

Virginia Avenue Tunnel (VAT) Reconstruction Noise Analysis Approach

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Railroad Environmental Conference
University of Illinois
Urbana, IL
October 28th 2015

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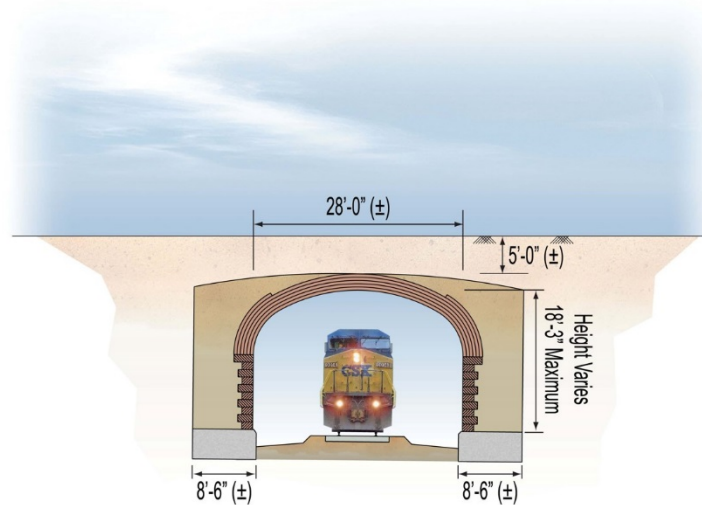
Overview - Unique Project Challenges

- The current VAT is 110 years old and 3,800 feet long
- Three construction alternatives studied for the NEPA EIS
- Proximity to multi-unit residential buildings
- Noise Analysis:
 - Train operations in and out of the tunnel
 - Train operation in open top runaround track
 - Traffic re-routing during construction
 - Construction noise from different construction operations
- Public Involvement and concern related to noise
- Innovation using “Sounds of Transit” during public workshop



Project Overview

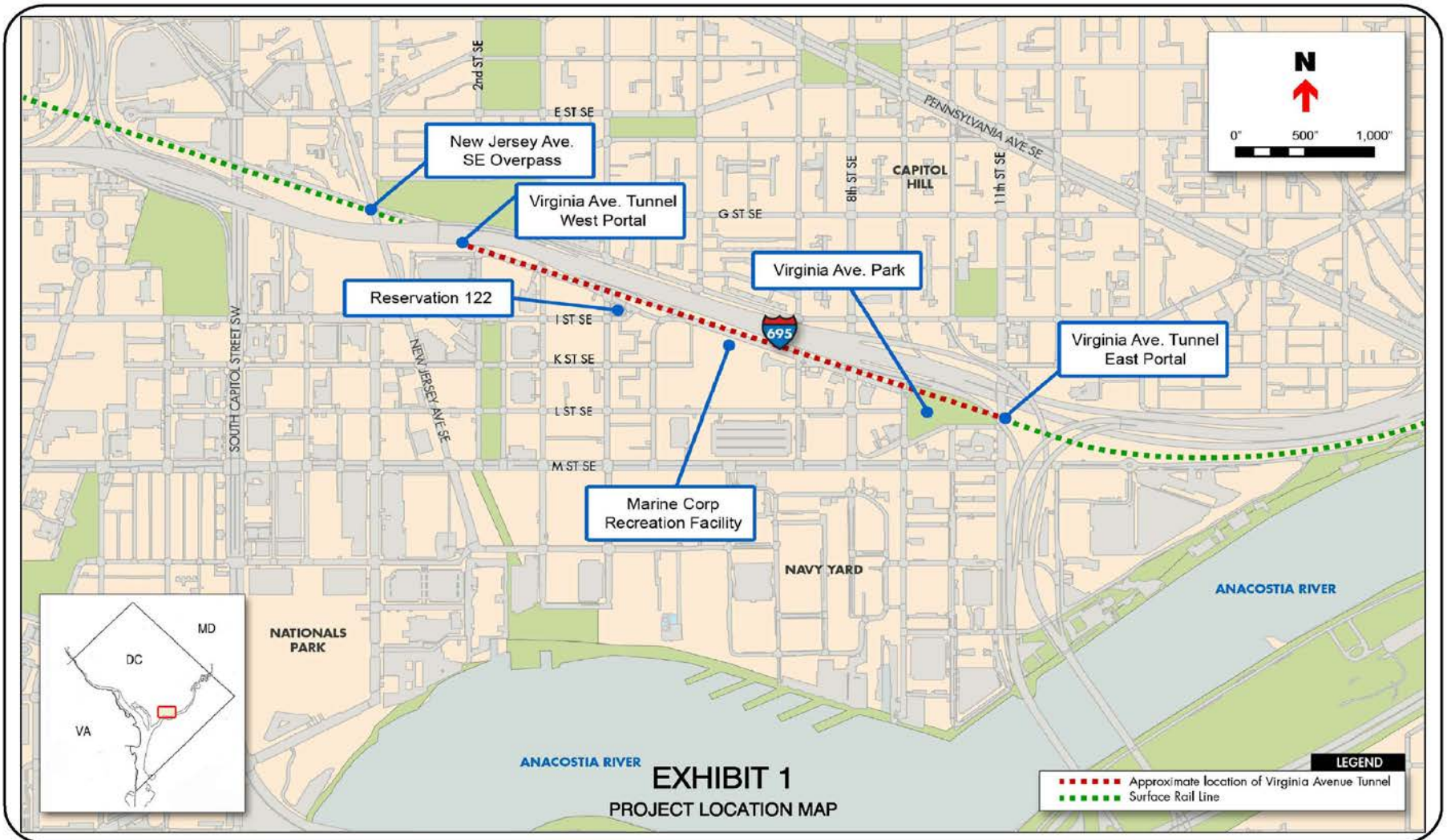
- Virginia Avenue Tunnel is located in Southeast Washington, DC
- The project location adjacent to I-695 (multi-lane highway)
- The project goal is to provide efficient and reliable freight transportation services
- The reconstruction will provide two single railroad tracks and vertical clearance for double stacking



