Minority
Block Group 1, Census Tract 3531.01, Middlesex County, Massachusetts	Cambridge	1,377	553	43.3	116,964	3.4	Minority
Block Group 1, Census Tract 3532, Middlesex County, Massachusetts	Cambridge	2,638	698	48.1	136,875	5.0	Minority
Block Group 1, Census Tract 3533, Middlesex County, Massachusetts	Cambridge	1,319	539	48.6	125,861	1.5	Minority
Block Group 1, Census Tract 3534, Middlesex County, Massachusetts	Cambridge	1,360	509	47.1	77,721	1.8	Minority
Block Group 1, Census Tract 3535, Middlesex County, Massachusetts	Cambridge	1,132	646	25.2	89,091	1.2	Minority
Block Group 2, Census Tract 3525, Middlesex County, Massachusetts	Cambridge	1,843	668	40.9	118,355	3.9	Minority
Block Group 2, Census Tract 3530, Middlesex County, Massachusetts	Cambridge	344	189	29.4	63,458	11.6	Minority
Block Group 2, Census Tract 3531.01, Middlesex County, Massachusetts	Cambridge	1,270	327	48.0	132,750	-	Minority
Block Group 2, Census Tract 3531.02, Middlesex County, Massachusetts	Cambridge	1,332	234	56.9	90,833	4.3	Minority
Block Group 2, Census Tract 3533, Middlesex County, Massachusetts	Cambridge	1,949	801	33.2	116,964	1.1	Minority
Block Group 2, Census Tract 3534, Middlesex County, Massachusetts	Cambridge	1,820	808	63.0	88,103	10.6	Minority
Block Group 2, Census Tract 3535, Middlesex County, Massachusetts	Cambridge	1,665	662	41.6	96,992	-	Minority
Block Group 2, Census Tract 3537, Middlesex County, Massachusetts	Cambridge	1,221	645	24.9	105,208	5.0	Minority
Block Group 2, Census Tract 3538, Middlesex County, Massachusetts	Cambridge	930	557	45.7	80,905	11.8	Minority
Block Group 2, Census Tract 3539, Middlesex County, Massachusetts	Cambridge	1,709	714	53.8	63,269	6.3	Minority
Block Group 3, Census Tract 3531.02, Middlesex County, Massachusetts	Cambridge	1,357	4	50.3	-	-	Minority
Block Group 3, Census Tract 3532, Middlesex County, Massachusetts	Cambridge	1,236	500	46.4	88,750	-	Minority
Block Group 3, Census Tract 3537, Middlesex County, Massachusetts	Cambridge	1,560	-	43.1	-	-	Minority
Block Group 3, Census Tract 3538, Middlesex County, Massachusetts	Cambridge	1,961	1,130	41.1	81,389	6.3	Minority
Block Group 3, Census Tract 3539, Middlesex County, Massachusetts	Cambridge	2,143	27	45.4	-	-	Minority
Block Group 3, Census Tract 3540, Middlesex County, Massachusetts	Cambridge	1,273	756	40.1	77,813	2.5	Minority
Block Group 3, Census Tract 3541, Middlesex County, Massachusetts	Cambridge	1,118	530	30.8	96,210	2.3	Minority
Block Group 4, Census Tract 3530, Middlesex County, Massachusetts	Cambridge	2,369	1,090	46.5	119,194	2.5	Minority
Block Group 4, Census Tract 3538, Middlesex County, Massachusetts	Cambridge	664	436	38.9	94,167	-	Minority
Block Group 4, Census Tract 3541, Middlesex County, Massachusetts	Cambridge	883	396	35.8	172,857	-	Minority
Block Group 1, Census Tract 1, Suffolk County, Massachusetts	Boston	2,359	933	62.0	48,098	6.3	Minority and income
Block Group 1, Census Tract 7.03, Suffolk County, Massachusetts	Boston	877	496	62.3	40,921	7.1	Minority and income
Block Group 1, Census Tract 102.03, Suffolk County, Massachusetts	Boston	815	424	52.6	13,500	11.6	Minority and income
Block Group 1, Census Tract 102.04, Suffolk County, Massachusetts	Boston	1,412	201	33.8	34,522	16.9	Minority and income
Block Group 2, Census Tract 7.03, Suffolk County, Massachusetts	Boston	1,143	529	43.4	45,375	6.6	Minority and income
Block Group 2, Census Tract 102.03, Suffolk County, Massachusetts	Boston	2,265	1,207	51.1	37,719	16.8	Minority and income
Block Group 3, Census Tract 6.02, Suffolk County, Massachusetts	Boston	1,646	904	62.2	20,490	23.2	Minority and income
Block Group 3, Census Tract 101.04, Suffolk County, Massachusetts	Boston	1,169	564	41.9	26,463	23.8	Minority and income
Block Group 3, Census Tract 102.04, Suffolk County, Massachusetts	Boston	832	410	42.3	35,500	8.8	Minority and income

