Travel Demand Forecasting
Phase I
Technical Report

December 2008

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1 Introduction

The Maryland Transit Administration (MTA) is preparing an Environmental Assessment (EA) to study a range of transit alternatives for addressing mobility and accessibility issues in the I-270 corridor in Montgomery County. These alternatives will also provide additional capacity to serve commuter markets whose residents live in Frederick County/northwest Montgomery County and travel to south Montgomery County and the District of Columbia, commuters and travelers within the corridor, and "reverse" commuters destined to the I-270 corridor.

The EA is a multi-modal study examining several different alternatives, from major investments in new managed highway lanes on I-270 as well as transit alternatives that use a dedicated transit guideway named the Corridor Cities Transitway (CCT). The overall objective of the EA is to determine which mix of highway and transit improvements achieves the greatest gain, balanced with impacts on communities and the environment; thus the EA examines CCT alternatives in concert with highway alternatives.

The CCT will provide a 14-mile transit connection between the Communications Satellite Corporation (COMSAT) facility just south of Clarksburg and the Shady Grove Metrorail Station in Rockville, Maryland. This *Travel Demand Forecasting Technical Report* describes the methodology used for the travel demand forecasting and presents the results of that analysis. This report presents the methodology and data used in the analyses documented in the CCT EA. The results presented in this report may be updated as the EA is finalized and in subsequent study activities.

MTA developed a common travel demand forecasting model and procedures for two alternatives analyses in two separate corridors contained in the metropolitan Washington planning area. The intention was to use the same "No-Build" forecast produced by the travel model as the starting point for alternatives analysis for both the CCT and the Purple Line[1]. Preliminary work on the CCT forecasts indicated that some enhancements, described below, to the Transportation Planning Board (TPB) travel model for the metropolitan Washington area would be required to provide transit corridor-level forecasts and information salient to alternatives analysis.

The travel model, developed by MTA, described in this document is referred to as the Maryland Alternatives Analysis Model (MDAA). It is based on the officially adopted TPB model version 2.1D#50, as modified by the Metropolitan Washington Council of Governments (MWCOG) for the 2007 Conformity Analysis. The TPB model is a classic four step model with a static six iterations of feedback through trip generation, distribution, mode choice, and assignment. The TPB mode choice model is a simple multinomial model that relies upon the path builder to distinguish choices among primary

[1] A rapid transit connection along the 16-mile corridor that lies between the Metrorail Red Line (Bethesda and Silver Spring Stations), Green Line (College Park Station), and Orange Line (New Carrollton Station)

transit modes. It does not disaggregate transit demand into the various transit modes or transit access modes, nor does it assign transit demand to specific service.

The TPB model was not fully developed to accommodate comprehensive transit analysis, and therefore a TPB model transit component post processor was developed, typically referred to as the Transit Component or "transit post-processor". Starting from the person trip tables produced from the sixth iteration of the feedback from the TPB model, the Transit Component applies a more sophisticated mode choice model which differentiates between buses, bus/Metrorail, Metrorail only and commuter rail demand. The Transit Component also differentiates demand by mode-of-access (walk, park-and-ride, and kiss-and-ride) and assigns the resulting demand forecasts to specific services, producing forecasts by route and line. Full documentation of the Transit Component can be found in *Post MWCOG - AECOM Transit Component of Washington Regional Demand Forecasting Model Users Guide,* prepared by AECOM Consult, Inc., and dated March 2005.

This Transit Component and the supporting TPB model was the starting point for modifications made for initial rounds of forecasts for the CCT. Additional modifications included edits to the transportation analysis zones (TAZ), networks, and all files that are related to zonal-based demographics and walk percentages, to address corridor-level conditions and reporting needs. Changes were made to the Transit Component scripts in order to accommodate the new zone structure and network modifications. The resulting model, referred to here as the CCT Model, was the starting point for the MDAA. The CCT Model was documented in the *Corridor Cities Transitway Travel Demand Forecasting Model—2000* report, prepared by Michael Baker Jr., Inc., in 2006.

The MDAA starts with the CCT Model and incorporates modifications to improve confidence in transit forecasts for both the CCT and the Purple Line. The MDAA Model was documented in the *Technical Memorandum: Travel Demand Forecasting Model Enhancements,* prepared by Parsons Brinckerhoff, Inc., in 2008.

Features of the MDAA include:

- Replacing the TPB model home-based work trip distribution with the distribution derived from the Year 2000 Census Transportation Planning Package (CTPP) data.
- A nested-logit mode choice model that differentiates buses, Metrorail, commuter rail, light rail and bus rapid transit modes.
- A park-and-ride station capacity restraint model to account for limited parking capacity at key stations.

