I-90 ALLSTON INTERMODAL PROJECT

Independent Review Team Report
Joint Board Meeting

October 15, 2018

Goals of this Presentation

- Preview the Independent Review Team report to the Secretary on evaluation of Alternatives for "The Throat" that will be released Wednesday at the Task Force meeting for 30 day review and comment period
- Discuss with the Board the findings presented in the report to the Secretary
- Discuss how the process will address the proposed Elevated Multi-Use Path Concept submitted by A Better City on October 5, 2018
- Summarize schedule and next steps on reaching a preferred alternative for the Throat

Reminder:
The Scope of the Independent Review Team Effort

- **Only focused on "The Throat"**
  - MassDOT Allston team continuing to work on West Station, bicycle/pedestrian infrastructure and other highway issues
- Convened to take a fresh look at the three families of DEIR Alternatives (Highway Viaduct, At Grade, Hybrid) and modify DEIR Alternatives if potential improvements are found
- Develop an evaluation matrix to allow apples-to-apples comparison of original DEIR and IRT Alternatives across multiple evaluation criteria
- Gather information about the Alternatives
- Present facts and findings on those Alternatives in a Report to the Secretary by conclusion of 90-day review period
  - Today the Secretary is releasing the executive summary, with the full report to be released for 30 day public comment period on Wednesday at the Task Force meeting
  - The IRT report does not and will not recommend a preferred Alternative

Materials Provided to the Board

- This deck summarizing results of the evaluation of Alternatives by the Independent Review team
- A separate deck with a recap of the three "families" of Alternatives including cross sections and renderings for each
- The executive summary of the Independent Review Team report to the Secretary
- Executive summary released to Task Force/public today
- Full report with all technical materials is being printed and will be released to the Task Force and Board and for public comment on Wednesday October 17, 2018
- Public comment period will run through November 16, 2018

Transportation Elements in Throat

- All transportation elements in The Throat must be included in order to meet the overall project purpose and need
  - Interstate highway: Eight lanes of I-90
  - Commuter rail: Two tracks of the Worcester Main Line
  - Freight rail: Two tracks of the Grand Junction Railroad
  - Limited access parkway: Four lanes of Soldiers Field Road
  - Pedestrian/bicycle path: Paul Dudley White Path

Review of Alternatives and Variants

- At-grade Family of Alternatives (all elements at-grade)
  - DEIR At-Grade Alternative
  - IRT At-Grade Variant

- Highway Viaduct Family of Alternatives (elevated I-90)
  - DEIR Highway Viaduct Alternative
  - IRT Highway Viaduct Variant

- Hybrid Family of Alternatives (some elements elevated, some at-grade)
  - DEIR Hybrid Alternative
  - IRT Hybrid Variant

At-grade Family: Key Components

- All elements at-grade
- I-90: 11-foot lanes, 2-foot shoulders (if FHWA approves)
- Soldiers Field Road: 10-foot lanes, 1-foot shoulders
- Paul Dudley White Path – relocation creates river impacts
- Greatest degree of permitting risk due to resource impacts
- Requires 7 feet of Boston University land
- Allows north-south pedestrian/bicycle connections to the river

Changes for IRT At-grade Variant

- DEIR At-Grade Alternative
  - I-90 at-grade
  - Grand Junction on retained fill
  - Slightly elevated Soldiers Field Road for noise protection
- IRT At-Grade Variant
  - Slope Grand Junction Line at 2% on fill and lower Grand Junction fly over I-90
    - Grand Junction crosses at lower elevation = less retained fill, reducing Grand Junction closure and construction duration
  - Explored cantilevered Paul Dudley White Path at river's edge, but does not solve permitting issues

Highway Viaduct Family: Key Components

- Elevated I-90: 12-foot lanes, 4-foot (inside) and 8-foot (outside) shoulders
- I-90 structure
  - height = 28 feet above rail (minimum), width = 127 feet, closest distance to river = 82 feet
- Rail and Soldiers Field Road at-grade
- Difficult north-south pedestrian-bicycle connections
- Room for expanded open space
- Expanded Paul Dudley White Path
- Does not require any property from Boston University

Changes for IRT Highway Viaduct Variant

- DEIR Highway Viaduct Alternative
  - 4-column viaduct scheme
  - Soldiers Field Road aligned along northernly edge of viaduct
  - Complex staging to maintain traffic during construction
- IRT Highway Viaduct Variant
  - 3-column viaduct scheme
  - Soldiers Field Road tucked under northern edge of I-90 WB viaduct provides additional parkland/open space/Paul Dudley White Path improvements
  - Stormwater management system within or underneath green space
  - Simplified staging due to fewer foundations