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Project Overview

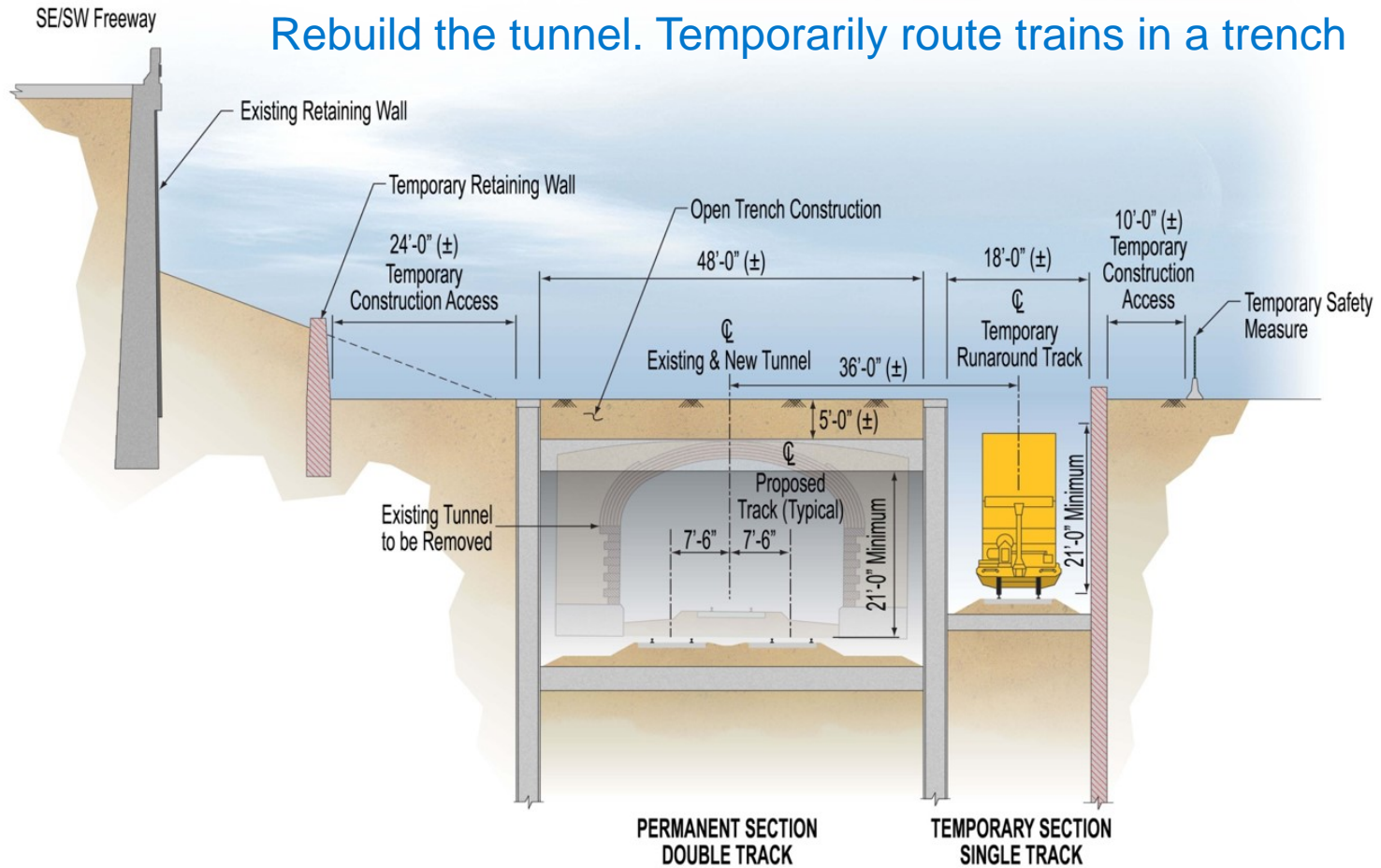


