

A Report to the Maryland General Assembly

Senate Budget and Taxation Committee

and

House Appropriations Committee

regarding

Green Line Feasibility Study  
(2006 Joint Chairmen's Report, Page 74)

June 2007

The Maryland Department of Transportation

# Green Line Feasibility Study (2006 Joint Chairmen's Report, Page 74)

## INTRODUCTION

This report was prepared at the request of the Maryland General Assembly in the 2006 Joint Chairman's Report. The language of the Joint Chairman's Report requiring this analysis is as follows:

*"The committees are interested in the proposed Green Line feasibility study to the Baltimore/Washington International Thurgood Marshall Airport being undertaken by the Maryland Transit Administration (MTA). As part of the feasibility study, the committees request that MTA submit a preliminary report analyzing the line traveling through the Columbia Town Center."*

## EXECUTIVE SUMMARY

The analysis investigated five concepts that would provide service to Columbia from Greenbelt and then on to Baltimore/Washington Thurgood Marshall (BWI) Airport (Figure 1). The first three concepts would extend the Washington Metropolitan Area Transit Authority (WMATA) Metrorail Green Line from Greenbelt to BWI Airport through Columbia Town Center. The other two concepts require a transfer off of a Green Line Extension to another line that would go to Columbia Town Center. Although assessed as rail transit in this report, the transfers could be provided by another mode such as express bus. These alignments were named:

- Concept A - Columbia Line via MD 32
- Concept B - Columbia Line via Fort Meade
- Concept C - Columbia Line via Konterra
- Concept D - Columbia Spur
- Concept E - Columbia Loop

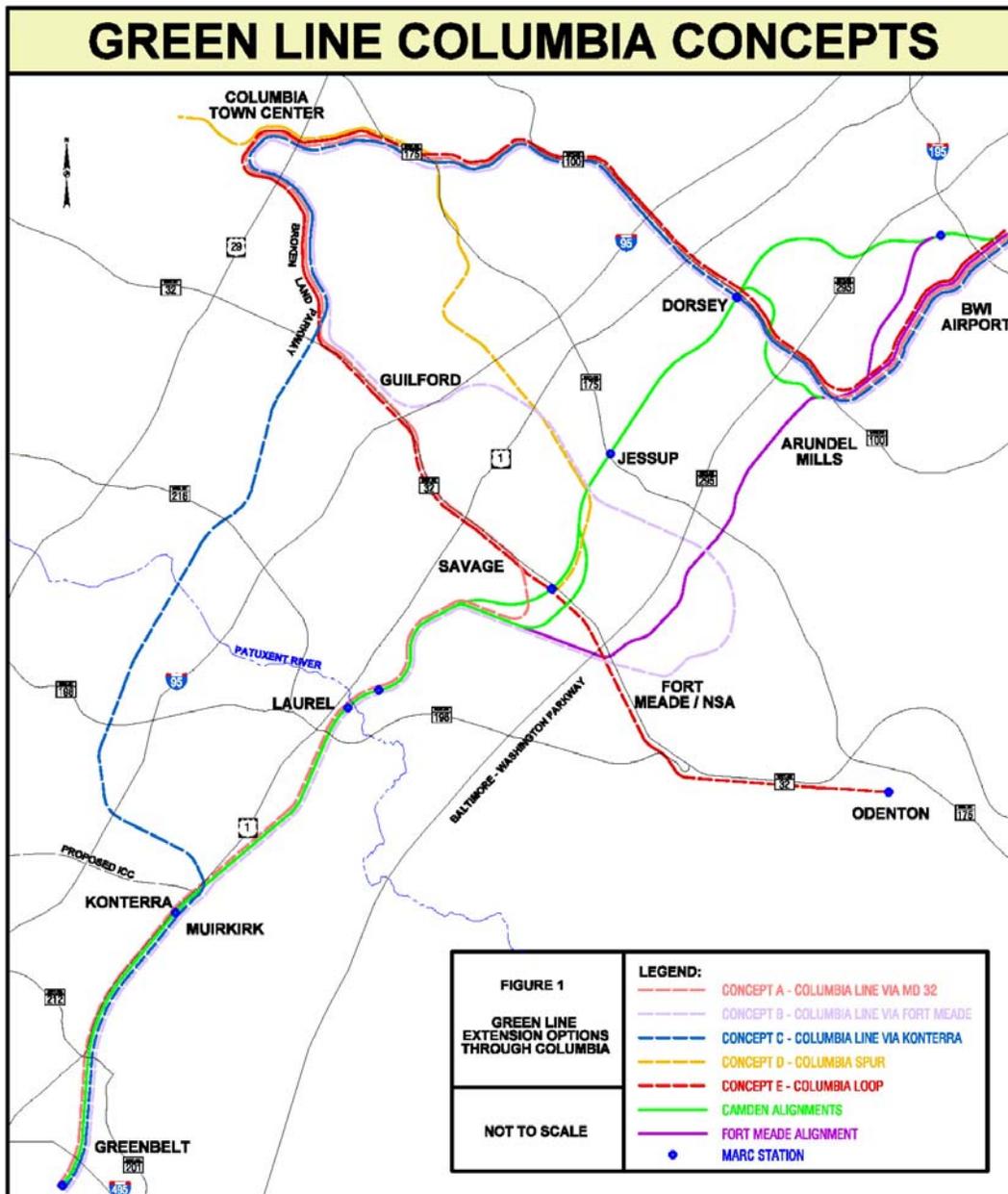
This report provides more detailed descriptions of these lines, which include length of alignment, travel times, environmental impacts, and costs.