Hybrid Family: Key Components

- One element on viaduct, others at-grade
- I-90: 11-foot lanes, 2-foot shoulders
- Expanded Paul Dudley White Path
- Room for expanded open space
- Allows north-south pedestrian/bicycle connections to the river
- Uses 0 – 7 feet of Boston University land

Changes for IRT Hybrid Variant

- **DEIR Hybrid Alternative**
  - Grand Junction on viaduct
  - Replaces Paul Dudley White Path without width improvements
  - Long Grand Junction closure during construction
  - Long runs for rail grade changes
  - Can accommodate N-S pedestrian/bike connections
  - Rail viaduct height = ~23.5 feet

- **IRT Hybrid Variant**
  - Soldiers Field Road on viaduct over at or below-grade I-90 WB lanes
  - Potential improved Paul Dudley White Path and expanded parkland/open space
  - Reduces Grand Junction closure duration during construction
  - Shorter length of Grand Junction on retained fill
  - Easier to accommodate north-south pedestrian/bike connections due to shorter Soldiers Field Road viaduct
  - Soldiers Field Road viaduct height = 20 feet above I-90 WB

EVALUATION CRITERIA FINDINGS

Evaluation Criteria Findings: Constructability

- The IRT Variants provide slightly improved construction timeframes (ranging from 6.5 to 7.5 years) from the respective DEIR Alternatives (ranging from 6.5 to 8 years)
- The IRT Variants shorten the closures and restrictions for railroad service through the throat
- The IRT At-Grade and IRT Hybrid Variants reduce impacts to use of Grand Junction Railroad

Constructability

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Construction timeframe	6.5 years	6.5 years	8 years	6.5 years	6.5 years	7.5 years
Effects on ramp connections for I-90 and SFR	Yes; Maintains ramps for I-90 and SFR through all phases of construction	Yes; Maintains ramps for I-90 and SFR through all phases of construction	Yes; Maintains ramps for I-90 and SFR through all phases of construction	Yes; Maintains ramps for I-90 and SFR through all phases of construction	Yes; Maintains ramps for I-90 and SFR through all phases of construction	Yes; Maintains ramps for I-90 and SFR through all phases of construction
Maintains current rail service to Framingham/ Worcester	Minor interruption, primarily 2 track operation	Moderate interruption, primarily 1 track operation	Minor interruption, primarily 2 track operation	Minor interruption, primarily 2 track operation	Moderate interruption, primarily 1 track operation	Minor interruption, primarily 2 track operation
Maintains current rail service to Grand Junction	Significant interruption	Minor/moderate interruption	Significant interruption	Significant interruption, reduced from DEIR	Minor/moderate interruption	Moderate interruption

Constructability Part 2

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Maintains access to Paul Dudley White Path during construction	Yes; Temporary during construction of path in river, detour delay of 5 minutes via two detour routes	No; Unless there are any planned improvements to PDW	Yes; During construction of SFR, detour delay of 5 minutes via two detour routes	Yes; Temporary during construction of path in river, detour delay of 5 minutes via two detour routes	No; Unless there are any planned improvements to PDW	Yes; During construction of SFR, detour delay of 5 minutes via two detour routes
Complexity of staging	6 stages	6 stages	7 stages	6 stages	6 stages	6 stages
	3 year Grand Junction closure	3 year Grand Junction closure	4 year Grand Junction closure	3 year Grand Junction closure	Grand Junction operational	3.75 year Grand Junction closure
	2 years impacted Worcester Line operations	2 years impacted Worcester Line operations	2 years impacted Worcester Line operations	2 years impacted Worcester line operations	2 years impacted Worcester line operations	2 years impacted Worcester line operations
	temporary viaduct structure to bring I-90 to grade at western edge	temporary viaduct structure to bring I-90 to grade at western edge	temporary structure limited to viaduct	temporary suppor t limited to viaduct supports during demolition	temporary columns and foundations required for viaduct	temporary structure limited to viaduct
Risk of delay/cost increase due to uncertainty/complexity	Medium - High	Medium	Medium - High	Slightly less than DEIR Highway At-Grade Alternative	Slightly less than DEIR Highway Viaduct Alternative	Slightly less than DEIR Hybrid Alternative

Evaluation Criteria Findings: Cost

- The At-Grade and Highway Viaduct IRT Variants are more expensive to construct (7-15%) than the respective DEIR Alternative
- The At-Grade and Highway Viaduct IRT Variants have a higher life cycle cost (8-10%) than the respective DEIR Alternative
- The Hybrid IRT Variant is less expensive (7% in construction cost, 25% in lifecycle cost) than the Hybrid DEIR Alternative
- Life cycle costs for IRT Variants range from **$59 million** for the At-Grade variant to **$78.8 million** for the Hybrid Variant
- Construction costs for IRT Variants range from $1.1 billion for the At-Grade variant to $1.13 billion for the Hybrid Variant