1.1 Background and Project Location

Within the study corridor (shown in Figure 1) and the commuter markets passing through the corridor there is considerable travel into and within Montgomery County. Most of these are automobile trips. Over half of Frederick County commuter trips leaving the

county are destined for Montgomery County. Considerable roadway congestion is experienced by commuters in the I-270 corridor.

Figure 1: Project Area

Transit patrons in this corridor also face obstacles. Despite increases in parking spaces at the Shady Grove Metro Station, there is not adequate capacity to serve peak period demand for transit patrons accessing the Metro system by driving to and parking at the station. The MTA 991 commuter bus route from Hagerstown to the Shady Grove Metro Station is overcrowded and has limited service to meet traveler demand. MARC service in the corridor provides limited weekday access to activity centers, and provides no weekend service.

Substantial growth is forecasted for the corridor travel markets and corridor roadway congestion is projected to be significant even with planned improvements. Demand for access to Shady Grove Metro is forecasted to grow significantly. Growth in demand for the MARC Brunswick line is projected to more than double. There is a need to provide a mobility alternative and additional capacity to serve the corridor travel markets with an emphasis on improved transit connections to and from MARC and corridor bus services, as well as added park and ride capacity at the Shady Grove Metro station. The 14-mile rapid transitway from Shady Grove Metro to COMSAT is designed to serve significant growth areas in Montgomery and Frederick counties and leverages existing Metro and MARC transit services.

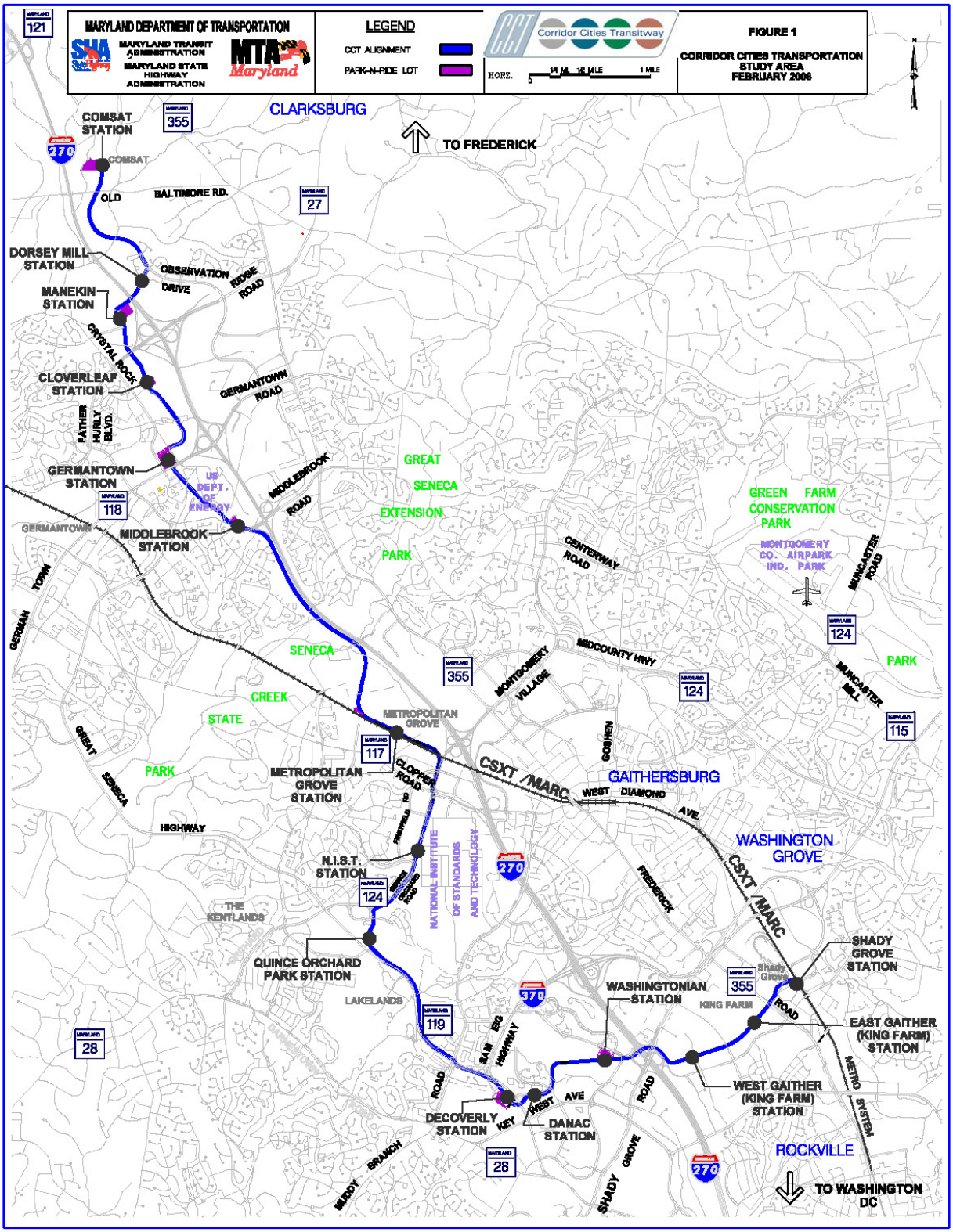
2 Alternatives Retained for Detailed Study