	Municipality	Total Population	Total Households	Total Minority Population (%)	Median Household Income ($)	Households with Language Isolation (%)	Block Group EJ Characteristics
Block Group 4, Census Tract 5.04, Suffolk County, Massachusetts	Boston	837	364	32.5	31,667	17.9	Minority and income
Block Group 4, Census Tract 7.01, Suffolk County, Massachusetts	Boston	675	390	25.2	54,911	8.7	Minority and income
Block Group 1, Census Tract 3539, Middlesex County, Massachusetts	Cambridge	2,187	557	45.0	55,547	6.1	Minority and income
Block Group 2, Census Tract 3532, Middlesex County, Massachusetts	Cambridge	1,345	622	36.4	49,167	16.2	Minority and income
Block Group 3, Census Tract 3530, Middlesex County, Massachusetts	Cambridge	1,065	541	53.6	48,646	19.4	Minority and income
Block Group 5, Census Tract 3536, Middlesex County, Massachusetts	Cambridge	1,937	209	42.1	55,461	-	Minority and income
Block Group 5, Census Tract 3537, Middlesex County, Massachusetts	Cambridge	720	286	46.1	44,444	3.5	Minority and income
Block Group 1, Census Tract 9818, Suffolk County, Massachusetts	Boston	32	14	31.3	-	28.6	Minority and English isolation
Block Group 4, Census Tract 7.04, Suffolk County, Massachusetts	Boston	1,204	538	82.2	62,655	27.1	Minority and English isolation
Block Group 1, Census Tract 3531.02, Middlesex County, Massachusetts	Cambridge	2,199	10	49.4	-	50.0	Minority and English isolation
Block Group 1, Census Tract 6.02, Suffolk County, Massachusetts	Boston	1,370	601	53.1	52,064	25.8	Minority, income and English isolation
Block Group 1, Census Tract 101.03, Suffolk County, Massachusetts	Boston	926	319	48.5	32,305	25.7	Minority, income and English isolation
Block Group 2, Census Tract 5.04, Suffolk County, Massachusetts	Boston	1,237	812	33.9	44,732	29.6	Minority, income and English isolation
Block Group 2, Census Tract 6.02, Suffolk County, Massachusetts	Boston	1,142	555	32.7	44,456	31.0	Minority, income and English isolation
Block Group 2, Census Tract 810.01, Suffolk County, Massachusetts	Boston	2,434	1,229	78.7	23,221	36.9	Minority, income and English isolation
Block Group 4, Census Tract 2.02, Suffolk County, Massachusetts	Boston	874	271	88.1	20,329	34.7	Minority, income and English isolation
Block Group 5, Census Tract 8.02, Suffolk County, Massachusetts	Boston	1,710	687	47.5	27,088	25.0	Minority, income and English isolation
Block Group 1, Census Tract 4002, Norfolk County, Massachusetts	Brookline	1,279	509	69.2	2,500	36.1	Minority, income and English isolation
Block Group 4, Census Tract 3537, Middlesex County, Massachusetts	Cambridge	1,296	206	47.9	35,227	24.8	Minority, income and English isolation

A determination of disproportionately high and adverse impacts, if present, including any potential mitigation of those impacts, will be further analyzed in the SDEIR. Existing demographic characteristics, including low-income, minority, zero vehicle, and limited-English speaking populations will be updated and Block group status as EJ communities will be updated using latest data from government and proprietary sources used in the DEIR. Potential MAPC, City of Boston and other relevant descriptions and analyses of study area populations will be reviewed and documented. Title VI of the federal Civil Rights Act of 1964 and other EJ compliance will be assessed and any potential mitigation measures identified.

Throughout the public involvement process, MassDOT has invited EJ populations to engage with the planning and design effort for the Allston Multimodal Project. Public outreach and engagement with environmental justice populations extend to a one-mile radius of the Project Area (see Figure 2.3.23-1), as well as additional notifications to community groups as required by MEPA.

From the outset of the Project in 2014, meetings have been advertised in English and Spanish, the two dominant languages in the Project Area. In the Boston area, meetings have been advertised in Spanish in El Planeta which has substantial circulation not only in Boston, but other heavily Spanish-speaking areas (e.g., Chelsea). There will be future outreach and coordination with *The Sampan* to advertise notice of meetings and document releases in Simplified Chinese.

Residents of the Allston and Brighton's EJ communities are represented on the Project Task Force by the Allston-Brighton CDC, the Allston Civic Association, and several community representatives placed on the Project Task Force for their residency in the Project Area. Beginning as part of the federal environmental permitting process, MassDOT has expanded outreach to target the communities along I-90 as far west as Worcester on the assumption that many of the residents of these communities are regular commuters to Boston. When advertising in the Worcester and Framingham area, advertisements have been placed in Vocero Hispano which circulates strongly in MetroWest and Central Massachusetts. Additionally, as part of the outreach process, MassDOT has provided notification of meetings and since 2019, the Project's fact sheet in Amharic, Haitian Creole, Russian, Simplified Chinese, and Spanish to the applicable municipal offices in Boston, Brookline and Cambridge to distribute among their residents who speak these more isolated languages. MassDOT has appeared at meetings of both the Allston-Brighton CDC and Allston Civic Association upon request and will continue to do so.