Providing rail service directly to Columbia will cost approximately \$1.3 to \$4.3 billion more than a Green Line Extension only to BWI Airport, which has an estimated cost that ranges from \$2.2 to \$2.9 billion. Travel times from Greenbelt via Columbia to BWI Airport would increase by approximately 15 to 35 minutes when compared to a Green Line Extension that travels directly to BWI Airport. A comparison of travel times and costs can be seen in Table 1.

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All of the concepts result in impacts to the environment. Minimizing environmental impacts may require modifying alignment locations which may lead to either longer travel times, bypassing of certain market areas, or additional costs to build underground tunnels.

**Figure 1 - Alignment Concepts**



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**Table 1 – Comparison of Travel Times and Costs**

Alignment	Total Alignment Length (miles)	Total Cost (Billions)	Time from Greenbelt to BWI Airport (min)	Time from Greenbelt to Columbia (min)	Time from Columbia to BWI Airport (min)
2004 Green Line Extension Study	20 - 23	\$2.2 - \$2.9	30 – 35	N/A	N/A
Concept A - Columbia Line via MD 32	31.5	\$4.3 - \$4.9	56	33	23
Concept B - Columbia Line via Fort Meade	37.5	\$5.3 - \$5.9	64	42	22
Concept C - Columbia Line via Konterra	29.5	\$4.3 - \$4.9	50	28	22
Concept D - Columbia Spur*	20.5+10.5= 31	\$4.2 - \$4.8	32	41	38
Concept E - Columbia Loop*	26+17= 43	\$5.9 - \$6.5	37	37	22

\* For both Concepts C and D, passengers would not go through Columbia to arrive at BWI Airport

### BACKGROUND

In August 2004, the Maryland Transit Administration (MTA) completed a feasibility study that explored extending the WMATA Green Line Metrorail from Greenbelt to BWI Airport. The study looked at two potential alignments: the Camden Alignment and the Fort Meade Alignment (Figure 1). The Camden Alignment traveled adjacent to the MARC Camden Line from Greenbelt to Hanover and then crossed over MD 170 to BWI Airport. The Fort Meade Alignment followed the Camden Alignment to Savage, then traveled east to Fort Meade and from there continued north to BWI Airport. The study concluded that both alignments were feasible and that further detailed study would be justified. These alignments are referred to as the 2004 Green Line Extension throughout this report.

