

Logistics of Constructing a Washington D.C.-Baltimore Rapid Transit Line

Washington Metropolitan Area Transit Authority
Maryland Transit Administration

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Sponsors

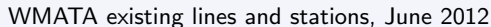
Washington Metropolitan Area Transit Authority (WMATA):

- ① transportation agency created by the Library of Congress
- ② operates in the District of Columbia, Maryland, and the Commonwealth of Virginia
- ③ rapid transit service (Metrorail)
- ④ bus services (Metrobus)
- ⑤ paratransit (MetroAccess)
- ⑥ currently constructing new lines in Virginia (Silver Line) and in Maryland suburbs of D.C. (Purple Line)

Sponsors (cont.)

Maryland Transit System (MTA Maryland):

- ① transportation agency operated by the state of Maryland
- ② operates in the Baltimore-Washington Metropolitan area
- ③ numerous bus lines
- ④ Light Rail
- ⑤ Metro Subway
- ⑥ MARC train



Relevance

Problem area:

- D.C. and Baltimore have similar worker populations

Table: Workers Who Use Public Transportation

City	# of workers	# of cars, trucks, or vans
Washington, D.C.	293,532	127,494
Baltimore	269,917	186,961

- 43% of D.C. workers commute in cars, trucks, or vans
- 69% of Baltimore workers commute in cars, trucks, or vans
- it is apparent that large populations of workers of both cities rely heavily on vehicles to commute
- a subway line between the two cities would greatly reduce traffic volume, jams, and accidents
- sponsors would find this model relevant

Problem Statement

- WMATA has no plans to expand the Metrorail system to the city and suburbs surrounding Baltimore
- MTA Maryland's Metro Subway system only operates within city limits
- residents of Greater Washington-Baltimore Metropolitan area have limited access to public transportation to travel between the two cities
- current public transportation methods:
 - AMTRAK fares too expensive for daily commute
 - MARC operates rush hours on weekdays
- both sponsors operate under two separate government agencies
- our task is to provide a model that can predict the operating capacity for a such a line based on published transportation statistics

Deliverables: From Sponsor to Team

- ① most recent data and statistics from Maryland Department of Transportation by Oct 19, 2012
 - contingency plan: if data not received by the assigned time, we will obtain data published on the Department of Transportation website
- ② computing resources
- ③ timely responses to inquiries
- ④ small expenses relevant to work

Deliverables: From Team to Sponsor

- ① mathematical model of traffic flow at various hours of the day (morning, noon, evening)
- ② traffic flow will model highways I-495 and I-95
- ③ analytical report on the results of traffic flow model to determine if a subway line is viable
- ④ time permitting, design of the subway line
- ⑤ R package with documentations and codes to reproduce test results
- ⑥ technical report and presentation summarizing the work done

Gathering the Data

- 1 contact statisticians through sponsors at Maryland Department of Transportation for the most recent data on highway mobility and traffic trends between D.C. and Baltimore
- 2 receive data through email (if electronic)
- 3 receive data through regular mail (if paper copies)
- 4 determine if data is relevant/useable to traffic model
- 5 contact statisticians in the event of needing additional data

Gathering the Data - Contingency Plan

In the event that we do not receive data from Maryland Department of Transportation by Oct 19, 2012:

- ① visit the Maryland Department of Transportation website at <http://sha.md.gov/index.aspx?PageId=682>
- ② download "2012 Maryland State Highway Mobility Report"
- ③ browse through "Traffic Trends" section
- ④ look for other relevant sources through Google, such as MARC and AMTRAK train statistics

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Payne-Whitham and Aw-Rascle Models

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Implementation of Traffic Flow Models

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Design of Subway Line (Time Permitting)

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Report and Presentation

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Remaining Work

- wait for sponsors to send us data by Oct 19; if deadline not met, activate contingency plan
- determine which traffic flow model to use
- write MATLAB code of chosen traffic flow model, implement appropriate initial conditions from transportation data, and plot relevant graphs
- compose analytical report on results of traffic flow model and R package
- time permitting, design a subway line based on model
- presentation of completed work

Future Research

- look into other traffic flow models
- implement more factors other than highway mobility for a more realistic model
- look into MARC and AMTRAK statistics for a different model, since the D.C.-Baltimore commuters are more likely to be commuters taking these trains
- if subway design not completed due to limited time, design the line based on all models considered above

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