Project Overview



Alternative 1

Rebuild the tunnel. Temporarily route trains in a trench



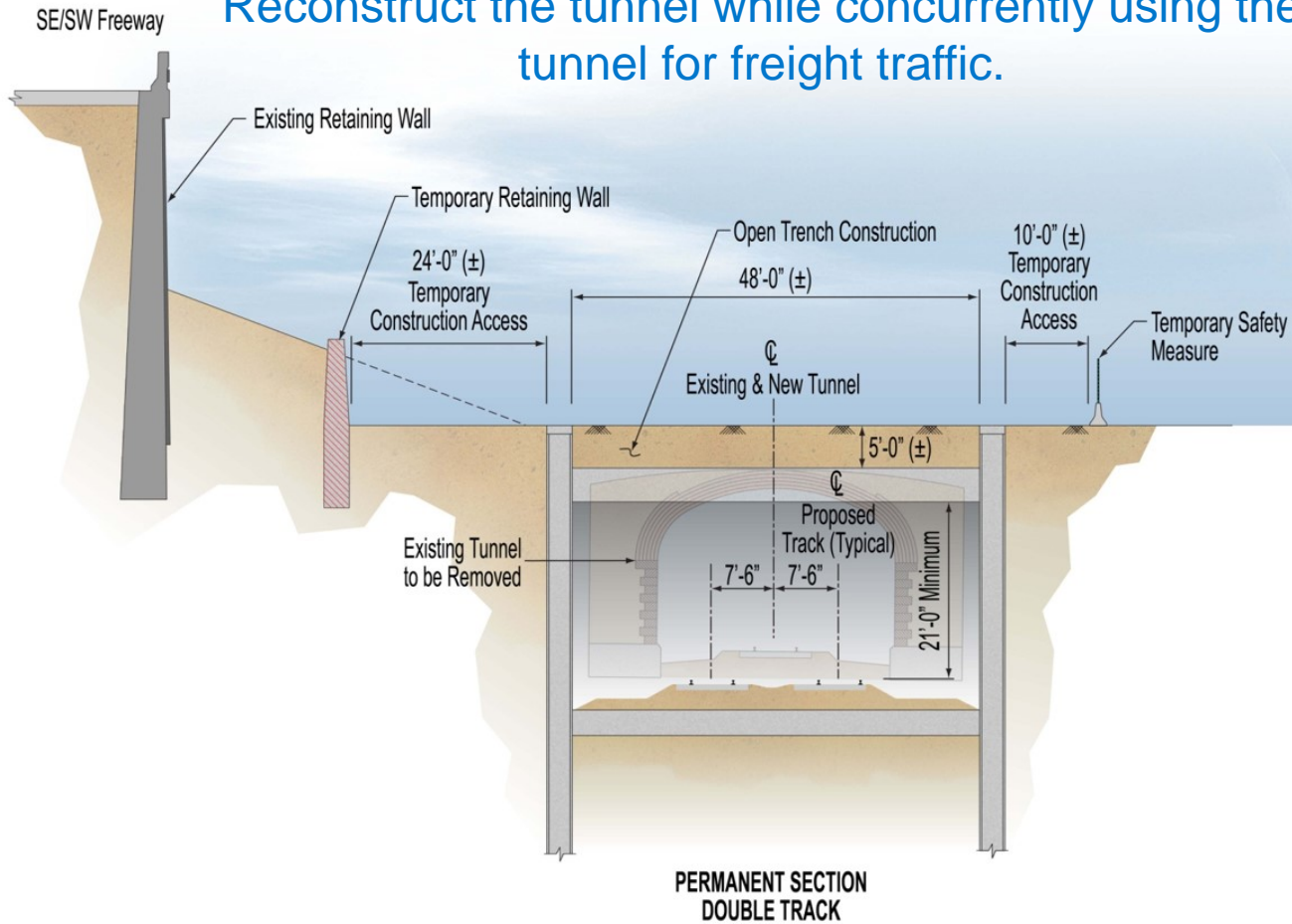