This section provides descriptions of the alternatives[2] for which travel forecasts were prepared for the EA. The proposed alignment of the CCT is shown in Figure 2. Two transit modes are being considered for the CCT: Bus Rapid Transit (BRT) and Light Rail Transit (LRT). The operating plans reflect the differences of the two modes. Seven multi-modal alternatives have been identified for detailed study.

The alternatives include two No-Build alternatives, a transportation system management (TSM) alternative, and four Build alternatives. Both No-Build alternatives assume no transit service on the Transitway, however one of these alternatives includes roadway improvements on I-270 while the other does not. The TSM alternative provides for enhanced bus service within the study corridor as well as roadway improvements on I-270. The Build alternatives include two using bus rapid transit (BRT) technology and two using light rail transit (LRT) technology along the CCT alignment, both with a variation on roadway improvements considered for I-270 in the study corridor.

[2] Material in this chapter is a synopsis of information contained in the "Detailed Definition of Alternatives, I-270 Multi-Model Corridor Study/Corridor Cities Transitway", October 2007.

Figure 2: Corridor Cities Transitway Alignment



Alternative 1 (Alt. 1A): Transit No-Build with Highway No-Build

This No-Build alternative consists of the transit service levels, highway networks and traffic volumes, and forecasted demographics for the horizon year of 2030 that are assumed in the Metropolitan Washington Council of Government's (MWCOG) Constrained Long Range Plan (CLRP). The CLRP consists of the existing highway and transit network as well as planned and programmed (committed) improvements.

Existing transit service within the CCT corridor consists of 22 local and 2 express bus routes operated by Ride-On in Montgomery County, 16 local or shuttle routes in Frederick County operated by TransIT, one commuter bus route operated by the MTA connecting Hagerstown and southern Frederick with Shady Grove Metro station, MARC commuter rail service on the Brunswick Line, and the northern terminus of the Washington Metrorail system at Shady Grove station in south Gaithersburg. Table 1 provides a description of existing transit service routes.

The CLRP includes the Corridor Cities Transitway and new HOV lanes on I-270 as part of the planned improvements. In the analysis of the No-Build Alternative for this study, the CCT project and new HOV lanes were removed from the travel demand model networks. Headways for future No-Build routes were improved to reflect increases in area population. Table 2 provides a description of the service characteristics of those routes.

The No-Build Alternative does not include any alterations to the existing TransIT, Ride On, MTA, or MARC service, other than service frequencies (headways). It does not include addition of a new mode or new exclusive right-of-way, and therefore does not significantly increase the reliability of the existing transit system. It is expected that increasing roadway congestion will continue to decrease the reliability of the bus service, its adherence to its operational schedule, and the predictability of expected headways and transit travel times.

