# REBOUCE July 22, 2014





Maryland Department of Transportation

## **Project Background**

- The Baltimore Red Line (BRL) Corridor highest priority corridor within Baltimore Region for potential transit improvements.
- Identified and prioritized in 2002 Baltimore Region Rail System Plan.
  - 6 lines
  - Access to jobs, education, shopping, recreation, and medical care.



## **Project Background**





## **Project Goals and Benefits**

- Encourage transit ridership.
- Improve transit service (including connections) for transitdependent users and others who choose to use transit as an option.
- Support community revitalization and economic development.
- Address air quality issues and environmental stewardship.
- Minimize impacts to the natural and human environment.



## **Project Goals and Benefits**

- Improve east-west public transit for Baltimore City and Baltimore County residential neighborhoods.
- Provide connections to existing Metro, Light Rail and MARC stations
- Better connectivity to leisure activity points of interest
  - Oriole Park at Camden Yards,
  - M&T Bank Stadium,
  - Inner Harbor,
  - Fells Point,
  - Canton areas, and
  - Hippodrome Theater.
- Increase transit mobility, efficiency and accessibility
- Reduce transit travel times in the corridor.



## Implementing the Community Compact





- Jobs
  - Workforce Development Strategy
  - DBE Outreach
  - Internship and pre-apprenticeship training
- Environment
  - Sustainability goals incorporated in design criteria
  - LEED Silver facilities
  - Green track
  - Pedestrian and bike access
- Station Area Planning
  - Station Area Advisory Committees
  - Community Liaisons
  - Coordinated with City investment
- Manage Impacts
  - Alignment refinements
  - Pre-construction piloting of communications strategies

## **Project Description**

- Baltimore Red Line will serve:
  - 4 Universities and Colleges
  - 2 Medical Centers
  - Baltimore City Hall
  - CMS and SSA Campuses
  - Inner Harbor and Harbor East entertainment and tourist districts
  - 1 major shopping mall
- 14.1 miles:
  - Surface: 8.7 miles; 2 Tunnels: 4.7 miles (3.4 miles downtown and 1.3 miles Cooks Lane); Aerial: 0.7 miles



## **Project Description**

- Stations: 19
  - 14 surface, 5 with parking; 5 underground
- Capital Cost: \$2.6 plus Billion (Year of Expenditure dollars)
- Average Daily Ridership (2035): 54,520
- Connections to:
  - MARC (commuter rail) at two stations
  - Central Light Rail (Blue Line) at Lombard St
  - Metro (short walk) at Charles Center
- No involuntary residential displacements
- Frequency of Service: 10 minutes peak at opening, 7 minute peak by 2035



## Alignment





## Yesterday, Today, and Tomorrow





**>** 1952

## Today





## Operations

- Vehicles:
  - Minimum 70% low floor
  - Compatible with future fleet on existing Central LR line
- Systems
  - Automatic Train Control in protected ROW
  - Communications fully integrated
  - Overhead Contract System/Traction Power Substations (OCS/TPS)
  - Operations Control Center co-located with other modes/lines



## Operations

- In-street running in median in separate ROW with protective ramped curbs and cobbled pavers, when not in tunnel or fully protected ROW.
- Traffic signal priority to LRT in many key locations.
- Aerial structures over railroads and major highways.



## **Development Schedule**

- FEIS Review: 2012
- Record of Decision: February 28, 2013
- Preliminary Engineering: 2011 to 2013
- Final Design: 2013 to 2017
- Full Funding Grant Agreement 2015
- Construction Start: 2015
- Revenue Service: 2022



## Design - Track

#### Track

- □ Exclusive transitway
- 2 tracks with 14-feet center
- 27-feet total transitway
- Overhead catenary
- Embedded / Ballast/ Paver trackway





## **Design**-Stations

### Stations

- 14 Surface Stations
- □ 5 Underground Stations
- □ 194-feet in Length
- □ 10-feet to 25-feet in Width









## Analysis Overview

- FEIS analysis: conservative
- Detailed operational assessment
  - LRT passbys
  - Adjust for rail, switches, ground, etc.
- Preliminary construction assessment
  - Maximum activity
  - Worst-case assumptions





#### TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT

FTA-VA-90-1003-06

May 2006



Office of Planning and Environment Federal Transit Administration



## Vibration Metrics Overview

- RMS (VdB) used to assess human annoyance
- PPV (in/sec) used to assess structural damage

BALTIMORE



Propagation of Ground-Borne Vibration into Buildings

## FTA Vibration Criteria

- Criteria selected for different land-use categories
- FTA defined different sensitivities for each category

Table 8-1. Ground-Borne Vibration (GBV) and Ground-Borne Noise (GBN) Impact Criteria for						
General Assessment						
Land Use Category	GBV Impact Levels			GBN Impact Levels		
	(VdB re 1 micro-inch /sec)			(dis re zu micro Pascals)		
	Frequent Events <sup>1</sup>	Occasional Events <sup>2</sup>	Infrequent Events <sup>3</sup>	Frequent Events <sup>1</sup>	Occasional Events <sup>2</sup>	Infrequent Events <sup>3</sup>
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB <sup>4</sup>	65 VdB⁴	65 VdB⁴	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Notes

- 1. "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
- 2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
- 3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
- 4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
- Vibration-sensitive equipment is generally not sensitive to ground-borne noise.



## **Construction Activities**

- Tunnel Boring Machine
  - Low-level Continuous Vibration
  - Primarily a Function of Depth
- Cross-Passage Excavation Mechanical ("Hoe-Ram")
  - Roadheader
  - Blasting
  - Function of Distance
  - Charge Weight (if Blasting)





## **Operational Activities**

- LRT train passbys
  - CWR
  - Switches
- Stations
  - Ventilation Fans
- Vent Buildings
  - Ventilation Fans
- Conclusion



- No vibration impacts predicted.



## **Types of Design Features**

- CWR
- Rail resilient fasteners
- Rail direct fixation
- Concrete lined tunnels
- Lighter weight vehicles compared to subways
- Conclusions/bottom line...FEIS no impacts



## Vibration Concerns (construction)

- University of Maryland Bio Park
- University of Maryland Hospital
- National Aquarium in Baltimore
- NIH Building on Hopkins Bayview Campus
- Several Historic Buildings and Districts
  - Canton/Fells Point
  - Little Italy
  - Edmondson Corridor, etc.

NIH Biomedical Research Center

National Institute on Aging

National Institute on Drug Abuse





## **Construction Monitoring**

- Mitigation Incorporated into Design
- Specifications Development
- Construction Monitoring Program
- Community Consultation Meetings
- Memorandum of Agreement







## **Baltimore Red Line**

## Questions ?

Ray Moravec Wallace Montgomery Red Line PMC 410-828-3816 rmoravec@baltimoreredline.com

Tom Herzog AECOM Red Line GEC 917-657-0906 tom.herzog@aecom.com