2.3.23.2 Public Outreach

MassDOT recognizes that public involvement is an integral component of reaching historically disadvantaged communities, as well as the overall development of this Project. Detailed information regarding the Project is maintained on the MassDOT I-90 Allston Multimodal Project's website at https://www.mass.gov/allston-multimodal-project. Since 2014, MassDOT has made significant outreach efforts and will continue to do so within the 1-mile radius of the Project Area. Chief among these efforts has been the engagement of a Project Task Force comprised of Allston residents and activists, elected leaders and city officials, members of the business and social services community, and participants from key institutions such as Boston and Harvard Universities.

Since publication of the ENF in 2014, MassDOT has maintained a Project website, grown the stakeholder contact list to over 3,000 recipients, and held over the course of the last three years:

- 21 meetings with the Project Task Force, including 3 meetings with the IRT, and one 5-hour workshop;
    - 5 public information meetings, 1 in Brighton, 2 in Framingham, 1 in Worcester, and one conducted virtually due to COVID-19; and
- 2 site walks at the request of Project Task Force membership.
- In addition, the Project team has held an array of targeted briefings including:
    - 1 targeting Cambridgeport residents;
    - 3 targeting rowing and powerboating users of the Charles River;
    - 1 targeting the Allston Civic Association; and
    - 1 targeting the Brookline Transportation Committee.

There have also been periodic Project updates to MassDOT's Board of Directors, which is open to the public and available as a livestream. Members of the Allston community and the Project Task Force have been present at these meetings.

NEPA scoping documents produced to date have been made available to the public digitally and in hard copy at libraries in Allston, Boston, Brookline, Cambridge, Framingham and Worcester. Elements used to announce document availability or public meetings have included:

- Newsprint advertising in English and Spanish;
- Placement of the announcements with geographically relevant public access cable TV channels;
- Mass emails to the above-referenced 3,000-person stakeholder database;
- Distribution of 1,000+ flyers each to outbound riders on the WML from Back Bay and South Station as well as to arriving riders at Worcester Union Station;
- Placement of display flyers at depository libraries;
- Sharing of flyers through town distribution in Amharic, Chinese, Haitian Creole, Russian and Spanish to reach isolated language pockets as identified by the EPA in Boston, Cambridge and Brookline; and,
- Placement of translated display flyers with minority-owned businesses located in and around the Project Area to reach their non-English speaking clientele.

July 2019 site walk

It is important to note that MassDOT has maintained a program of public outreach during COVID-19 by conducting Project Task Force and Public meetings using virtual platforms, electronically distributing key documents, and making additional hard copies of published documents available to libraries for use and circulation. In October 2020, MassDOT announced a voluntary comment period regarding the three Throat Area options described in this NPC and presented the options in a virtual public meeting attended by 237 registrants. 532 individual comments were received.

The Impact of Public Comment on Project Development

The sustained level of meaningful public participation related to the Project is reflected in the enhanced and refined design of the 3L Re-alignment Alternative and three Throat Area options described in this NPC and proposed for further analysis in the SDEIR. Detailed documentation of public input is available on the Project website https://www.mass.gov/allston-multimodal-project. Public comment has had a significant impact on Project development, particularly regarding:

- Significant public support for an at-grade Throat Area option
- Efforts to minimize construction impacts to the commuter rail and I-90
- Proposed West Station commuter rail connections
- Pedestrian and bicycle access
- Efforts to expand/enhance the parkland along the Charles River
- Efforts to minimize Charles River Impacts
- Approach to future development within the Project Area as expressed through the Boston Planning and Development Agency place-making study
- Character of the Interchange/street network

All of these topics are detailed herein and will be more closely explored in the SDEIR and subsequent MEPA and NEPA publications. Throughout the Project history, the development and refinement of alternatives by MassDOT has been guided by shared goals, developed in 2014 through interaction with the public and the Project Task Force:

- Improve safety for all modes: walking, cycling, driving, and transit
- Protect the neighborhood during construction
- Realign I-90
- Context sensitive design or:
  - Lessen impact of interchange
  - Avoid inducing cut-through traffic with new configuration
  - Reconnect sections of Allston to each other and the River
- A more vibrant Cambridge Street that serves all modes
- Accessibility to transit at the future West Station

Next Steps

The 3L-Realignment Alternative and its three Throat Area options will be presented and analyzed fully in the SDEIR and associated NEPA documents. The scope of the SDEIR will reflect public input in response to this NPC. This NPC and future environmental filings will be shared with both the Project Task Force and the public, including residents of Central Massachusetts and MetroWest through all the accessible communications means described earlier. Project Task Force meetings, public meetings and briefings will continue at key junctures as the Project progresses. The Project website will be updated regularly as the central repository of Project information.