Table 1: Existing Bus Service in CCT Corridor

	Current Terminals					
Route	Start	End	2006 Headways Peak	2006 Headways Off-Peak	notes	Feb. 2006 Daily Passenger Trips
43	Traville Transit Ctr	Shady Grove	15	20		860
54	Lake Forest	Rockville	20	30		2,040
55	Germantown Transit Ctr	Rockville	15	30		6,900
56	Lake Forest	Rockville	20	30		2,360
61	Germantown Transit Ctr	Shady Grove	30	30		2,610
63	Shady Grove	Rockville	30	30		650
66	Traville Transit Ctr	Shady Grove	30	-	off-pk dir only	120
67	Traville Transit Ctr	Shady Grove	30	-	pk dir only	140
68	MARC-German	return	eliminated			40
69	MARC	return	eliminated			20
70	Milestone	Bethesda/Med Ctr	15	-	not all stops	550
71	Kingview PnR	Shady Grove	30	-	pk dir only	310
72	Germantown Commons	Shady Grove	eliminated			
73	Milestone	Shady Grove	eliminated			
74	Germantown Transit Ctr	Shady Grove	30	30		750
75	Urbana	Germantown Transit Ctr	30	30	not all stops in off-pk	230
76	Poolesville	Shady Grove	30	-	not all stops in off-pk	570
77	Germantown Commons	Shady Grove	eliminated			
78	Kingview PnR	Shady Grove	30	-	pk dir only	210
79	Milestone	Shady Grove	30	-	pk dir only	130
82	Clarksburg	Germantown Tra Ctr/DOE	30	-	pk dir only	
83	Milestone	Germantown Transit Ctr	15	30	MARC station in pk	700
90	Milestone	Shady Grove	30	30	different routings throughout day	860
97	Germantown Transit Ctr	Germantown MARC	15	30	loop	720
98	Germantown Transit Ctr	Seabreeze Ct	15	30	loop	380
100	Germantown Transit Ctr	Shday Grove	5	15	express via I-270	1,500
124	Rt. 124 PnR (Rt 117 PnR)	Shady Grove	30	-	express via I-270	70
MTA 991	Hagerstown	Shady Grove/Rock Spring Pk	15	-		
						22,720
FT10	Frederick Towne Mall	Francis Scott Key Mall	30	40		
FT20	Francis Scott Key Mall	Frederick Transit Center	30	60		
FT30	Frederick Towne Mall	Frederick Transit Center	30	60	loop	
FT40	Frederick Towne Mall	Frederick Transit Center	30	60		
FT50	Frederick Towne Mall	Frederick Transit Center	30	60	loop	
FT60	Frederick Community College	Frederick Transit Center	30	60	loop	
FT70	College Park Plaza	Frederick Transit Center	60	60	loop	
FT80	Frederick Community College	Frederick Towne Mall	30	60		
FT-EC Shuttle	Spring Ridge Apts	Dept of Aging			4 round trips/day	
FT-BJ Shuttle	Frederick Transit Center	Brunswick MARC station	180	-	4 round trips/day	
FT-ET Shuttle	Emmitsburg	Frederick Transit Center	120	-	2 round trips/day	
FT-85 Shuttle	Bowmans Industrial Pk	Frederick Transit Center			2 round trips/day	
FT-POR Shuttle	Frederick Shopping Ctr	Point of Rocks MARC	40		pk dir only	
FT-Fd/MARC Shuttle	Frederick Towne Mall	Frederick Transit Center	60	-	pk dir only	
FT-Walk/MARC Shuttle	Walkersville	Frederick Transit Center	60	-	pk dir only	
FT-Walk Shuttle	Walkersville	Frederick Transit Center	60	120		

Table 2: Alternative 1 – Transit No-Build Bus Service

	Current Terminals						