In 2006, the Maryland General Assembly requested a preliminary report analyzing a Washington Metropolitan Area Transit Authority (WMATA) Green Line extension traveling through the Columbia Town Center to BWI Airport. As part of this report, previous studies that proposed connecting Columbia to BWI Airport were identified. One such study was the August 2002 Baltimore Region Rail System Plan (Figure 2). This plan proposed to extend the light rail Yellow Line from BWI Airport to Columbia Town Center. A feasibility study was conducted to extend the Yellow Line to Arundel Mills, but planning activities have not moved forward beyond its initial phase.



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## METHODOLOGY

Five alignments were developed to provide rail access from Columbia to BWI Airport. Three of these potential alignments go from Greenbelt through Columbia Town Center to BWI Airport. All three of these alignments used the 2004 Metrorail Green Line Extension Feasibility Study alignment as the starting basis for the alternatives. Each alignment was developed with the goal of creating a potential feasible alignment to Columbia Town Center and then BWI Airport. The alignments included serving destinations that would potentially attract riders as suggested in other studies (i.e. 2002 Baltimore Regional Rail System Plan, 2004 WMATA Green Line Metrorail Extension), while trying to minimize the time to travel along the alignment.

Two alignments were developed that seek to reduce costs, travel time, and/or environmental impacts while allowing rail transit access to Columbia and BWI Airport from the existing Metrorail. Separate spur and loop routes were investigated, using the 2004 Green Line Extension with a separate new line for the service to Columbia. All proposed alignments can be seen in Figure 1.

The study travel times were calculated based on the WMATA Metrorail schedules. Existing travel times between stations outside the downtown area were examined along with the distance between the stations. Then proposed locations of stations were assigned on each concept and the distance between each proposed station was estimated. A travel time value was then given between each proposed station based on the existing system. These travel times were totaled along each concept to give travel times between Columbia and BWI Airport. For simplicity, if a transfer was needed, an additional four minutes was added.

Preliminary costs are "order of magnitude" costs, calculated based on a cost per mile estimate of a WMATA Metrorail. Assumptions were made as to where the alignment would be elevated, at-grade, or underground and costs were calculated per mile based on those assumptions. Other preliminary costs that were added were based on assumptions for stations, electric supply, parking facilities, maintenance shops, right of way costs, and bridges. A contingency for planning and construction were also added in the costs.

Potential environmental impacts were determined from Geographic Information System (GIS) data. A buffer range of 75 to 200 feet (37.5 to 100 feet on each side of the alignment) was utilized when calculating impacts. While this method provides a basis of comparison among alternatives, alignment adjustments could either reduce or increase environmental impacts.

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## EXISTING SERVICES

There are currently several transit options that connect Columbia with Washington, D.C. or BWI Airport, including:

- **Connecting Columbia with Washington, D.C.**

The Maryland Transit Administration (MTA) provides two commuter bus lines that connect Columbia and Washington D.C., the No. 915 and No. 995. Both routes have multiple stops in Columbia and Washington. The travel time from the last stop in Columbia to the first stop in Washington for each line varies between 35 to 55 minutes depending on the time of day and traffic.

Corridor Transportation Corporation manages Howard Transit (Howard County based) and Connect-A-Ride (Laurel/Anne Arundel based) transit services. Connections to Columbia can also be made from these two systems in combination with other transit systems. From Greenbelt, WMATA offers three bus lines to Laurel, the No. 87, 88, and 89. Once in Laurel, a transfer can be made to the Connect-A-Ride E Route, which goes from Laurel to Columbia. With the transfers and limited service time, it could take more than 2 hours to get from Washington to Columbia via Greenbelt and Laurel.

MARC trains can be used from Washington to access Columbia via the Camden Line. Three times a day, the Howard Transit Blue Route leaves from the Savage MARC Station and arrives at the Columbia Town Center. Likewise, three times a day, the Blue Route arrives at Savage Station. Including transfer wait times, the whole trip from Columbia to Washington ranges from approximately 80 to 110 minutes. A transfer in the afternoon is not possible.