2.4 Summary: Alternatives Dismissed from Further Evaluation

2.4.1 3K Interchange Alignment Layout Refined to 3L Re-alignment

As described throughout this NPC, the 3K interchange alternative has been refined since publication of the DEIR and is now referred to as the 3L Re-alignment Alternative. This 3L Re-alignment Alternative represents the alternative that responds to the stakeholder comments from the MEPA process to date and addresses the Secretary's Certificate comments on the DEIR, as advanced from DEIR Alternative 3K. This urban interchange alternative, the 3L Re-alignment Alternative, remains MassDOT's Preferred Alternative and the 3K Alternative, as described in the DEIR, is dismissed from further evaluation.

2.4.2 DEIR Throat Area Variations

The design of the Throat Area variations described in the DEIR, 3K-HV, 3K-ABC and 3K-AMP, have been further developed and refined after publication of the DEIR. Each of these variations have been replaced with the updated Throat Area options described in this NPC (See Section 2.2.2.2): the Modified Highway Viaduct, the Modified At-Grade and the SFR Hybrid Throat Area options, respectively. These changes have been made to take into account Project planning updates including an updated Purpose and Need, the Secretary's Certificate on the DEIR, and public comments made throughout the state and federal environmental review processes. Therefore, the Throat Area variations as described in the DEIR will not be advanced for further review during the state environmental review process.

2.4.3 3L Re-alignment: MEPA DEIR West Station and Rail Layout

The DEIR West Station and Rail layout which located a multimodal West Station along the existing WML tracks on the southern edge of BPY roughly between Malvern Street and Babcock Street, with the layover yard located to the north of West Station, did not address the full range of multimodal needs for the station and also limits air rights development on the south side of I-90, as described in section 2.1. MassDOT recognizes the potential for future development in North Allston afforded by the Project and is committed to a Project that considers the development opportunities within the Project Area. Because the DEIR layout limits West Station flexibility and the future development potential, the DEIR West Station and Rail layout would not best meet the Purpose and Need of the Project. As a result, the DEIR rail layout is dismissed from further evaluation.

2.4.4 3L Re-alignment: Flip West Station and Rail Layout

The Flip Layout Option presented a multimodal West Station positioned to the north side of BPY and the layover yard to the south side, opening air rights development potential east of West Station and introducing a potential Cambridge Street bypass road for access to anticipated air rights development. While the Flip would provide additional air rights development benefits over the DEIR layout, and a potential for the creation of an open space buffer path on the south side of the layover yard, the Flip Layout Option diverts the existing tangential tracks into multiple curved alignments, imposing a civil speed restriction that would decrease railroad movements to a maximum allowable speed of 45 mph or less, and increases MBTA customer travel times. Express tracks provide faster and more reliable service and flexibility in operations for both commuter rail and Amtrak intercity movements.

The Flip layout would also hamper operational flexibility between WML, layover and GJR because geometric constraints presented by the Flip layout limit crossover moves. For example, under the Flip, trains could not move between the GJR tracks at proposed West Station towards South Station. Trains positioned on the two northerly station tracks (GJR tracks) would be limited to movements only between West Station and Cambridge or west towards Worcester. Likewise, potential future urban rail vehicles originating from South Station could not access the GJR tracks at West Station. As described above, providing operational flexibility between WML, layover and GJR has been established as a rail operations screening criterion for preliminary alternatives. The Flip layout features would not provide this flexibility. In addition, local and regional multi-modal (pedestrian, bicycle, bus, passenger vehicle, and transit) access to a future West Station is also a rail operations screening criterion established for preliminary alternatives.

The Flip concept also omits an express track which would serve express services, like the MBTA Heart-to-Hub and Amtrak trains, neither of which would stop at West Station. In addition to express operations, the flexibility afforded by the Express Tracks adds a measure of service reliability that is important to the MBTA and its customers. The Flip layout features would not adequately address these rail operational deficiencies. The Flip Layout Option does not provide full operational flexibility when compared to other alternatives and is therefore dismissed from further evaluation.

2.5 Summary: Alternatives to Carry Forward for Further Evaluation in SDEIR

2.5.1 No Build

The alternatives analysis is the heart of any environmental review and should provide a thorough comparison of the environmental impacts associated with all reasonable build and no build/no action alternatives. The Interchange 3L alternative as refined and described below, remains MassDOT's Preferred Interchange Alternative with three options for the Throat Area also described below. Even though the updated No-Build Alternative described in section 2.2.1 does not meet the redefined Purpose and Need of the Project, it will be evaluated in the SDEIR.