Route	Start	End	2006 Headways Peak	2006 Headways Off-Peak	notes	Proposed 2030 Nobuild Headway Peak	Proposed 2030 Nobuild Headway Off-Peak
43	Traville Transit Ctr	Shady Grove	15	20		15	20
54	Lake Forest	Rockville	20	30		15	30
55	Germantown Transit Ctr	Rockville	15	30		10	20
56	Lake Forest	Rockville	20	30		15	30
61	Germantown Transit Ctr	Shady Grove	30	30		15	30
63	Shady Grove	Rockville	30	30		20	30
66	Traville Transit Ctr	Shady Grove	30	-	off-pk dir only	20	30
67	Traville Transit Ctr	Shady Grove	30	-	pk dir only	20	30
68	MARC-German	return	eliminated				
69	MARC	return	eliminated				
70	Milestone	Bethesda/Med Ctr	15	-	not all stops	15	
71	Kingview PnR	Shady Grove	30	-	pk dir only	20	
72	Germantown Commons	Shady Grove	eliminated				
73	Milestone	Shady Grove	eliminated				
74	Germantown Transit Ctr	Shady Grove	30	30		20	30
75	Urbana	Germantown Transit Ctr	30	30	not all stops in off-pk	20	30
76	Poolesville	Shady Grove	30	-	not all stops in off-pk	20	30
77	Germantown Commons	Shady Grove	eliminated				
78	Kingview PnR	Shady Grove	30	-	pk dir only	20	-
79	Milestone	Shady Grove	30	-	pk dir only	20	-
82	Clarksburg	Germantown Tra Ctr/DOE	30	-	pk dir only	20	-
83	Milestone	Germantown Transit Ctr	15	30	MARC station in pk	15	30
90	Milestone	Shady Grove	30	30	different routings throughout day	20	30
97	Germantown Transit Ctr	Germantown MARC	15	30	loop	15	30
98	Germantown Transit Ctr	Seabreeze Ct	15	30	loop	15	30
100	Germantown Transit Ctr	Shday Grove	5	15	express via I-270	5	15
124	Rt. 124 PnR (Rt 117 PnR)	Shady Grove	30	-	express via I-270	20	-
MTA 991	Hagerstown	Shady Grove/Rock Spring Pk	15	-		15	-
FT10	Frederick Towne Mall	Francis Scott Key Mall	30	40		30	40
FT20	Francis Scott Key Mall	Frederick Transit Center	30	60		30	60
FT30	Frederick Towne Mall	Frederick Transit Center	30	60	loop	30	60
FT40	Frederick Towne Mall	Frederick Transit Center	30	60		30	60
FT50	Frederick Towne Mall	Frederick Transit Center	30	60	loop	30	60
FT60	Frederick Community College	Frederick Transit Center	30	60	loop	30	60
FT70	College Park Plaza	Frederick Transit Center	60	60	loop	60	60
FT80	Frederick Community College	Frederick Towne Mall	30	60		30	60
FT-EC Shuttle	Spring Ridge Apts	Dept of Aging			4 round trips/day		
FT-BJ Shuttle	Frederick Transit Center	Brunswick MARC station	180	-	4 round trips/day	180	-
FT-ET Shuttle	Emmitsburg	Frederick Transit Center	120	-	2 round trips/day	120	-
FT-85 Shuttle	Bowmans Industrial Pk	Frederick Transit Center			2 round trips/day		
FT-POR Shuttle	Frederick Shopping Ctr	Point of Rocks MARC	40		pk dir only	40	
FT-Fd/MARC Shuttle	Frederick Towne Mall	Frederick Transit Center	60	-	pk dir only	60	-
FT-Walk/MARC Shuttle	Walkersville	Frederick Transit Center	60	-	pk dir only	60	-
FT-Walk Shuttle	Walkersville	Frederick Transit Center	60	120		60	120

