

# Evaluation Matrix (1 of 2)

## ENGINEERING

	Criterion	Measure	Alt 1 (2 Tracks)	Alt 2 (2 Tracks)	Alt 3A (4 Tracks)	Alt 3B (4 Tracks)	Alt 3C (4 Tracks)	Alt 11A (4 Tracks)	Alt 11B (4 Tracks)	
Operations	1. Travel Time Between Penn Station and Gwynns Falls Bridge (SB/NB)	Minutes: Seconds	Amtrak Acela 5:43/6:10 Amtrak Regional 5:50/6:19 MARC 5:50/6:14	Amtrak Acela 5:43/6:10 Amtrak Regional 5:50/6:19 MARC 5:50/6:14	Amtrak Acela 3:59/4:02 Amtrak Regional 4:19/4:19 MARC 4:56/4:17	Amtrak Acela 3:24/3:25 Amtrak Regional 3:43/3:34 MARC 4:22/3:56	Amtrak Acela 3:27/3:27 Amtrak Regional 3:46/3:37 MARC 4:33/4:04	Amtrak Acela 3:16/3:11 Amtrak Regional 3:31/3:25 MARC 4:09/3:25	Amtrak Acela 3:20/3:16 Amtrak Regional 3:34/3:29 MARC 4:16/3:28	
	2. Travel Time Savings over Alternative 1 (SB/NB)	Minutes: Seconds	Not Applicable	Amtrak Acela 0:00/0:00 Amtrak Regional 0:00/0:00 MARC 0:00/0:00	Amtrak Acela 1:44/2:08 Amtrak Regional 1:31/2:00 MARC 0:54/1:57	Amtrak Acela 2:19/2:45 Amtrak Regional 2:07/2:45 MARC 1:28/2:18	Amtrak Acela 2:16/2:43 Amtrak Regional 2:04/2:42 MARC 1:17/2:10	Amtrak Acela 2:27/2:59 Amtrak Regional 2:19/2:54 MARC 1:41/2:49	Amtrak Acela 2:23/2:54 Amtrak Regional 2:16/2:50 MARC 1:34/2:46	
	3. Value of Time Savings for All Passengers <sup>1</sup>	Dollars per year	Not Applicable	\$0 per Year	\$32.5 Million per Year	\$43.4 Million per Year	\$42.3 Million per Year	\$46.8 Million per Year	\$45.5 Million per Year	
	4. Lowest Design Speed within the Alignment	MPH	30 mph	30 mph	50 mph	50 mph	50 mph	50 mph	50 mph	
	5. Maximum Design Speed along the Alignment	MPH	75 mph	75 mph	100 mph	100 mph	100 mph	110 mph	110 mph	
	6. Average Operating Speed (SB/NB)	MPH	Amtrak Acela 35/34 mph Amtrak Regional 34/34 mph MARC 34/34 mph	Amtrak Acela 35/34 mph Amtrak Regional 34/34 mph MARC 34/34 mph	Amtrak Acela 54/56 mph Amtrak Regional 50/52 mph MARC 44/52 mph	Amtrak Acela 63/66 mph Amtrak Regional 57/63 mph MARC 49/57 mph	Amtrak Acela 65/68 mph Amtrak Regional 59/65 mph MARC 49/57 mph	Amtrak Acela 60/65 mph Amtrak Regional 56/60 mph MARC 47/60 mph	Amtrak Acela 59/64 mph Amtrak Regional 55/60 mph MARC 46/60 mph	
	7. Operational Flexibility and Reliability	High Medium Low	Low – only two tracks in common bore	Low – only two tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	High – four tracks in individual bores and the ability to platform at West Baltimore from two different tunnel tracks	Medium – four tracks in individual bores; can only platform at West Baltimore from one tunnel track	
	8. Meets Projected Year 2040 Level of Service for Amtrak/ MARC/ Freight	Yes/No	No – two tracks does not accommodate projected level of service; does not accommodate double-stack freight	No – two tracks does not accommodate projected level of service	Yes	Yes	Yes	Yes	Yes	
Engineering	9. Length of Alignment between Penn Station and Gwynns Falls Bridge	Miles	3.5 Miles	3.5 Miles	3.66 Miles	3.66 Miles	3.83 Miles	3.31 Miles	3.35 Miles	
	10. Length of Tunnel	Miles	1.42 Miles	1.42 Miles	1.91 Miles	2.03 Miles	2.23 Miles	1.90 Miles	2.26 Miles	
	11. Steepest Vertical Grade	% Grade	1.3%	1.3%	2.0%	2.0%	2.0%	2.0%	2.0%	
	12. Ability to Meet Current Project Design Criteria: Passenger (P) and Freight (F)	High Medium Low	Low (P) Low (F) Two tracks in a single bore, does not accommodate double-stack freight	Low (P) High (F) Two tracks in separate bores, accommodates double-stack freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	High (P) Medium (F) Four tracks in individual bores, accommodates double-stack freight, steep grades for freight	
	13. Depth of Tunnel	Average Depth in Feet	15 foot average depth	10 foot average depth	130 foot average depth	130 foot average depth	140 foot average depth	95 foot average depth	105 foot average depth	
	14. Extent of Major Utility Relocations	Minor Moderate Major Severe	None	Major – Relocations along entire existing tunnel alignment	Major – Relocations in the general vicinity of tunnel portals	Severe – Relocations extend significant distances outside of tunnel portal areas	Major – Relocations in the general vicinity of tunnel portals	Severe – Relocations extend significant distances outside of tunnel portal areas	Severe – Relocations extend significant distances outside of tunnel portal areas	
Transportation	15. Estimated Number of On-Street Parking Spaces Lost	# Spaces	0	310	0	150	40	120	10	
	16. Requires Reconstruction of West Baltimore MARC Station	Yes/No	No	No	No	Yes	Yes	Yes	Yes	
	17. West Baltimore MARC Station in proximity to Existing MARC Parking and Future Red Line	Yes/No	Yes	Yes	Yes	Yes	Yes	No – Shifts West Baltimore MARC Station south	Yes	
	18. Allows for High-Level Platforms for West Baltimore MARC Station between Franklin and Mulberry Streets	Yes/No	No	No	No	Yes	Yes	No	Yes	
	19. Impacts to Proposed Red Line	Minor Moderate Major Severe	None	None	None	Minor – crosses over Red Line alignment	Minor – crosses over Red Line alignment	Moderate – affects Red Line profile	Severe – requires Red Line to cross over NEC on structure	