Cost

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Construction cost	$987 million	$1 billion	$1.2 billion	$1.1 billion	$1.2 billion	$1.1 billion
Life-cycle cost	$54 million	$71.8 million	$81.5 million	$59 million	$78.9 million	$60.5 million
Need to acquire/take property	11,860 SF	0 SF	9,605 SF	3,820 SF	0 SF	3,820 SF
Mitigation Costs	Relatively greater risk of mitigation costs	Relatively lesser risk of mitigation costs	Relatively lesser risk of mitigation costs	Relatively greater risk of mitigation costs	Relatively lesser risk of mitigation costs	Relatively lesser risk of mitigation costs

Evaluation Criteria Findings: Environment

- The At-Grade IRT Variant and DEIR Alternative have impacts to open space, historic resources, wetlands and tidelands generally above what is estimated for Hybrid and Highway Viaduct IRT Variants and DEIR Alternatives
- All Alternatives and Variants have temporary impacts on open space, historic resources, wetlands and tidelands

Environment

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Permanent effects on designated historic resources	41,430 SF of CRBHD land used -6,044 SF net loss of accessible open space Narrower PDW than existing Eliminate viaduct visual, shadow impacts; cause river impacts N-S ped/bike connections feasible Reconstructed LGJ Bridge/improved PDW east end	11,640 SF of CRBHD land used 16,942 SF net gain of accessible open space Wider PDW than existing Maintain viaduct visual, shadow impacts N-S ped/bike connections infeasible No reconstructed LGJ for improved PDW east	19,420 SF of CRBHD land used 12,422 SF net gain of accessible open space Wider PDW than existing Reduce viaduct visual, shadow impacts N-S ped/bike connections feasible Reconstructed LGJ Bridge/improved PDW east end	46,950 SF of CRBHD land used -10,251 SF net loss of accessible open space Narrower PDW than existing Eliminated viaduct visual, shadow impacts; cause river impacts N-S ped/bike connections feasible Reconstructed LGJ Bridge/improved PDW east end	8,353 SF of CRBHD land used 38,722 SF net gain of accessible open space Considerably wider PDW than existing Maintain viaduct visual, shadow impacts N-S ped/bike connections infeasible No reconstructed LGJ for improved PDW east	47,290 SF of CRHBD land used 47,242 SF net gain of accessible open space Considerably wider PDW than existing Viaduct visual, shadow impacts differ from existing; better landscape screening N-S ped/bike connections feasible Reconstructed LGJ Bridge/improved PDW east end
Temporary effects on designated historic resources	Assumed that all alternatives will occupy throat during full construction period.					

Environment Part 2

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Permanent effects on parks/open space	For Article 97, project-wide open space benefits compensate for 4(f) review, see historic resource impacts/benefits.					
Temporary effects on parks/open space	Assumed that all alternatives will occupy throat during full construction period, and that PDW path will be closed and relocated, route to be determined.					
Permanent effects on wetlands	Stormwater outfall work, common to all alternatives: 10 LF Bank, 40 SF of LUW, unspecified amount of BLSF, 60 SF Waters of the US					
	330 LF Bank 420 SF of LUW 1,100 SF Waters of the U.S. In addition to stormwater outfall work, common to all alternatives	Stormwater outfall work, common to all alternatives: 10 LF Bank 40 SF of LUW 60 SF Waters of the U.S.	Stormwater outfall work, common to all alternatives: 10 LF Bank 40 SF of LUW 60 SF Waters of the U.S.	400 / 670 LF Bank 1,100 / 4,310 SF LUW In addition to stormwater outfall work, common to all alternatives	Stormwater outfall work, common to all alternatives: 10 LF Bank 40 SF of LUW 60 SF Waters of the U.S.	Stormwater outfall work, common to all alternatives: 10 LF Bank 40 SF of LUW 60 SF Waters of the U.S.
Temporary effects on wetlands	Temporary impacts for stormwater installation, common to all alternatives: 90 LF of Bank, 240 SF of LUW, unspecified amount of BLSF					
	Additional 20 LF of Bank 3,300 SF of LUW In addition to temporary impacts for stormwater installation, common to all alternatives	Additional temporary impacts for stormwater installation, common to all alternatives: 90 LF of Bank 240 SF of LUW	Additional temporary impacts for stormwater installation, common to all alternatives: 90 LF of Bank 240 SF of LUW	Additional temporary impacts for stormwater installation, common to all alternatives: 90 LF of Bank 240 SF of LUW	Additional temporary impacts for stormwater installation, common to all alternatives: 90 LF of Bank 240 SF of LUW	Additional temporary impacts for stormwater installation, common to all alternatives: 90 LF of Bank 240 SF of LUW