From the Dorsey MARC Station, the Howard Transit Silver (formerly Red Express) Route can be used to travel directly to Columbia. The complete travel time including transfer delays between Washington and Columbia ranges from 86 minutes to 139 minutes.

- **Connecting Columbia with BWI Airport**

Howard Transit Silver Route also provides service from Columbia to BWI Airport. This route leaves every hour from Columbia Mall from 6 AM to 10 PM and arrives at BWI Airport in approximately 80 minutes. From BWI Airport, the route leaves every hour starting at approximately 6:30 AM, with the last route leaving the airport at 9:30 PM.

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- **Connecting Columbia with Washington, D.C via BWI Airport**

Once reaching BWI Airport using the Howard Transit Silver Route, WMATA's B30 bus (Greenbelt-BWI Airport Express Line) can be used to access WMATA's Greenbelt station. Service is provided approximately every 40 minutes with a travel time of approximately 35 minutes.

### ALIGNMENT DESCRIPTION

Five alignments were evaluated in this feasibility study (Figure 1):

- *Concept A – Columbia Line via MD 32*
- *Concept B – Columbia Line via Fort Meade*
- *Concept C – Columbia Line via Konterra*
- *Concept D – Columbia Spur Line*
- *Concept E – Columbia Loop Line*

The first three alignments, Concepts A, B, and C, use the 2004 Green Line Extension alignment as their starting point and then vary from that alignment at different locations in order to reach Columbia. The main difference among the first three alignments is the route from Greenbelt to Columbia Town Center. The segments of the alignments that connect Columbia to BWI Airport are the same for each of these three concepts.

Concept D uses the 2004 Green Line Extension alignment in its entirety and adds an independent alignment to make the connection to Columbia. Concepts E uses the 2004 Green Line Extension alignment from Greenbelt to Dorsey and adds an independent alignment to make the connection to Columbia.

All of the concepts were assumed to have exclusive right-of-way. Unless noted otherwise, all proposed alignments were assumed at-grade where feasible. Where this was not feasible, e.g. like at roadway intersections, the alignment would be on an elevated structure. These concepts include:

- **CONCEPT A – COLUMBIA LINE via MD 32**

Concept A follows the Camden Alignment along the CSX right-of-way from Greenbelt to Savage using the Savage East Option from the 2004 Green Line Extension feasibility report. From Savage, the alignment curves through the Savage industrial area to head westbound in the wide median of MD 32.

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West of I-95, the alignment would run on the north side of the westbound MD 32 lanes until Broken Land Parkway where the alignment would follow the off-ramp to curve north on to Broken Land Parkway. At this point, the alignment would follow Broken Land Parkway to Columbia Town Center and then to BWI Airport as described further below in the Columbia to BWI Airport section.

In total, a Columbia Line via MD 32 would require approximately 19 miles of new line from Greenbelt to Columbia Town Center and an additional 12.5 miles to BWI Airport. The total length of a Columbia Line via MD 32 is approximately 31.5 miles of new alignment.

- **CONCEPT B – COLUMBIA LINE via FORT MEADE**

Concept B follows the Camden Alignment along the CSX right-of-way from Greenbelt to Savage using the Savage East Option from the 2004 Green Line Extension feasibility report. From the Savage station, the alignment continues east to Fort Meade. The line then curves north and into Fort Meade, before curving west towards Jessup. The alignment in Fort Meade would potentially be underground to reduce impacts and shorten the travel time needed to travel in this area.

The alignment continues west to I-95 before heading south alongside I-95 to the MD 32 interchange. The alignment will follow the ramp and then run alongside westbound MD 32 to Broken Land Parkway where the alignment would follow the off-ramp to curve north on to Broken Land Parkway. At this point, the alignment follows Broken Land Parkway to Columbia Town Center and then to BWI Airport as described further below.