Cost	20. Capital Cost Estimate	YOE \$ 2023	\$0	\$700 Million	\$ 3.7 Billion	\$ 4.0 Billion	\$ 4.2 Billion	\$ 3.7 Billion	\$ 4.2 Billion	
	Construction	21. Impacts to Existing Amtrak Operations during Construction/ Rehabilitation	Minor Moderate Major Severe	Minor – Scheduled maintenance would continue during off-peak; emergency repairs could cause significant delays. Frequency and magnitude of repairs expected to increase with time.	Severe – There are no detours for Amtrak service; no service between Washington and Baltimore; limited regional service between Baltimore and Philadelphia; and no Acela service between New York and Washington for duration of construction.	Minor – Most work would be performed without affecting NEC operations; only final cutover would cause minor impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Major – Most work would be performed without affecting NEC operations once temporary runaround tracks are in place; however, low speed of runaround would cause major impacts.
		22. Impacts to Existing MARC Operations during Construction/ Rehabilitation	Minor Moderate Severe	Minor – Scheduled maintenance would continue during off-peak; emergency repairs could cause significant delays. Frequency and magnitude of repairs expected to increase with time.	Severe – There are no detours for MARC service; MARC would be shut down between West Baltimore and Baltimore Pennsylvania Station.	Minor – Most work would be performed without affecting NEC operations; only final cutover would cause minor impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most work would be performed without affecting NEC operations; numerous track shifts and temporary cutovers would cause moderate impacts.	Moderate – Most Work would be performed without affecting NEC operations once temporary runaround tracks are in place; low speed of runaround would moderately impact MARC.
		23. Impacts to Existing LRT Operations during Construction/ Rehabilitation	Minor Moderate Severe	None – Construction would be contained within existing tunnel.	Severe – Construction requires open cut through North Avenue and LRT track bed.	Minor – Adequate ground cover between proposed tunnel and LRT track for minimally disruptive tunneling.	Minor – Adequate ground cover between proposed tunnel and LRT track for minimally disruptive tunneling.	Minor – Adequate ground cover between proposed tunnel and LRT track for minimally disruptive tunneling.	Moderate – Minimal ground cover between proposed tunnel and LRT track requiring off-peak shutdown of LRT.	Moderate – Minimal ground cover between proposed tunnel and LRT track requiring off-peak shutdown of LRT.
		24. Impacts to Existing NEC Freight Rail Operations during Construction/ Rehabilitation	Minor Moderate Severe	Minor – Scheduled maintenance would continue during off-peak; emergency repairs could cause significant delays. Frequency and magnitude of repairs expected to increase with time.	Severe – There are no convenient detours for freight service; local freight trains could not traverse B&P Tunnel to serve customers' sidings.	Minor – Most work would be performed without affecting freight operations; only final cutover would cause minor impacts.	Minor – Most work would be performed without affecting freight operations; freight trains could be scheduled around the numerous track shifts and temporary cutovers.	Minor – Most work would be performed without affecting freight operations; freight trains could be scheduled around the numerous track shifts and temporary cutovers.	Minor – Most work would be performed without affecting freight operations; freight trains could be scheduled around the numerous track shifts and temporary cutovers.	Minor – Most work would be performed without affecting freight operations once temporary runaround tracks are in place.
		25. Temporary Community Impacts During Construction	High Medium Low	None	High – Extensive cut-and-cover construction would result in street closures and major impacts to communities.	Low – The portal construction area is mostly located in either existing Amtrak ROW or industrial property.	Medium – Portal construction would impact residential and industrial areas east of the existing NEC.	Medium – Portal construction would impact residential and industrial areas west of the existing NEC.	High – Portal construction would require extensive excavation in residential areas.	High – Portal construction would primarily impact industrial areas and existing Amtrak ROW, with some impacts to residences. Requires reconstruction of Franklin and Mulberry Streets over NEC.

<sup>1</sup> 2040 Projected ridership, 2015 dollars

Note: All surface area impacts based on estimate limit of disturbance for conceptual design. Includes portal area only and does not include vent/egress shafts. Criteria highlighted in blue are emphasized by the Project Team in the alternatives evaluation.