Environment Part 3

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Permanent effects on tidelands	Fill 1,100 SF of flowed tidelands NWDIF impacts on filled tidelands -6,044 net loss accessible open space Narrower PDW than existing	NWDIF impacts on filled tidelands 16,942 SF net gain accessible open space Wider PDW than existing	NWDIF impacts on filled tidelands 12,422 SF net gain accessible open space Wider PDW than existing	NWDIF impacts on filled tidelands -10,251 SF net loss accessible open space Narrower PDW than existing	NWDIF impacts on filled tidelands 38,722 SF net gain accessible open space Wider PDW than existing	NWDIF impacts on filled tidelands 47,242 SF net gain accessible open space Wider PDW than existing
Temporary effects on tidelands	Assumed that PDW path closed and relocated during construction for all alternatives.					
	Temp impact 3,000 SF Flowed Tidelands	See Above	See Above	See Above	See Above	See Above
Effects on air quality	All alternatives expected to produce very similar Air Quality Impacts.					

Evaluation Criteria Findings: Permitting

- The At-Grade IRT Variant and DEIR Alternative have greater permitting risk under wetlands permitting, and likely under open space and historic reviews
- The IRT At-Grade Variant has high overall risk of not receiving necessary permits:
  - MassDEP State Wetlands Permit
  - US Army Corps of Engineers Federal Wetlands Permit
  - MassDEP Section 401 Water Quality Certification
  - MassDEP State Tidelands (Chapter 91) Permit

Permitting

Criteria		DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Risk of not receiving necessary permit(s)	**Overall Risk**	High	Low - Medium	Low - Medium	High	Low - Medium	Low - Medium
	MassDEP State Wetlands Permit	High - unlikely to receive variance	Low - No variance required		High - likely to require variance; variance could not be granted	Low - no variance required	
	US Army Corpse of Engineers Federal Wetlands Permit	Medium to High - may require individual permit, with heightened standards	Low - may not require individual permit		Low - may not require individual permit		
	MassDEP Section 401 Water Quality Certification	Medium to High - may require certification, with heightened standards	Low - may not require certification		Low - may not require certification		
	MassDEP State	High - unlikely to receive variance	Low to Medium - no variance required; but outcome depends upon whether another alternative is judged superior on grounds of public access		Low to Medium - no variance required; but outcome depends upon whether another alternative is judged superior on grounds of public access		

Permitting Part 2

Criteria		DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Risk of permitting delay	**Overall Risk**	High	Low - Medium	Low - Medium	Medium - High	Low - Medium	Low - Medium
	MassDEP State Wetlands Permit	High - due to extended length of variance process	Low - no variance process		Medium to High - due to extended length of variance process	Low - no variance process	
	US Army Corps of Engineers Federal Wetlands Permit	Medium to High - due to extended length of individual permit process, if one is required	Low - likely not to require individual permit		Low - likely not to require individual permit		
	MassDEP Section 401 Water Quality Certification	Medium to High - due to extended length of individual permit process, if one is required	Low - likely not to require certification		Low - likely not to require certification		
	MassDEP State Tidelands (Chapter 91) Permit	High - due to extended length of variance process	Low - no variance process		Low - no variance process		

Permitting Part 3

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Able to meet all state wetlands regulatory requirements without variances	Variance required, would not be granted due to other reasonable alternatives without these impacts	Yes	Yes	Variance likely required, would not be granted due to other reasonable alternatives without these impacts	Yes	Yes
Able to meet all state tidelands regulatory requirements without variances	Variance required, would not be obtained due to other reasonable alternatives without these impacts	Yes	Yes	Yes	Yes	Yes

Permitting Part 4

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Existence of alternative with lesser impact to wetlands, tidelands, parklands or historic resources	Yes for wetlands and tidelands, Potentially for parklands or historic resources	No for wetland and tidelands, Potentially for parklands or historic resources	No for wetlands and tidelands, Potentially for parklands or historic resources	Yes for wetlands, No for tidelands, Potentially for parklands or historic resources	No for wetlands and tidelands, Potentially for parklands or historic resources	No for wetland and tidelands Potentially for parklands or historic resources
4(f) parkland impacts	Medium risk - outcome depends on whether another alternative is judged superior. This alternative has lesser area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior. This alternative has greater area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior. This alternative has greater area of riverfront open space	Medium risk - outcome depends on whether another alternative is judged superior. This alternative has lesser area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior. This alternative has greater area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior. This alternative has greater area of riverfront open space
Sect. 106 historic resource impacts	Medium risk - outcome depends on whether another alternative is judged superior; This alternative has lesser area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior; This alternative has greater area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior; This alternative has greater area of riverfront open space	Medium risk - outcome depends on whether another alternative is judged superior; This alternative has lesser area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior; This alternative has greater area of riverfront open space	Low - Medium risk - outcome depends on whether another alternative is judged superior; This alternative has greater area of riverfront open space
Risk of I-90 inundation by 50-year flood	No	No	No	No	No	No