2.1 Alternative 2 (Alt. 6.1): Transit No-Build w/ Highway "Build 1"

Because this is a multi-modal study, there are two transit No-Build alternatives against which the Build alternatives can be compared. For each set of comparable alternatives, the highway assumptions are the same, which will ensure consistency and allow comparison between transit alternatives. By varying highway assumptions between two sets of comparable alternatives, the effects of highway assumptions can be evaluated.

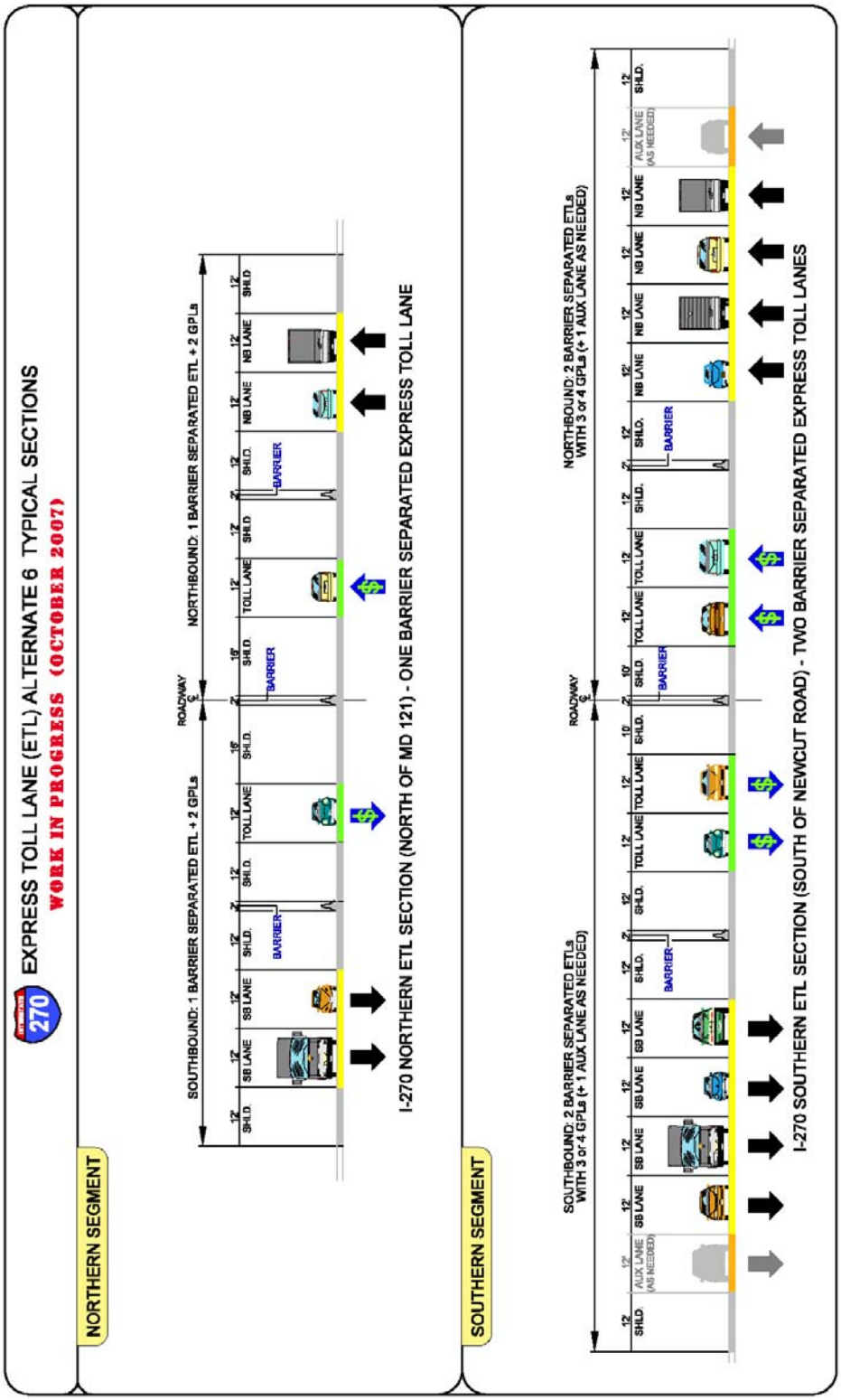
2.1.1 *Highway Component*

This alternative includes the Highway Build Option 1, which includes 4 general purpose lanes and 2 express toll lanes (ETL) on the Montgomery County portion of I-270 and 2 general purpose lanes and 1 ETL lanes on the Frederick County portion of I-270. Figure 3 shows a cross section of the two lane configurations in the northern and southern segments of the study corridor.

2.1.2 *Transit Component*

The transit assumptions associated with this alternative are identical to those described in Alternative 1.

Figure 3: Highway "Build 1" – Cross Sections



2.2 Alternative 3 (Alt. 6.2): Transit TSM with Highway Build 1

The TSM or "transportation system management" alternative emphasizes upgrades in transit service in the study corridor through operational and small physical improvements, plus selected highway upgrades through intersection improvements, minor widening, and other focused traffic engineering actions. Outside the study corridor, the TSM will have the same transit network as the No-Build alternative.

2.2.1 *Highway Component*

The highway assumptions are identical to those in Alternative 2.

2.2.2 *Transit Component*

Alternative 3 generally includes additional park-and-ride lots where proposed in the yet to be described Build alternatives, and new bus service connecting the park-and-rides along existing roadways to the Shady Grove Metro station. The TSM bus service consists of one trunkline bus route operating on existing streets and 3 new intercounty bus routes connecting Frederick County with the study area and the Shady Grove Metro station. The TSM incorporates the same service plan as the Build alternatives but would have slower travel times as a result of traveling in shared lanes on existing streets.

The one trunkline bus route comprising the TSM would be limited stop operating on a 6-minute peak period headway from COMSAT to Shady Grove Metro, making stops at locations at or near where stations are proposed in the Build alternatives. During off-peak periods, the TSM service would operate at 10-minute headways, augmented by existing feeder bus routes. Table 3 provides peak period station-station travel times for the TSM service, station facilities, and connecting feeder service.

The new TSM bus service would begin at a new park-and-ride lot at COMSAT in north Germantown and operate in shared lanes (mixed traffic) on Observation Drive, turning west on Father Hurley Blvd., then left via Crystal Rock Drive and Century Blvd to the Germantown Transit Center. The TSM bus route then would follow Germantown Road to Clopper Road, stopping at an expanded park-and-ride lot at the MARC Metropolitan Grove station, and follow Quince Orchard Road to a new park-and-ride lot near Great Seneca Highway.

The TSM bus route continues along Great Seneca Highway, serves a new park-and-ride lot at Decoverly Road, turns left on Key West Avenue, left onto Omega Drive, serving a stop on Research Blvd, and traversing Shady Grove Road across I-270. On the east side of I-270, the TSM route turns right onto Gaither Road, serves two stops along King Farm Blvd. before crossing MD 355 to the west side bus bays at the Shady Grove Metro station (Figure 4).