2.5.2 3L Re-alignment Alternative with Modified Flip West Station and Rail Layout and Three Throat Area Options

MassDOT has determined the 3L Re-alignment Alternative (See Figure 2.2.2-1) with the Modified Flip West Station and Rail layout meets the updated Purpose and Need as well as the secondary screening criteria established for the Project. Three Throat Area options under the 3L Re-alignment Alternative will be carried forward into the SDEIR for further evaluation. A detailed discussion of environmental impacts and potential mitigation measures for unavoidable impacts associated with this alternative and infrastructure options will be described in the SDEIR.

Interchange. The 3L Re-alignment Alternative described below fully meets the Purpose and Need as well as secondary screening criteria established for the Project. The 3L Re-alignment Alternative will:

- Reconfigure the I-90 Interchange and replace the I-90 viaduct, addressing structural deficiencies, correcting non-conforming geometry and obsolete design and addressing safety issues within the Project Area;
- Enhance transit and commuter rail facilities, including construction of a new West Station and infrastructure supporting mid-day commuter rail operations while achieving needed rail flexibility; and
- Improve mobility and transportation access within the Project Area, including realignment of SFR to allow for construction of separate bicycle and pedestrian facilities on the PDW Path and dedicated pedestrian and bicycle infrastructure throughout the Project Area and supports mixed-use development.

The 3L Re-alignment Alternative will also provide more open space along the Charles River within the Project Area, a strong desire of the Allston community and Project stakeholders as evidenced by public comments received on the DEIR. Further refinements to the interchange may be made during the environmental review process as the Project team continues to optimize traffic and rail operations and seek input from regulatory agencies and other stakeholders.

West Station and Rail. The 3L Re-alignment Alternative with the Modified Flip West Station and Rail Layout refined to include a four track and three platform station will be carried forward for further analysis in the SDEIR. As described above, the Modified Flip seeks to balance the goals of the operator (MBTA) and landowner (Harvard University), maximizing rail operations with universal flexibility among the WML, layover yard and GJR, while balancing prospective future GJR service with expansion of high-speed intercity service and express commuter rail service on the WML. The refined four track, three platform layout would accommodate future aspirational operations, such as GJR passenger service or operational concepts presented under Rail Vision. Those aspirational operations remain independent of this Project. In addition, MassDOT will continue to advance development of a shared use path from Franklin Street to Agganis Way and the Charles River Reservation into the design of the Project's Build Alternative.

Cambridge Street Bypass Road. A potential refinement to the 3L Re-alignment Alternative to be considered as part of the SDEIR is construction of the Cambridge Street Bypass. This would include a new two-way roadway departing the Cambridge Street bridge over I-90 and connecting with West Station and Cattle Drive. Its technical and financial feasibility would need to be determined through this additional review.

2.5.2.1 Modified Highway Viaduct Throat Area Option

The 3L Re-alignment Alternative with the Modified Highway Viaduct Throat Area option will be carried forward into the SDEIR for further analysis. A full evaluation of the potential impacts and benefits of the 3L Re-alignment alternative with the Modified Highway Viaduct Throat Area option will be presented in the SDEIR.

2.5.2.2 Modified At-Grade Throat Area Option

The 3L Re-alignment Alternative with the Modified At-Grade Throat Area option best meets the Project's Purpose and Need as it would address existing roadway deficiencies while eliminating the perceived visual and physical barrier between Allston and lower Allston as well as provide superior pedestrian and bicycle user experience within the Project Area. Further, an at-grade Throat Area option has received extensive public support throughout the state and federal environmental review processes. While the Modified At-Grade will result in permanent encroachment into the Charles River, public comments received throughout the state and federal environmental review processes identified a number of benefits an all at-grade Throat Area option could provide to the Project, such as improvements to I-90 geometry with flatter and straighter alignment, proposed bicycle and pedestrian improvements designed with user experience in mind, better connectivity and visual improvements for surrounding neighborhoods and users. Therefore, the Modified At-Grade Throat Area option will be carried forward into the SDEIR for further development, consideration of potential mitigation measures, and analysis.

2.5.2.3 SFR Hybrid Throat Area Option

The 3L Re-alignment Alternative with the SFR Hybrid Throat Area option meets the Purpose and Need of the Project. While this option has not been formally reviewed in the state environmental review process prior to this Notice of Project Change, many public comments received during the federal environmental review process expressed concerns regarding construction schedule as well as environmental impacts associated with construction of the SFR Hybrid. MassDOT recognizes the SFR Hybrid Throat Area option requires a long and complicated construction period. Temporary and permanent environmental impacts of the SFR Hybrid Throat Area option as well as impacts to commuters will be further characterized in the SDEIR.

3.0 Significance of Proposed Changes, with Specific Reference to Factors listed at 301 CMR 11.10(6):

3.1 301 CMR 11.10 (6)(a) Expansion of the Project

While the scope of the Project has not changed, as Project design has continued to develop since publication of the DEIR, the Project Area has been expanded to approximately 165 acres and now includes the Malvern Street Transitway to the south and the construction staging area for the SFR Hybrid Throat Area option (See Figure 1.1-2). Therefore, the Project Area now includes an extension south of the BPY along Malvern Street and a portion of the Charles River, just north of the PDW Path within the Throat Area.