Evaluation Criteria Findings: Multimodal Connectivity

- The Highway Viaduct IRT Variant and DEIR Alternative create more connectivity challenges than the At-Grade and Hybrid Variants/Alternatives
- The Hybrid IRT Variant creates new opportunities for multimodal connections compared to the DEIR Alternative
- All IRT Variants equally accommodate expandability of West Station

Multimodal Connectivity

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Impact (if any) on West Station constructability/ expandability	No Impact					
Number of N-S access points to river for peds/bikes	Multiple - Likely 2 including West End	None	Potentially at West End	Multiple - LIkely 2	None	Multiple - Likely 2 including West End
Provides minimum 50 mph railroad design speed	Yes					
Provides desired 79 mph railroad design speed	No - Requires Spreading of Track and West Station Relocation					

Multimodal Connectivity Part 2

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Maintains desired clearance (18'-6") over train operations	Yes					
Allows future 2- or 3-track operation on Grand Junction	Yes					
Effect on future multi-modal connectivity	No	Yes – vertical elements make North/South connections difficult	No	No	Yes - vertical elements make North/South connections difficult	Yes - vertical elements make North/South connections difficult, but less difficult than Highway Viaduct Alternative/ Variant

Evaluation Criteria Findings: Public Realm

- The Highway Viaduct IRT Variant and DEIR Alternative have challenges to riverfront access, visual impact and noise – however the IRT Variant does provide additional open space
- The At-Grade IRT Variant and DEIR Alternative remove the visual barrier of a viaduct and allow improved connections – however, they provide the least open space, and the adjacency to highway along the path is a concern
- The Hybrid IRT Variant and DEIR Alternative reduce, but don't remove, the visual barrier of a viaduct – however, the IRT Variant provides the greatest amount of additional open space
- Each Variant/Alternative has mixed impacts for noise, depending on the receptor and direction

Public Realm

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Accommodates filed land use plans for project area (including any air rights development plans)	Yes					
Effects on noise (both sides of river)	Noise levels at Magazine Beach approach or exceed criterion. Receptors along Paul Dudley White Path experience significant noise in all DEIR alternatives. Noise abatement and mitigation should be considered as the receptors approach or exceed required dBa level.	Noise increases over existing conditions, especially for receptors close to the highway (BU). Noise decreases some along PDW and at Magazine Beach. Noise wall near Nickerson Field feasible. No feasible mitigation for PDW because of physical constraints. Magazine Beach noise reduced but mitigation not feasible or cost effective. Rail noise mitigated with special track turnout or relocating turnout away from receptors.	Noise increases over existing conditions, especially for receptors close to the highway (BU). Rail viaduct shields PDW and noise decreases. Noise wall near Nickerson Field feasible. No feasible mitigation for PDW because of physical constraints. Magazine Beach noise reduced but mitigation not feasible or cost effective. Rail noise mitigated with special track turnout or relocating turnout away from receptors.	Noise levels at BU receptors should be similar to DEIR alternatives because of proximity to the highway and rail traffic; a noise wall along Nickerson Field would be feasible. Noise from SFR traffic and I-90 will continue to impact receptors along PDW although constructing the trail on structure along SFR with a profile that is higher than the roadways would reduce noise levels along a portion of the PDW trail. Magazine Beach noise levels would be similar as existing conditions; noise mitigation is not likely to benefit this area.	Noise levels at BU receptors should be similar to DEIR alternatives because of proximity to the highway and rail traffic; a noise wall along Nickerson Field would be feasible. Shifting SFR traffic away from the Charles River (partially under I-90 viaduct) should reduce noise at PDW receptors and created green space could support a noise wall along a portion of the length. Magazine Beach noise levels should also be reduced; no further mitigation is likely.	Noise levels at BU receptors should be similar to DEIR alternatives because of proximity to the highway and rail traffic; a noise wall along Nickerson Field would be feasible. Depressing I-90 westbound traffic into a boat section and shifting SFR traffic away from the Charles River and on top of the I-90 boat section should reduce noise at PDW receptors, and created green space could support a noise wall along a portion of the length. Magazine Beach noise levels should also be reduced; no further mitigation is likely.