In total, Concept B would require approximately 25 miles of new line from Greenbelt to Columbia Town Center and an additional 12.5 miles to BWI Airport. The total length of the Columbia Line via MD 32 alignment is approximately 37.5 miles.

- **CONCEPT C – COLUMBIA LINE via KONTERRA**

Concept C follows the Camden Alignment along the CSX right-of-way from Greenbelt to Muirkirk from the 2004 Green Line Extension report. After the Muirkirk station, the alignment curves to the west, crossing US 1 and I-95. The alignment would then curve north to run parallel to the BGE high-tension power lines.

The alignment would continue north along the power lines before crossing over the Patuxent River. On the other side of the Patuxent River, the alignment would then

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line up with the southern end of Broken Land Parkway and then follow Broken Land Parkway to the MD 32 interchange. After the interchange at MD 32, the alignment would follow Broken Land Parkway to Columbia Town Center and then to BWI Airport as described below.

In total, Concept C would require approximately 17 miles of new line from Greenbelt to Columbia Town Center and an additional 12.5 miles to BWI Airport. The total length of the Columbia Line via MD 32 is approximately 29.5 miles of new alignment.

- **COLUMBIA TO BWI AIRPORT (Concepts A, B, C, and E)**

From the Broken Land Parkway / MD 32 interchange, the alignments continue north along Broken Land Parkway to Columbia Town Center. After the Columbia Town Center station, the alignment curves east to the southern end of the Lake in Columbia and crosses over US 29 to the Oakland Mills Village Center. The alignment then continues east in Oakland Mills, briefly entering a local park, and then joins MD 175, where the alignment runs along on the eastbound side.

The alignment then passes through the Long Reach Village Center and continues north alongside Snowden River Parkway to MD 100, where the alignment enters the median. The median appears to be wide enough to allow an at-grade alignment in the median.

The alignment then continues in the median of MD 100 to Arundel Mills. At the Arundel Mills area, the alignment would head north through the Baltimore Commons industrial area and then to BWI Airport.

- **CONCEPT D – COLUMBIA SPUR LINE**

Concept D includes a transfer line that begins at the Savage Station. North of the station, the alignment curves west and follows alongside spur tracks from the existing CSX tracks that lead to an industrial area in Jessup. Continuing west, the alignment enters the Columbia Gateway area and the Snowden River shopping area before heading to MD 175.

The alignment is parallel to MD 175 until it reaches the Oakland Mills area. The Spur Line then curves towards the Oakland Mills Village Center and crosses US 29 to reach the southern side of the Columbia Town Center. The spur terminates near the Howard Community College and Howard County General Hospital.

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In total, Concept D adds approximately 10.5 miles of new line from Savage to Columbia. This is in addition to a Green Line Extension that is approximately 20.5 miles of new alignment from Greenbelt to BWI Airport. A total of 31 miles of new alignment is required for Concept D.

- **CONCEPT E – COLUMBIA LOOP LINE**

Concept E is a completely separate line with two transfer stations to the Green Line extension.

The alignment begins at the Odenton MARC Station. The alignment then travels west until reaching MD 32 by Tipton Airport, located adjacent to Fort Meade. The alignment then continues along MD 32 until Broken Land Parkway, at which point Concept E follows the Columbia lines through Columbia and to BWI Airport, refer to COLUMBIA TO BWI AIRPORT (Concepts A, B, C, and E). For the purpose of this report, the Columbia Loop assumes that the Green Line Extension terminates at a transfer station near Dorsey, allowing for the travel time from Columbia to BWI Airport to remain the priority and the potential for a future extension toward Baltimore.

In total, Concept E adds approximately 26.5 miles of new line from Odenton to Fort Meade to Columbia to BWI Airport. This is in addition to a Green Line Extension that is approximately 16.5 miles of new alignment from Greenbelt to Dorsey. The total length of new alignment is approximately 43 miles.