3.2 301 CMR 11.10 (6)(b) Generation of Further Impacts

See Section 2.3 above. Modifications to two Throat Area options, as well as the addition of a new Throat Area option, may result in the generation of additional impacts than those impacts described in the DEIR for these alternatives. The SDEIR will further analyze and describe impacts of each alternative under consideration.

3.3 301 CMR 11.10 (6)(c) Change in Expected Date for Commencement of the Project

It is MassDOT's goal to substantially complete the state and federal environmental review processes by Summer of 2024 with all federal and state-dependent authorization decisions acquired for the Project by Spring 2025. Commencement of construction activities is anticipated to begin in 2025.

In addition, MassDOT is no longer relying on the phasing plan described in the DEIR. The Project will be built under a single phasing scenario. A constructability analysis, including details regarding phasing and construction, of West Station as well as the entire Project will be prepared and presented in the SDEIR.

3.4 301 CMR 11.10 (6)(d) Change of the Project Site

N/A

3.5 301 CMR 11.10 (6)(e) New Application for a Permit or New Request for Financial Assistance or a Land Transfer

See Table 3.5-1 on the following page for an updated list of applicable permits and approvals needed for the Project.

3.6 301 CMR 11.10 (6)(f) Any Change that Prevents or Materially Delays Realization of Such Benefits

N/A

3.7 301 CMR 11.10 (6)(g) For a Project involving a Lapse of Time, Changes in the Ambient Environment

N/A

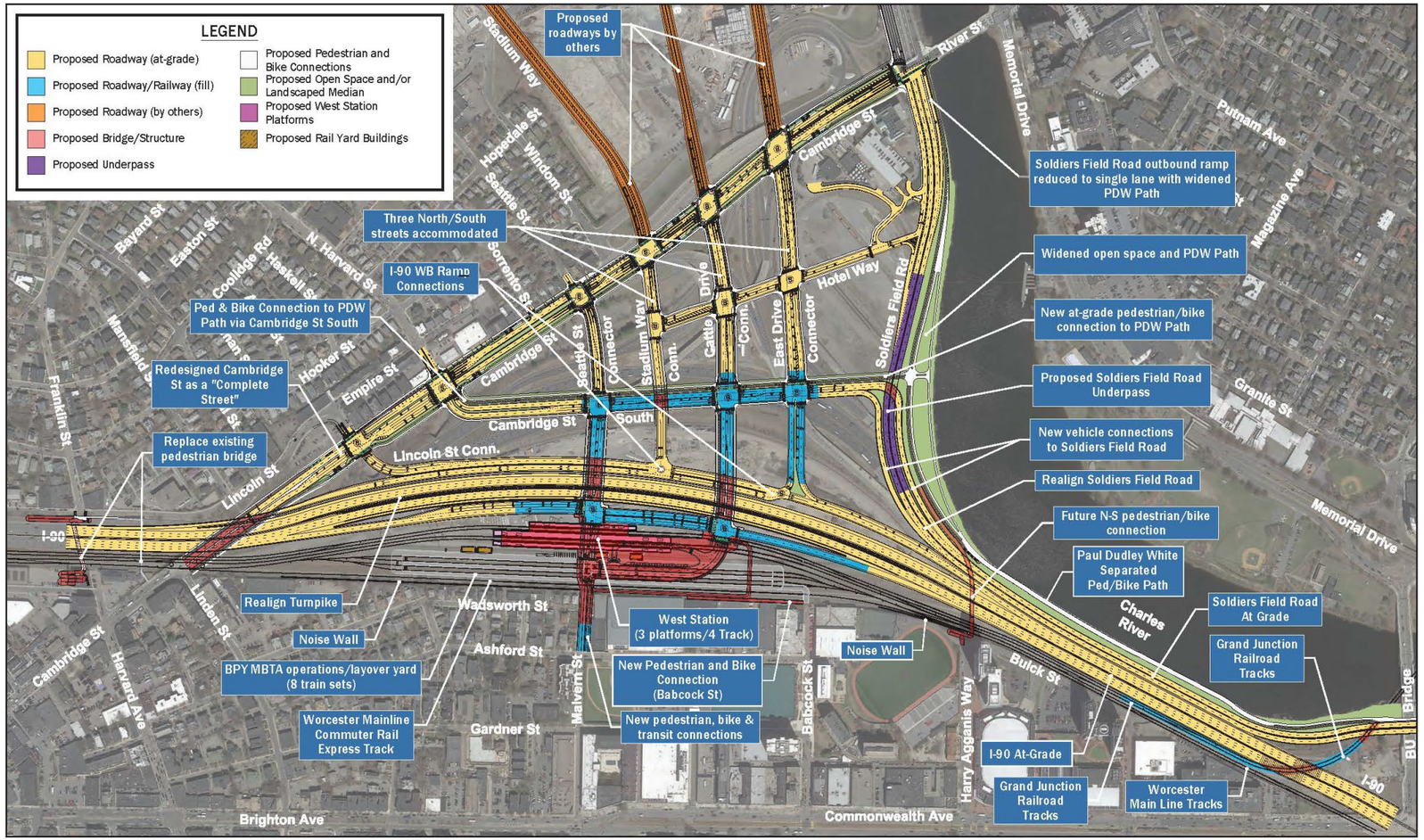
4.0 Measures the Project is Taking to Avoid Damage to the Environment or to Minimize & Mitigate Unavoidable Environmental Impacts