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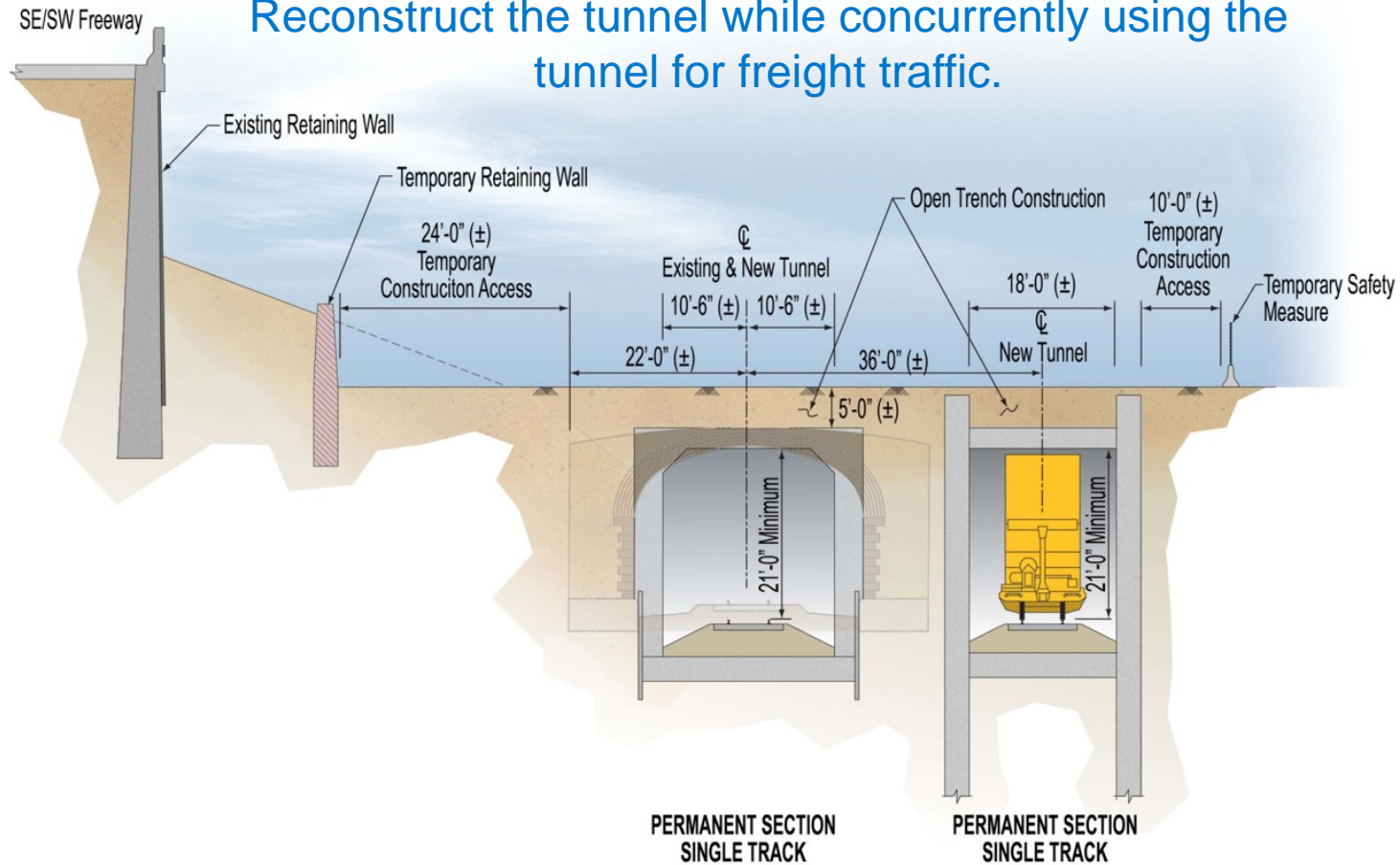
Alternative 2