### FINDINGS

All of these alignments, Concepts A, B, C, D, and E, will be compared in the following tables to the 2004 Green Line Extension alignments and options that are discussed in the 2004 Green Line Extension Feasibility Study, which connect Greenbelt to BWI Airport without a detour to Columbia. The 2004 Green Line Extension alignments ranged between 30 to 35 minutes in travel time and 20 to 23 miles in length from Greenbelt to BWI Airport. Concepts D and E were developed to reduce overall travel times between Greenbelt and BWI Airport while still providing service to Columbia.

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### Travel Times

Table 2 shows the travel times between Greenbelt, Columbia and BWI Airport by alignment.

Note that Concept D adds nearly 20 additional minutes to a trip from Columbia to BWI Airport compared to the other concepts. The additional time is due to the need to travel down the spur to Savage and then transfer to a 2004 Green Line Extension alignment that goes to the airport. Also, transfers are required for Concepts D and E when traveling to Columbia from Greenbelt.

**Table 2 – Travel times between Columbia, BWI Airport, and Greenbelt**

Alignments	Travel Time to Columbia (min)	Travel Times to BWI Airport (min)	
		From Greenbelt	From Columbia
2004 Green Line Extension	n/a	31 - 35	n/a
Concept A – Columbia Line via MD 32	33	56	22
Concept B – Columbia Line via Ft. Meade	42	64	22
Concept C – Columbia Line via Konterra	28	50	22
Concept D – Columbia Spur	17 (Greenbelt to Savage) +4 (transfer time) +20 (Savage to Columbia) =41	32	20 (Columbia to Savage) +4 (transfer time) +14 (Savage to BWI) =38
Concept E – Columbia Loop	17 (Greenbelt to Savage) +4 (transfer time) +16 (Savage to Columbia) =37	37	22

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Table 3 shows how much new alignment is needed for each concept to be built.

**Table 3 – Length of Alignment Needed**

Alignments	Total Length Needed
2004 Green Line Extension	20.0 – 22.5 miles
Concept A – Columbia Line via MD 32	31.5 miles
Concept B – Columbia Line via Ft. Meade	37.5 miles
Concept C – Columbia Line via Konterra	29.5 miles
Concept D – Columbia Spur	10.5 miles for Spur + 20.5 miles for Ft. Meade Alignment = 31.0 miles
Concept E – Columbia Loop	26 miles for Loop + 16.5 miles for Camden Line (Greenbelt to Dorsey) = 42.5 miles

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## Estimated Costs

Table 4 shows the preliminary cost estimates for each alignment. Estimates were based on the assumption that all alignments would be WMATA Metrorail. For the Columbia Loop and Columbia Spur, the Total Cost includes the Green Line Extension to BWI, which would need to be built in conjunction with those lines. The table shows that any line that involves a destination to Columbia would cost anywhere from \$1.3 to \$4.3 billion in addition to the \$2.2 to \$2.9 billion projected for the Green Line Extension to BWI Airport.

**Table 4 – Costs for each alignment**

Alignment	Total Alignment Length (miles)	Total Cost (Billions)
2004 Green Line Extension - Camden or Fort Meade Alignment	20.0 – 22.5	\$2.2 - \$2.9
Concept A – Columbia Line via MD 32	31.5	\$4.3 - \$4.9
Concept B – Columbia Line via Fort Meade	37.5	\$5.3 - \$5.9
Concept C – Columbia Line via Konterra	29.5	\$4.3 - \$4.9
Concept D – Columbia Spur	31.0	\$4.2 - \$4.8
Concept E – Columbia Loop	42.5	\$5.9 - \$6.5

## Environmental Concerns

Table 5 compares the potential environmental impacts of each option. Table 6 provides a description of terms used in Table 5. Impacts were determined using available map data and no field assessments were conducted. Concept D – Spur and Concept E - Loop options were calculated separately from the Green Line Extension to BWI Airport, which would need to be constructed for the Loop or Spur line to function. There would be environmental impacts for each line. When compared to a direct connection from Greenbelt to BWI Airport, the Columbia alignments generally have more potential impacts. To determine the total amount of environmental impacts for Concept D and E, you must add the impacts from the 2004 Green Line Extension. Further minimization of environmental impacts would likely lead to longer travel times, higher costs, and/or avoidance of certain areas.