The alternatives described in this NPC have been developed, to the greatest extent practicable, to minimize environmental impacts. MassDOT continues to explore potential mitigation measures for unavoidable adverse environmental impacts and construction period impacts. To date, the public has provided many suggestions for minimization and mitigation measures which will be reviewed for practicability and feasibility during preparation of the SDEIR and FEIR.

5.0 Summary

Since publication of the Allston I-90 DEIR in 2017, the Project's Purpose and Need has been updated to more closely reflect those changes made during the federal environmental review process. In addition, the design of various Project elements including the interchange, West Station and Throat Area options have continued to progress and be refined. The 3K Interchange described in the 2017 DEIR has been refined and is now referred to as the 3L Interchange. The design and layout of West Station has been further refined to take into account the updated Purpose and Need, as well as comments received from the public and Project stakeholders, and subsequently re-named the Modified Flip West Station. Finally, the three Throat Area variations described in the 2017 DEIR, 3K-Highway Viaduct, 3K-ABC, and 3K-AMP, have been further refined based on the updated Purpose and Need, input from the public and Project stakeholders, and additional analysis by MassDOT and an IRT. The Throat Area options currently under consideration are the Modified Highway Viaduct, Modified At-Grade, and SFR Hybrid. While this NPC briefly describes the impacts associated with each of these updated Throat Area options based on current information, the Project's SDEIR will provide further analysis of impacts, as well as potential mitigation measures for adverse impacts, associated with each of these options as well as the Modified Flip West Station and the 3L Interchange alternative.

The refined 3L Re-alignment Alternative represents the alternative that responds to the stakeholder comments from the MEPA process to date and addresses the Secretary's Certificate comments on the DEIR, as advanced from DEIR Alternative 3K. This urban



The 3L Re-alignment Alternative responds to stakeholder comments from the MEPA process and remains MassDOT's Preferred Interchange Alternative.

interchange alternative, the 3L Re-alignment Alternative, remains MassDOT's Preferred Interchange Alternative. Further refinements to the interchange may be made during the environmental review process as the Project team continues to optimize traffic and rail operations and seek input from regulatory agencies and other stakeholders.

A Preferred Alternative for the Throat Area has not yet been identified; it will be identified in subsequent environmental review filings upon completion of a detailed analysis of environmental impacts. The preferred Throat Area option will reflect the combined public, institutional and regulatory vision for this multimodal transportation, recreational and historic riverfront corridor. Given further refinement of the Throat Area options to further minimize their environmental consequences, and significant stakeholder engagement as well as input and support from elected officials and the Project Task Force, MassDOT publicly announced it will focus on advancing the Modified At-Grade design for the I-90 Allston Multimodal Project. MassDOT will continue to assess each alternative considered in detail in future environmental review filings so readers can evaluate their comparative merits.

It is the intent of MassDOT to follow filing and publication of this NPC with the filing and publication of a SDEIR for public review and comment. The SDEIR will provide a complete analysis of impacts associated with the updated No Build and 3L Re-alignment Alternatives including impacts associated with the interchange, updated West Station design and layout and updated Throat Area options. The SDEIR will also expand on the analysis of Project costs, phasing, and mitigation efforts anticipated for unavoidable adverse impacts associated with proposed alternatives.