Public Realm Part 2

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Effects on visual quality of the riverfront and other open spaces	"Wall" effect of viaduct is eliminated, all vegetation is removed and replaced with retained fill	"Wall" effect of highway, slightly increased space for landscaping between SFRd and PDW, little to no change in man-made elements with potential for improved path	"Wall" effect of rail viaduct is shorter than existing, no change to river's edge, no added vegetation	"Wall" effect of viaduct is eliminated, all vegetation is removed and replaced with paved area	"Wall" effect of highway, increased space for landscaping between SFR and PDW, reduced presence of man-made roads in existing parkland area	"Wall" effect reduced with lower viaduct, large increase in space for landscaping between SFR and PDW, increased presence of man-made elements with multiple roads adjacent to parkland, potential for improved PDW man-made facilities
Increases/ decreases navigable water sheet area available	Decreases by 481 SF	No Change	No Change	Decreases by 1,760 SF	No Change	No Change
Effects on physical quality of open space and PDW through amenities	No additional open space. Additional furniture or green space is not an option.	Provides the most space for the PDW and green space/buffer.	No additional open space. Opportunity to increase the PDW width by 2 feet.	No additional open space. Additional furniture or green space is not an option.	Provides additional space compared to the DEIR Option for the PDW and green space/buffer.	Shading impacts due to the proximity of the SFR over I-90 WB viaduct to the PDW. Provides additional space for expanding the PDW or for green space/buffer.
Acres of open space added	-0.66	-0.09	-0.23	-0.61	0.27	0.55
Effect on quality of riverfront access points	Low, gradual access across throat. Requires additional space for landing stairs/ramps along river. Barriers along edges.	Very high access across throat with stairs and ramps at both ends. Barriers along edges.	Very high access across throat with stairs and ramps at both ends. Barriers along edges.	Low, gradual access across throat. Requires additional space for landing stairs/ramps along river. Barriers along edges.	Very high access across throat with stairs and ramps at both ends. Barriers along edges.	Medium-high access with stairs and ramps required only along river. Barriers along edges

Evaluation Criteria Findings: Resiliency

- The areas vulnerable to flooding from storms and sea level rise do not substantively change between each Variant/Alternative
- Space for stormwater runoff is provided within the Highway Viaduct and Hybrid Variants/Alternatives; more complex stormwater management would be required for the At-Grade Alternative and Variant
- Only the Hybrid IRT Variant reduces impervious surface area significantly from the DEIR Alternatives

Resiliency

Criteria		DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Protects key components of project from flood impacts	2070 1% flood	Grand Junction Rail and Commuter Rail are not vulnerable. PDW path is vulnerable.					
	2070 0.1% flood	Grand Junction Rail: No Commuter Rail: No	Grand Junction Rail: Yes Commuter Rail: Yes	Grand Junction Rail: No Commuter Rail: Yes	Grand Junction Rail: No Commuter Rail: No	Grand Junction Rail: Yes Commuter Rail: Yes	Grand Junction Rail: No Commuter Rail: No
Addresses stormwater runoff impacts from future rainfall projections		BMPs provide 59% phosphorus removal / Constrained space for BMPs / Limited capacity to address future rainfall	BMPs provide 66% phosphorus removal / Substantial space for BMPs / Sufficient capacity to address future rainfall	BMPs provide 59% phosphorus removal / Moderate space for BMPs / Limited capacity to address future rainfall	BMPs anticipated to provide 59% phosphorus removal / Constrained space for BMPs / Limited capacity to address future rainfall	BMPs anticipated to exceed 59% phosphorus removal / Moderate space for BMPs / Sufficient capacity to address future rainfall	BMPs anticipated to exceed 59% phosphorus removal / Moderate space for BMPs / Limited capacity to address future rainfall

Resiliency Part 2

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Protects highway infrastructure from flood impacts	2030 1% flood: I-90 and SFR not vulnerable under any alternative or variant.					
	2070 1% flood: I-90 is not vulnerable; SFR at BU Bridge and outside the throat is vulnerable for all alternatives and variants.					
	2070 0.1% flood: Large sections of I-90 and SFR (Throat and at BU Bridge) are vulnerable.	2070 0.1% flood: I-90 at BU Bridge Underpass and large sections of SFR (Throat and at BU Bridge) are vulnerable.	2070 0.1% flood: Large sections of I-90 and SFR (Throat and at BU Bridge) are vulnerable.	2070 0.1% flood: Large sections of I-90 and SFR (Throat and at BU Bridge) are vulnerable.	2070 0.1% flood: I-90 at BU Bridge Underpass and large sections of SFR (Throat and at BU Bridge) are vulnerable.	2070 0.1% flood: SFR at BU Bridge Underpass and large sections of I-90 (Throat and at BU Bridge) are vulnerable.
Accommodates FHWA guidance on building of interstate highway in flood plain	Yes					
Acres of impervious surface created	4.90	5.90	5.39	4.95	5.56	3.56