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**Table 5 – Assessed extent of environmental and community/cultural impacts**

	Concept A MD 32	Concept B Fort Meade	Concept C Konterra	Concept D Spur	Concept E Loop	2004 Green Line Extension - Camden Alignment
<b>Environmental</b>						
Wetlands from DNR (acres)	6 to 18	12 to 35	4.5 to 15.5	8 to 21	2 to 6.5	4 to 13.5
Wetlands from NWI (acres)	13 to 30.5	23.5 to 61.5	10.5 to 26.5	15 to 43	4.5 to 13	14 to 30
Wetlands of Special State Concern (acres)	0.24 to 0.56	0.24 to 0.56	0.22 to 0.54	none	0.24 to 0.56	0.78 to 1.88
Sensitive Species Review Areas	6	5	3	none	4	5
MD Streams (crossings)	25	31	26	5	20	17
Flood Area from FEMA (acres)	25 to 52	45.5 to 92	18 to 36	19 to 50	11.5 to 29	19.5 to 55.5
Greenways from DNR (miles)	0.53 to 1.17	0.53 to 1.11	0.49 to 1.04	0.02 to 0.05	0.49 to 0.99	0.09 to 0.21
Green Infrastructure (acres)	52.5 to 144.5	89 to 239.5	65 to 176	29 to 78	35.5 to 97	69 to 167.5
Forest Interior Dwelling Species (FIDS) (acres)	21 to 56	44.5 to 117.5	29.5 to 77.5	18 to 47.5	11 to 31	34 to 80
<b>Cultural</b>						
County Parks (acres)	5 to 16	5 to 15	10 to 29	4 to 11.5	5 to 15	0.41 to 1.07
State Parks (acres)	None	none	none	none	none	2 to 5
National Parks (acres)	none	2 to 5	none	none	0.75 to 2	none
Federal Lands (acres)	0.5 to 12	3 to 73.5	0.5 to 11	none	3 to 95	0.5 to 1.1
MD Inventory of Historic Properties (acres)	12.5 to 30	18 to 47.5	8.5 to 24.5	7 to 18.5	0.00 to 1.75	25.5 to 57
MD Historic Trust Preservation Easements (acres)	none	none	none	none	0.00 to 0.06	none
National Register of Historic Places (acres)	0.53	1.81 to 5.36	0.00 to 0.46	none	0.75 to 3.10	0 to 0.12

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**Table 6 – Description of Terms used in Table 5**