Reconstruct the tunnel while concurrently using the tunnel for freight traffic.



Alternative 3

Reconstruct the tunnel while concurrently using the tunnel for freight traffic.



Definition of Common Noise Terms

- dB: A Decibel, the standard unit of measurement for sound level
- A-weighting: A standardized filter to account for the sensitivity of the human ear with respect to low and high frequency
- Leq: The time-averaged A-weighted sound level over a stated period of time (e.g. 1-hour period)
- Ldn: Day Night Sound Level, the sound exposure level for a 24-hour day calculated by adding the sound level obtained during the daytime and nighttime
- Ambient: the pre-project background noise level
- Future Sound Level: the summation of the ambient and the new project emitted sound levels



Train Noise Analysis

- Ambient sound level measurements (May and June 2012)
- Train operations (Daytime Vs. Nighttime)
- Train consist (Locomotive and no. of rail Cars)
- Train operations future Growth



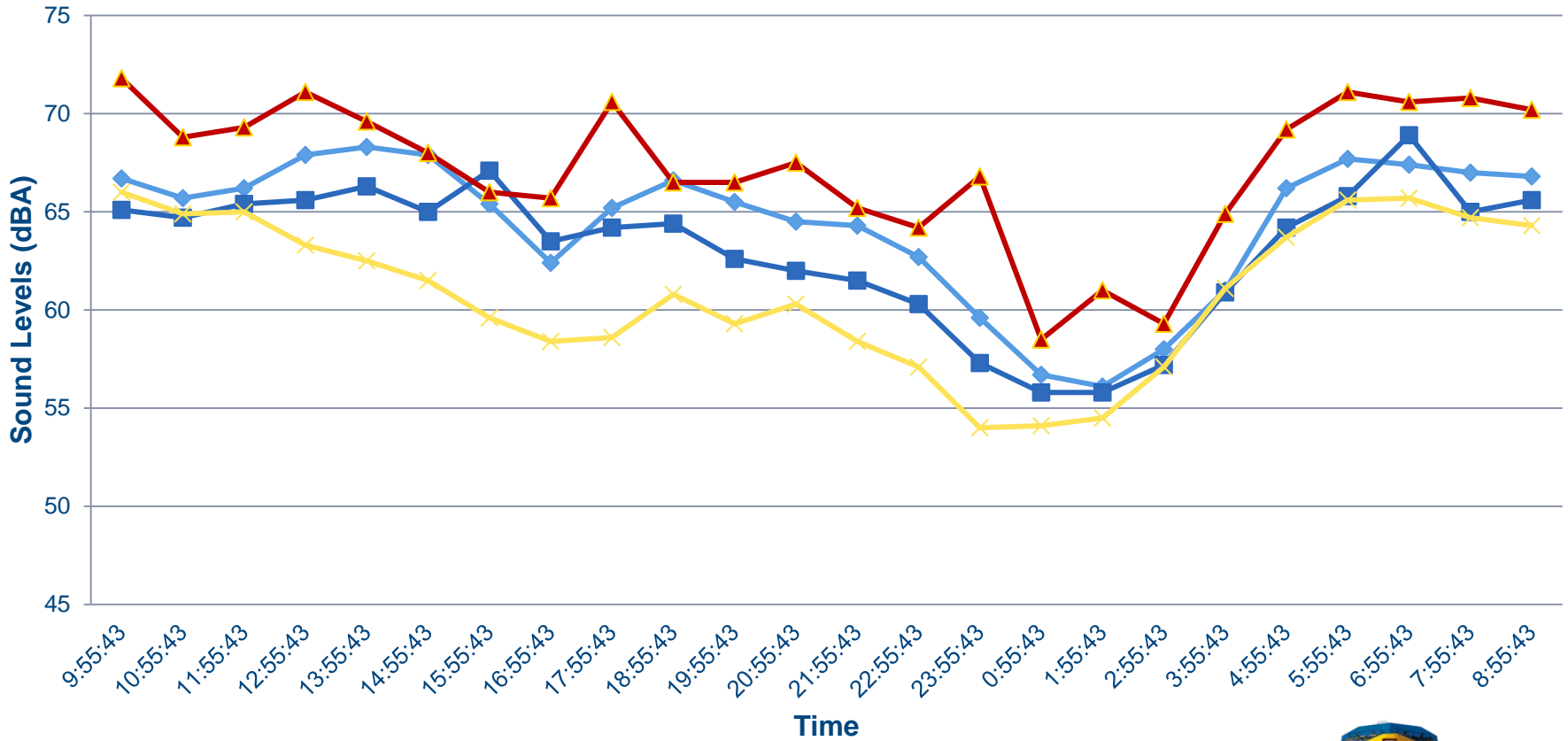
EXHIBIT 8

24 HR. NOISE MONITORING LOCATIONS



Train Noise Analysis

Equivalent Day-Night Sound Level (Ldn)



◆ 300 Block ■ Marines ▲ Dorms × Virginia Avenue Park



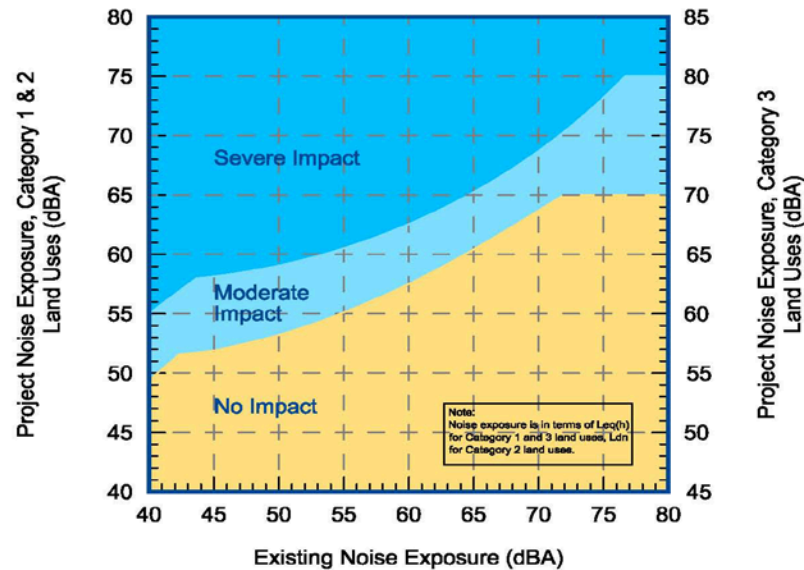
Train Noise Analysis

- FRA CREATE Noise Analysis
- Project Related Sound Levels (Train operation and Horn use)
- Land Use (Church, residential, senior living, office space)
- Noise reduction inside the trench

Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$	Land where quiet is an essential element in their intended purpose.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep.
3	Outdoor $L_{eq}(h)$	Institutional land uses with primarily daytime and evening use.

Noise Impact Criteria for Transit Projects



Source: *Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006*

Predicted noise impacts are based on increase above existing background noise levels.



Train Noise Analysis Summary

Receptor		Distance to Centerline Tracks (ft)	Warning Device	Maximum Speed (mph)	Existing Noise (dB(A))	Build Noise (dB(A))	Total Noise (dB(A))	Increase Over Existing
ID	Description							
R-1	200 I street	43	No	25	70	59	70	0
R-2	Capital Quarters (3 rd /4 th)	43	No	25	70	66	72	2
R-3	Capital Quarters (4 th /5 th)	95	No	25	70	61	71	1
R-4	Capper Seniors	45	No	25	73	66	74	1
R-5	Marine Field	45	No	25	69	58	69	0
R-6	Marine Quarters	100	No	25	69	60	70	1
R-7	Building at 8 th street	55	No	25	69	65	71	2
R-8	Admiral at Barracks ROW	60	No	25	69	64	70	1
R-9	Potomac Avenue SE	120	No	25	68	59	69	1
R-10	L Street SE	115	No	25	68	59	69	1



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Highway Noise Analysis

- FHWA and DDOT TNM analysis
- Changes in traffic volume → Change in sound level
- Short-term noise field work to validate model
- Future noise modeling for Year 2015



EXHIBIT 18
HIGHWAY NOISE ANALYSIS SITES



Highway Noise Analysis Summary

Site ID	Existing Noise Levels (dB(A))	Future Build Construction	
		Noise Levels (dB(A))	I.O.E. (dB)
A-1	71	71	0
A-2	72	72	0
A-3	71	72	1
A-4	72	72	0
A-5	70	70	0
A-6	70	70	0
A-7	71	71	0
A-8	72	71	-1
A-9	70	70	0
A-10	69	69	0
A-11	70	70	0
A-12	72	72	0
A-13	70	69	-1
A-14	68	68	0
A-15	67	67	0
A-16	68	68	0
A-17	69	69	0
A-18	71	71	0
A-19	76	76	0
A-20	74	74	0
A-21	70	70	0
A-22	71	71	0
A-23	72	72	0
A-24	71	70	-1
A-25	69	68	-1
A-26	71	71	0



Construction Noise Analysis

- Noise levels from construction activities for each alternative
- Mobile vs. Stationary equipment
- FHWA RCNM used for analysis
- Construction duration vary depends on alternative



EXHIBIT 12
RAIL ANALYSIS SITES



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Construction Noise Analysis

Site ID	Slurry Wall	Excavation	Excavation/Demolition	Structural Concrete	Work/Paving	Work/Backfill/Drainage
R-1 ^a	85	83	87	86	89	86
R-2 ^b	85	83	87	86	89	86
R-3	78	76	80	79	82	80
R-4	85	83	86	86	88	86
R-5 ^a	85	83	86	86	88	86
R-6	78	76	80	79	81	79
R-7	83	81	85	84	86	84
R-8	82	80	84	83	86	84
R-9	76	74	78	77	80	78
R-10	77	74	78	78	80	78



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Construction Noise Analysis

Site ID	Slurry Wall	Excavation	Excavation/Demolition	Structural Concrete	Work/Paving	Work/Backfill/Drainage	Sheet pile
R-1	83	81	85	84	86	84	93
R-2	83	81	8185	84	86	84	93
R-3	77	75	79	78	81	79	87
R-4	83	80	84	84	86	84	93
R-5	83	80	84	84	86	84	93
R-6	77	74	78	78	80	78	87
R-7	81	79	83	82	84	82	91
R-8	80	78	81	81	83	81	90
R-9	74	72	76	75	78	76	84
R-10	74	72	76	75	77	75	84



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Construction Noise Analysis Mitigation

- Adhere to DDOT construction noise specifications
- Establish a community outreach program to notify nearby residents and businesses about upcoming high noise producing activities
- Prepare a noise monitoring plan and conduct noise monitoring during construction in accordance with the plan