Figure 4: Alternative 3 – TSM

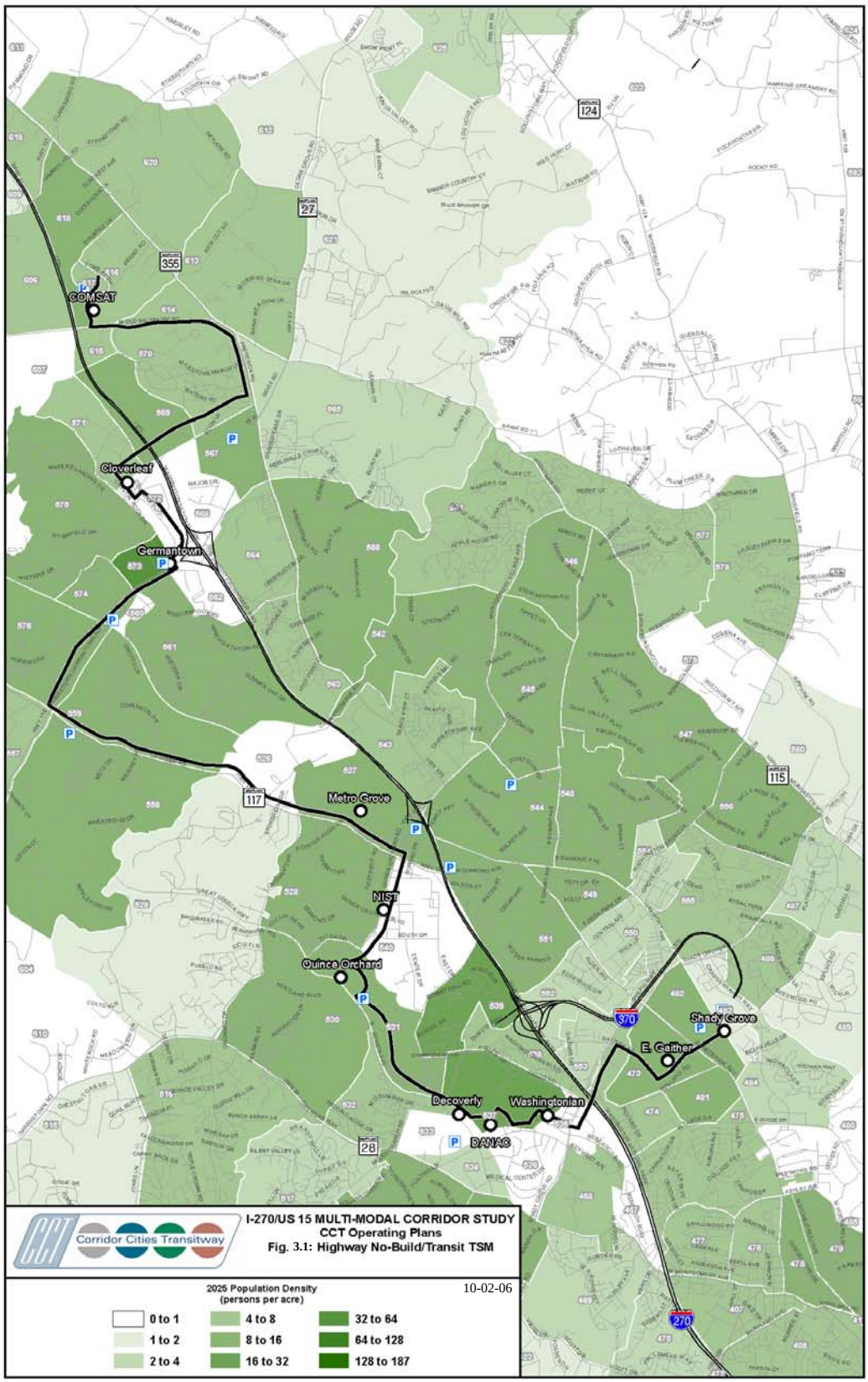

COMSAT
Cloverleaf
Germantown
Metro Grove
NIST
Quince Orchard
Shady Grove
E. Gaither
Decoverly
Washingtonian
DANAC
I-270/US 15 MULTI-MODAL CORRIDOR STUDY
CCT Operating Plans
Fig. 3.1: Highway No-Build/Transit TSM
Corridor Cities Transitway
10-02-06
2025 Population Density
(persons per acre)
0 to 1
1 to 2
2 to 4
4 to 8
8 to 16
16 to 32
32 to 64
64 to 128
128 to 187

Table 3: Alternative 3 - TSM Travel Time, Station Facility, and Feeder Bus

Stations	Station-Station Dist	Station-Station Time	Avg. Spd w/dwell	Park and Ride		Feeder Bus Service
COMSAT				Yes		RO75, 82
Dorsey Mill	8,881 '	4.2 min	25.3	No		RO82, 83
Cloverleaf	6,278 '	4.3 min	16.4	No		RO83
Germantown	3,638 '	2.8 min	15.1	Exist		RO55, 61, 74, 75, 82, 83, 97, 98, 100
Metro Grove	28,679 '	15.2 min	21.4	Exist		RO61, 71, 78
NIST	6,421 '	4.7 min	15.4	No		RO56
Quince Orchard	5,922 '	4.2 min	16.0	Yes		RO56, 74, 76
Decoverly	10,615 '	5.6 min	21.7	Yes		RO74, 67
DANAC	1,471 '	2.0 min	8.1	No		RO66, 67, 74
Washingtonian	3,080 '	2.6 min	13.9	Yes		RO54
West Gaither Rd	11,948 '	9.0 min	14.9	No		
E. Gaither	1,866 '	2.1 min	10.2	No		
Shady Grove	4,213 '	2.9 min	15.6	Exist		*Many bus routes
Total	93,012 '	59.6 min	17.7			

The feeder bus plan for the TSM alternative would build upon the existing route structure, extend the service area into Frederick County, and improve service frequencies where appropriate. Table 4 lists the TSM bus services and frequencies.