GIS Layer	Description
DNR Wetlands	These digital data files are records of wetlands locations and classifications as defined by the U.S. Fish & Wildlife Service National Wetlands Inventory (NWI) program. The wetlands were mapped by Maryland Department of Natural Resources (MD DNR) using Maryland's Digital Orthophoto Quarter Quads, flown over the period 1988 to 1995.
NWI Wetlands	NWI digital data files are records of wetlands locations and classifications as determined by the U.S. Fish & Wildlife Service. The NWI maps do not show all wetlands since the maps are derived from aerial photointerpretation with varying limitations due to scale, photo quality, inventory techniques, and other factors.
Wetlands of Special State Concern	In Maryland, certain wetlands with unique habitat or rare, threatened, or endangered species receive special attention. The Code of Maryland Regulations (COMAR) 26.23.06.01 & 02 identifies these as Wetlands of Special State Concern (WSSC) and affords them certain protections, including a 100-foot buffer from development. The Maryland Department of the Environment is responsible for identifying and regulating these wetlands. In general, the U.S. Fish and Wildlife Service NWI wetlands provide the basis for identifying these special wetlands. Additional information, determined from field inspections, is used to identify and classify these areas.
Sensitive Species Project Review Areas	This statewide vector file shows buffered areas that contain habitat for rare, threatened, and endangered species and rare natural community types. These include federally listed species, state listed species, and species or natural communities of concern to DNR, but with no official status.
MD Streams	This coverage contains streams from the USGS 1:100,000 DLGs.
FEMA	The Q3 Flood Data are derived from the Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA).
Greenways	Greenways are natural corridors set aside to connect larger areas of open space and to provide for the conservation and protection of natural resources, protection of habitat, movement of plants and animals, and to provide opportunities for recreation, alternative transportation, and nature study. In addition to Greenway Corridors, water routes know as Water Trails have been recognized as pathways for recreation and nature study.
Green Infrastructure	Maryland's green infrastructure is a network of undeveloped lands that represents the state's natural support system. Hubs are typically large contiguous areas separated by major roads and/or human land uses. Corridors are linear features connecting hubs together to facilitate animal and plant movement between hubs.
FIDS	Potential habitat area for Forest Interior Dwelling Species (FIDS) in the State of Maryland. These data were generated by a model to depict where FIDS habitat may occur based on certain criteria.
County Parks	The County Parks data layer consists of land areas that are owned and maintained by county and municipal authorities.
National Parks	The National Parks data layer consists of land areas designated as parks that are owned and maintained by the National Park Service.
Federal Lands	The Federal Lands data layer consists of land areas that are owned and maintained by U.S. Governmental authorities.
MD Inventory of Historic Properties	This data layer depicts all historic properties which have been listed on the state inventory as having historic significance or potential historic significance.
MD Historic Trust Preservation Easements	This data layer depicts properties where owners have entered into an easement agreement with the Maryland Historical Trust to protect their property's historic character.

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### Challenges

There are many challenges with the five concepts that were developed for this feasibility study. The challenges are as follows:

- Even assuming the most expensive estimate for a direct line to BWI Airport compared to the least expensive estimate for any of the concepts that travels to Columbia, the cost for an alignment to Columbia ranges from approximately \$1.3 to \$4.3 billion more than an alignment that does not go through Columbia.
- Neither Concept A nor C provide service to Fort Meade and the National Security Agency (NSA). When combined, Fort Meade and NSA are the largest employers in the state of Maryland. Fort Meade has a population of approximately 110,000 people and is expecting to grow significantly due to the Base Realignment and Closure Act (BRAC).
- Although Concept C provides the fastest travel time to Columbia, this concept bypasses locations such as Historic Laurel, Laurel Racetrack, and Savage. These locations were all potentially served by any of the alignments in the 2004 Green Line Extension report and have the greatest potential for transit-oriented development and public-private partnerships that will help fund and attract riders to the project.
- Concept B's circuitous route to nearly every major population center in between Greenbelt and BWI Airport adds over \$3 billion to the cost of a direct alignment from Greenbelt to BWI Airport, and \$1 billion more than an alignment that goes through Columbia. The Columbia alignment also adds approximately one half hour more travel time to BWI Airport than a direct extension.
- Concept D compares similarly in costs to Concept A and C, while still providing service to the Fort Meade area. Using the same comparison however, travel times increase by about 8 to 13 minutes from Greenbelt to Columbia and about 15 minutes from Columbia to BWI Airport.
- Concept E has the flexibility to add other station locations such as Odenton, that none of the other concepts can reasonably provide. A loop line would need approximately 26 miles for its separate alignment, which would be more than one and a half times longer than a direct Green Line Extension to BWI Airport from Greenbelt and would cost significantly more than any other concept.

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- For all the concepts, there are several potential environmental challenges to consider. Reducing the environmental impacts for any concept could potentially increase the length of the alignment and therefore travel time due to possible shifts in the alignment.
- Minimization of environmental impacts could increase capital costs if it was determined that an underground alignment or an extended elevated structure is necessary.
- The project length and travel time may affect the ability to attract the ridership needed to have a viable project.