Land Use	FRA/FTA 8-hour Leq (dBA) Day	DDOT Leq (dBA)
Residential	80	80
Commercial	85	80
Industrial	90	80



Construction Noise Analysis Mitigation

- Use a type of perimeter fencing near noise sensitive receptors
- Use of noise dampening blankets to improve the noise reduction.
- Use drilled installation (Auger) methods instead of driven (Pile) methods
- Use demolition equipment with crush/shear technology, instead of impact technology
- Consider noise impacts in selecting construction equipment that need to run over extended periods of time, such as gen sets (whisper quiet line)
- Placing stationary noise generating equipment as far from residences as reasonably practical and feasible
- Route heavily loaded delivery and disposal trucks away from residential streets as reasonably practical and feasible



Innovative Approach to Public Meetings “Sound of Transit”

- Demonstrates various noise levels in an easy format
- Provide “real” noise examples
- Easily deliver answers to “What if? Scenario”
- Provide opportunity to experience the sound in outdoor and indoor environment
- Engages the public and enables them to hear and see an depiction of construction alternatives

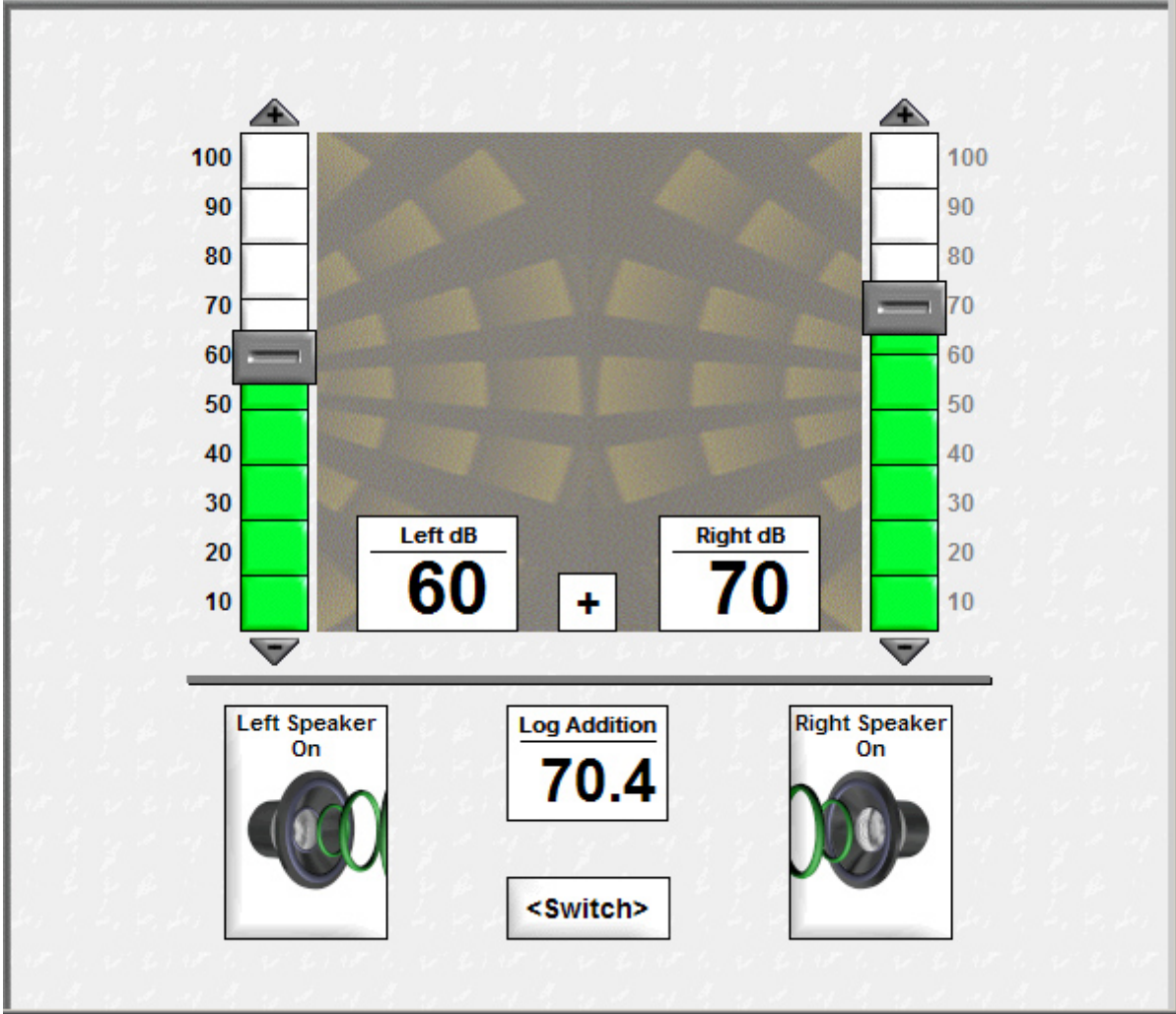


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Public Workshop



Public Workshop

Sound Source:
Reg Diesel - Tri-Rail 44 mph ▼

TV Volume: 60

TV On/Off

Indoor dBA: 55

Outdoor dBA: 80

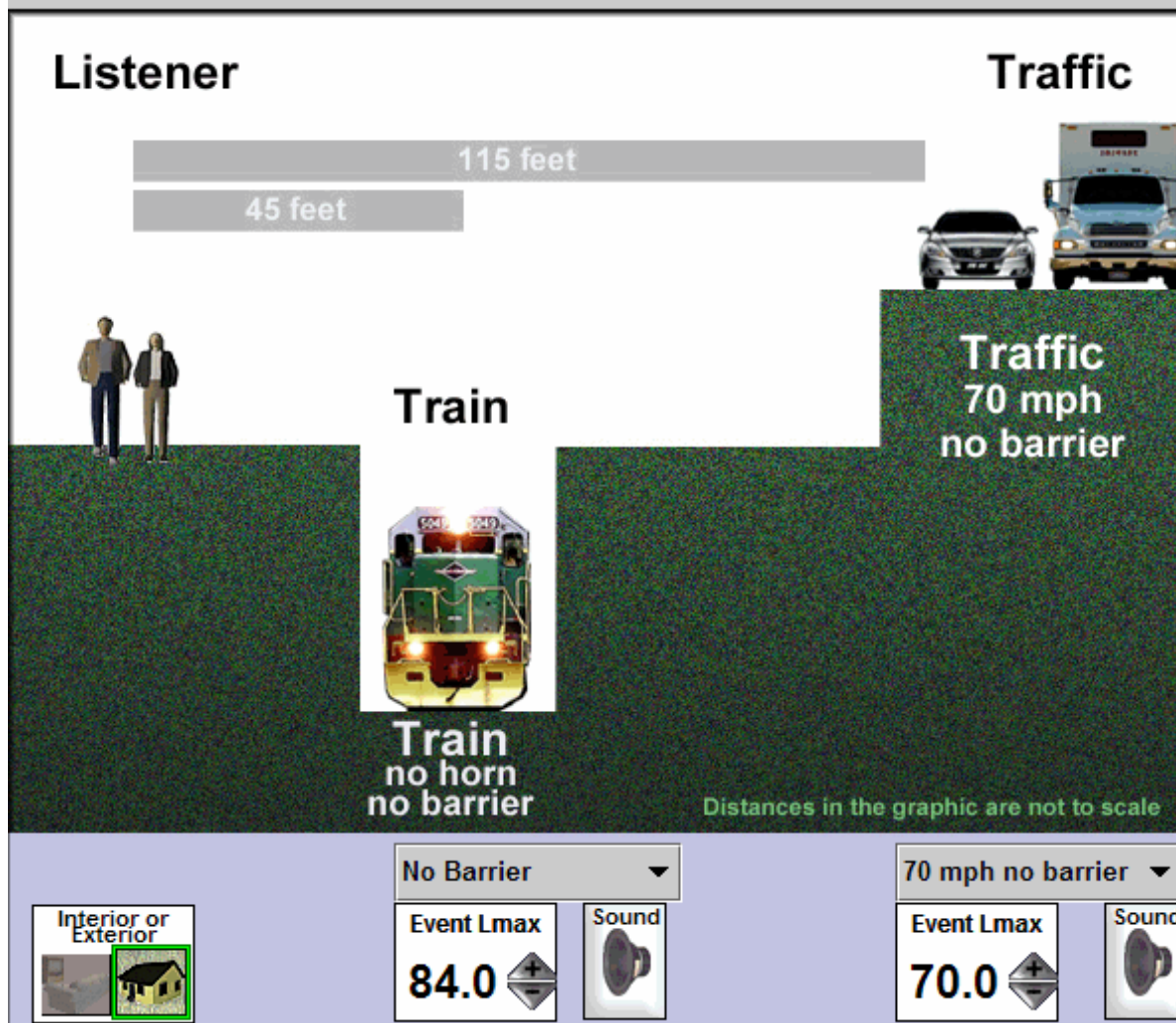
dBA: -10, -20, -25, -30, -35

Receiver: Inside/Outside

Sound



Public Workshop



Public Workshop

Train: no barrier
Road: no barrier

Location	Barrier	Event Lmax	Sound
Train at a 45 foot Distance	No Barrier	84.0	[Speaker Icon]
Road at a 115 foot Distance	Road - No Barrier	70.0	[Speaker Icon]





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Thank You!

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