Table 3.5-1: List of Applicable Project Permits and Approvals

Jurisdiction	Modified HV	Modified At-Grade	SFR Hybrid
Federal Approvals	• United States Army Corp of Engineers (USACE) Rivers and Harbors Act of 1899 Section 10 and Clean Water Act Section 404 General Permit (GP) Self Verification (SV): ○ GP 5 Dredging; ○ GP 9 Utility Line (Outfalls) SV (1) impacts of single complete project under 5,000 sq. Ft • Section 106 of the National Historic Preservation Act of 1966 (36CFR 800) • FHWA/FTA: NEPA and Section 4(f) Evaluation • National Environmental Policy Act: EIS • U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit	• USACE Rivers and Harbors Act of 1899 Section 10 and Clean Water Act Section 404 General Permit Pre- Construction Notification (PCN): ○ GP 3 Structures in navigable WUS – PCN unless USCG Section 9 permit is required; ○ GP 5 Dredging; ○ GP 9 Utility Line – PCN (1) impacts of single complete project over 5,000 sq. ft.; ○ GP 10 Linear Transportation Projects • Section 106 of the National Historic Preservation Act of 1966 (36CFR 800) • FHWA/FTA: NEPA and Section 4(f) Evaluation • National Environmental Policy Act: EIS • U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit	• USCG Section 9 Rivers and Harbors Act of 1899 Bridge Permit for temporary trestle • USACE Rivers and Harbors Act of 1899 Section 10 and Clean Water Act Section 404 USACE General Permit (PCN) or Individual Permit ○ Assumes Massachusetts General Permit for Trestle abutment fill, outfalls ○ GP 5 Dredging; ○ GP 9 Utility Line – PCN (1) impacts of single complete project over 5,000 sq. Ft.; ○ GP 10 Linear Transportation Project • Section 106 of the National Historic Preservation Act of 1966 (36CFR 800) • FHWA/FTA: NEPA and Section 4(f) Evaluation • National Environmental Policy Act: EIS • U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit
State Approvals	• 401 WQC: BRP WW 08 Minor Project Certification dredge (between 100 cy and 5;000 cy) ○ Outfall work • Ch. 91 Nonwater-Dependent License ○ Work in Filled and Flowed Tidelands • Article 97 required for transfer of 3,500 sq. ft. of land from DCR control to MassDOT control • 350 CMR 2.00 Use of Reservations and Parkways DCR Construction and Access Permit • Solid Waste Beneficial Use Determination, 310 CMR 19.00 • DEP, Bureau of Air and Waste Solid Waste Site Assignment, 310 CMR 16.00 • DEP, Bureau of Air and Waste Demolition/Construction Notification, 310 CMR 7.09 • Massachusetts Contingency Plan (MCP): M.G.L. c. 21E and regulations at 310 CMR 40.000. • Protection of Properties Included in the State Register of Historic Places, 950 CMR 71	• 401 WQC: BRP WW 08 Minor Project Certification dredge (between 100 cy and 5,000 cy); BRP WW 10 Major Project Certification for SFR, shoreline enhancement and outfall fill (More than 5,000 sq. ft.) • Ch. 91 Nonwater-Dependent License or Variance ○ Work in Filled and Flowed Tidelands ○ Fill for Shoreline Enhancement may require variance • Article 97 required for the transfer of 57,000 sq. ft. of land from DCR control to MassDOT control • 350 CMR 2.00 Use of Reservations and Parkways DCR Construction and Access Permit • Solid Waste Beneficial Use Determination, 310 CMR 19.00 • DEP, Bureau of Air and Waste Solid Waste Site Assignment, 310 CMR 16.00 • DEP, Bureau of Air and Waste Demolition/Construction Notification, 310 CMR 7.09 • Mass Coastal Zone Management Consistency Review • Massachusetts Contingency Plan (MCP): M.G.L. c. 21E and regulations at 310 CMR 40.000. • Protection of Properties Included in the State Register of Historic Places, 950 CMR 71	• 401 WQC: BRP WW 08 Minor Project Certification dredge (between 100 cy and 5;000 cy); BRP WW 10 Major Project Certification for trestle and temporary I-90 fill (More than 5,000 sq. Ft.) • Ch. 91 Nonwater-Dependent License or Variance – Impacts would exceed 6 months in duration and therefore, would not fall under a temporary permit under Ch. 91 regulations • Article 97 required for the transfer of 66,250 sq. ft. of land from DCR control to MassDOT control • 350 CMR 2.00 Use of Reservations and Parkways DCR Construction and Access Permit • Solid Waste Beneficial Use Determination, 310 CMR 19.00 • DEP, Bureau of Air and Waste Solid Waste Site Assignment, 310 CMR 16.00 • DEP, Bureau of Air and Waste Demolition/Construction Notification, 310 CMR 7.09 • Mass Coastal Zone Management Consistency Review • Massachusetts Contingency Plan (MCP): M.G.L. c. 21E and regulations at 310 CMR 40.000. • Protection of Properties Included in the State Register of Historic Places, 950 CMR 71
Local Approvals	• WPA Notice of Intent ○ Outfall work, Bank Restoration, Buffer Zone work • Boston Landmarks Commission, Certificate of Appropriateness for local landmarks: ○ Charles River Esplanade ○ Allston Depot	• WPA Notice of Intent for ○ SFR fill, pile supported PDW Path, Shoreline Improvements/Fill and outfall work, Buffer Zone work ○ Will likely not qualify as Ecological Restoration Project under Wetland Regulations because primary purpose of overall project is not restoration of natural resource areas ○ Potential Wetland Variance due to available option with less impacts • Boston Landmarks Commission, Certificate of Appropriateness for local landmarks: ○ Charles River Esplanade and Allston Depot	• WPA Notice of Intent ○ For trestle, temporary I-90, outfall work and Buffer Zone work ○ Potential Wetland Variance due to available option with less impacts • Boston Landmarks Commission, Certificate of Appropriateness for local landmarks: • Charles River Esplanade • Allston Depot