Evaluation Criteria Findings: Safety and Operations

- The Highway Viaduct IRT Variant and DEIR Alternative provide for 8' outside shoulders, while other variants/alternatives provide for 2'-3' outside shoulders – wider shoulders provide improved operations during breakdowns, accidents, maintenance and drainage
- Safety analysis shows that total predicted crash rates are relatively similar across Alternatives with the Highway Viaduct DEIR Alternative having a marginally lower total predicted crash rate than the other Alternatives
- The Highway Viaduct IRT Variant and the DEIR Hybrid Alternatives have marginally higher total predicted crash rates than the other Alternatives
- The IRT Hybrid and IRT Highway Viaduct Variants provide flexibility for the separation of modes on the Paul Dudley White Path

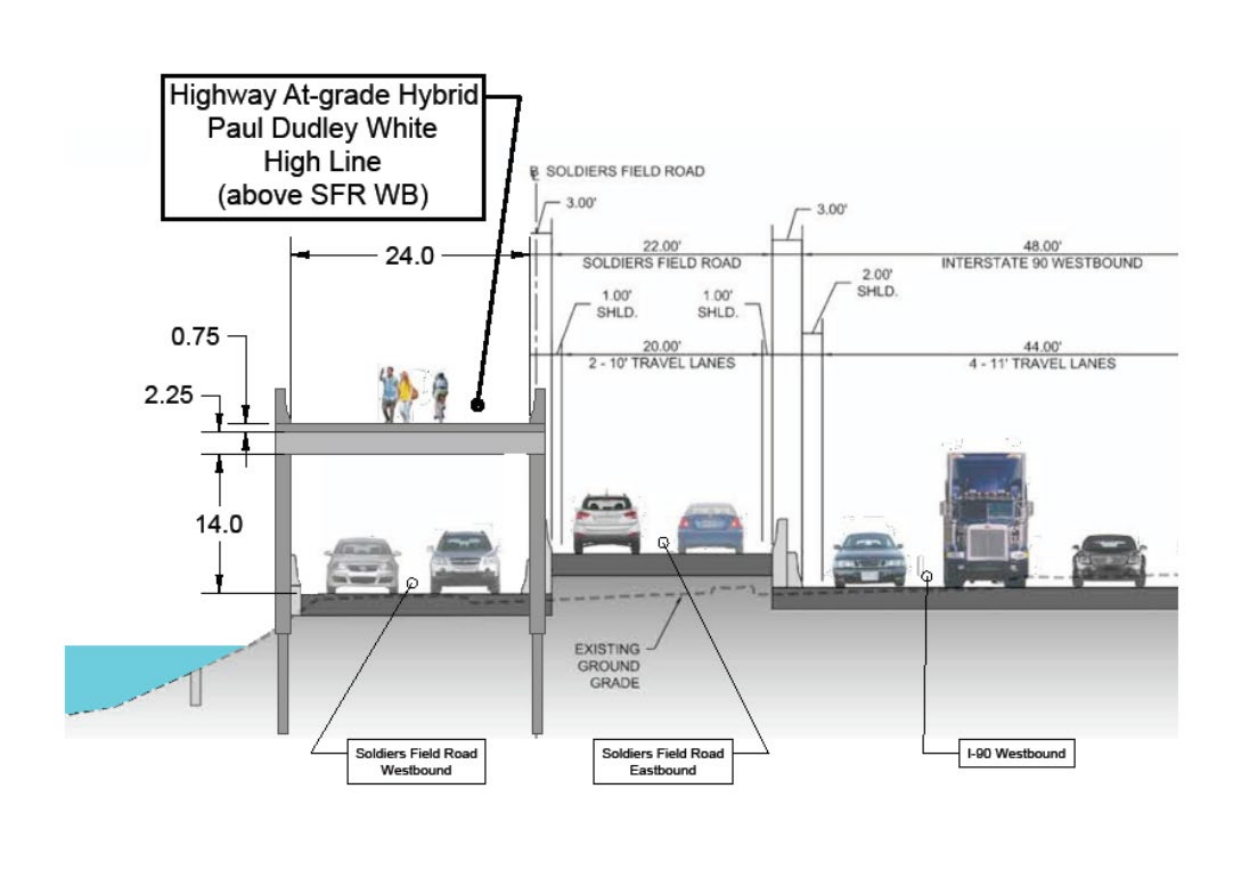
Safety and Operations

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Effects on safety for I-90	10 crashes 0.86 crashes/MVMT No safe place for vehicles to pull out of traffic	11 crashes 0.94 crashes/MVMT	11 crashes 0.94 crashes/MVMT No safe place for vehicles to pull out of traffic	11 crashes 0.94 crashes/MVMT No safe place for vehicles to pull out of traffic	10 crashes 0.86 crashes/MVMT	11 crashes 0.94 crashes/MVMT No safe place for vehicles to pull out of traffic
Effects on safety for SFR	16 crashes 1.60 crashes/MVMT	13 crashes 1.30 crashes/MVMT	16 crashes 1.60 crashes/MVMT	15 crashes 1.50 crashes/MVMT	17 crashes 1.70 crashes/MVMT	15 crashes 1.50 crashes/MVMT
Effects on operations and maintenance on I-90	Substandard shoulders result in impact to traffic operations and worker safety issues when there is a breakdown or accident; Trench drains full length of throat area or drain inlets every 5-10 feet are required to prevent 10-year storm gutter flow spreading into travel lanes	8-foot shoulders provide safe refuge area for breakdowns and responders; Drain inlets every 190 feet are required to prevent 10-year storm gutter flow spreading into travel lanes	Substandard shoulders result in impact to traffic operations and worker safety issues when there is a breakdown or accident; Drain inlets every 15-20 feet are required to prevent 10-year storm gutter flow spreading into travel lanes	Substandard shoulders result in impact to traffic operations and worker safety issues when there is a breakdown or accident; Trench drains full length of throat area or drain inlets every 5-10 feet are required to prevent 10-year storm gutter flow spreading into travel lanes	8-foot shoulder provides safe refuge area; Drain inlets every 350 feet are required to prevent 10-year storm gutter flow spreading into travel lanes	Substandard shoulders result in impact to traffic operations and worker safety issues when there is a breakdown or accident; Trench drains full length of throat area or drain inlets every 5-10 feet are required to prevent 10-year storm gutter flow spreading into travel lanes
Effects on operations and maintenance on SFR	No opportunity for maintenance vehicles to pull over. Limited snow storage.	Opportunity for maintenance vehicles to pull over. More snow storage.	No opportunity for maintenance vehicles to pull over. Limited snow storage.	No opportunity for maintenance vehicles to pull over. Limited snow storage.	Opportunity for maintenance vehicles to pull over. More snow storage.	No opportunity for maintenance vehicles to pull over. Limited snow storage.

Safety and Operations Part 2

Criteria	DEIR At-grade	DEIR Highway Viaduct	DEIR Hybrid	IRT At-Grade	IRT Highway Viaduct	IRT Hybrid
Requires design exception from NHS Design Standards	Yes - shoulder, lane	Yes - shoulder	Yes - shoulder, lane	Yes - shoulder, lane	Yes - shoulder, lane, vertical clearance	Yes - shoulder, lane, vertical clearance
Accommodates addition of shoulders	2-foot shoulder	8-foot shoulder	2-3-foot shoulder	2-foot shoulder	8-foot shoulder	2-foot shoulder
Allows separation of modes on PDW Path	No separation of modes (8.5'). Concrete barrier separation from traffic. Edge of path is 2.5' from travel lane.	No separation of modes (12'). Guard rail and landscaped buffer separation from traffic. Edge of path is 11.5' from travel lane.	No separation of modes (12'). Guard rail separation from traffic. Edge of path is 3' from travel lane.	No separation of modes (8.5' - 12'). Various separation alternatives from traffic (vertical and horizontal). Edge of path is 2.5' from travel lane or vertically separated.	Room for separation of modes (26'). Various option for separation from traffic including guard rail and landscaped buffer. Edge of path is 8'-18' from travel lane.	Room for separation of modes (26'). Various option for separation from traffic including guard rail and landscaped buffer. Edge of path is 20-'30' from travel lane.

Report Addendum:
Proposed Elevated Multi-Use Path Concept



- Cross section submitted on October 5, 2018 - Source: A Better City
- The IRT will further review and analyze the submission separate from this report by the end of the comment period

Report Addendum:
Proposed Elevated Multi-Use Path Concept Part 2

- The IRT will further review and analyze the submission separate from this report
- The IRT worked with A Better City (ABC), the primary proponent of the At-Grade Alternative (meetings, phone calls, material exchange)
- The IRT believes that there would be a high permitting risk for the At-Grade Alternative under state wetlands regulations
- ABC sought to develop variants to avoid environmental impacts/permitting challenges
- At the September 26 Task Force meeting, ABC proposed a new concept for consideration
- A Better City submitted new materials to MassDOT and the IRT on October 5, 2018

What Happens Next?

- Task Force meeting on Wednesday
  - Full Independent Review Team report will be released for 30 days of public comment (through November 16)
- Additional analytic work by IRT on the Throat
  - IRT has been extended to allow for additional analytic work
  - Will include full "matrix" analysis of proposed Elevated Multi-Use Path Concept submitted by A Better City on October 5
- Allston Multimodal Team continues to work on issues outside the throat
- Secretary will make decision on preferred alternative for the Throat following close of public comment period and consideration of comments submitted and additional analytic work by IRT

QUESTIONS?