In addition, the TSM Alternative includes the following general components:

- More frequent bus service
- Reconstruction of roadway surfaces only where absolutely necessary.
- Installation of new bus stops consisting of shelters and amenities comparable to those proposed for the Build alternatives, plus some improvements to adjacent sidewalks for access and ADA compliance.
- The incorporation of signal priority and/ or queue jump lanes at major intersections, where feasible, if the analysis demonstrates that such priority provides significant time savings.

Table 4: Alternative 3 - TSM Bus Service

	Current Terminals						
Route	Start	End	2006 Headways Peak	2006 Headways Off-Peak	notes	Proposed 2030 TSM Headway Peak	Proposed 2030 TSM Headway Off-Peak
43	Traville Transit Ctr	Shady Grove	15	20		15	20
54	Lake Forest	Rockville	20	30		15	30
55	Germantown Transit Ctr	Rockville	15	30		10	20
56	Lake Forest	Rockville	20	30		15	30
61	Germantown Transit Ctr	Shady Grove	30	30		15	30
63	Shady Grove	Rockville	30	30		20	30
66	Traville Transit Ctr	Shady Grove	30	-	off-pk dir only	20	30
67	Traville Transit Ctr	Shady Grove	30	-	pk dir only	20	30
68	MARC-German	return	eliminated				
69	MARC	return	eliminated				
70	Milestone	Bethesda/Med Ctr	15	-	not all stops	15	
71	Kingview PnR	Shady Grove	30	-	pk dir only	20	
72	Germantown Commons	Shady Grove	eliminated				
73	Milestone	Shady Grove	eliminated				
74	Germantown Transit Ctr	Shady Grove	30	30		20	30
75	Urbana	Germantown Transit Ctr	30	30	not all stops in off-pk	20	30
76	Poolesville	Shady Grove	30	-	not all stops in off-pk	20	30
77	Germantown Commons	Shady Grove	eliminated				
78	Kingview PnR	Shady Grove	30	-	pk dir only	20	-
79	Milestone	Shady Grove	30	-	pk dir only	20	-
82	Clarksburg	Germantown Tra Ctr/DOE	30	-	pk dir only	20	-
83	Milestone	Germantown Transit Ctr	15	30	MARC station in pk	15	30
90	Milestone	Shady Grove	30	30	different routings throughout day	20	30
97	Germantown Transit Ctr	Germantown MARC	15	30	loop	15	30
98	Germantown Transit Ctr	Seabreeze Ct	15	30	loop	15	30
100	Germantown Transit Ctr	Shday Grove	5	15	express via I-270	5	15
124	Rt. 124 PnR (Rt 117 PnR)	Shady Grove	30	-	express via I-270	20	-
MTA 991	Hagerstown	Shady Grove/Rock Spring P	15	-		15	-
FT10	Frederick Towne Mall	Francis Scott Key Mall	30	40		30	40
FT20	Francis Scott Key Mall	Frederick Transit Center	30	60		30	60
FT30	Frederick Towne Mall	Frederick Transit Center	30	60	loop	30	60
FT40	Frederick Towne Mall	Frederick Transit Center	30	60		30	60
FT50	Frederick Towne Mall	Frederick Transit Center	30	60	loop	30	60
FT60	Frederick Community College	Frederick Transit Center	30	60	loop	30	60
FT70	College Park Plaza	Frederick Transit Center	60	60	loop	60	60
FT80	Frederick Community College	Frederick Towne Mall	30	60		30	60
FT-EC Shuttle	Spring Ridge Apts	Dept of Aging			4 round trips/day		
FT-BJ Shuttle	Frederick Transit Center	Brunswick MARC station	180	-	4 round trips/day	180	-
FT-ET Shuttle	Emmitsburg	Frederick Transit Center	120	-	2 round trips/day	120	-
FT-85 Shuttle	Bowmans Industrial Pk	Frederick Transit Center			2 round trips/day		
FT-POR Shuttle	Frederick Shopping Ctr	Point of Rocks MARC	40		pk dir only	40	
FT-Fd/MARC Shuttle	Frederick Towne Mall	Frederick Transit Center	60	-	pk dir only	60	-
FT-Walk/MARC Shuttle	Walkersville	Frederick Transit Center	60	-	pk dir only	60	-
FT-Walk Shuttle	Walkersville	Frederick Transit Center	60	120		60	120
FREDSG	Frederick Transit Center	Shady Grove	-			15	-
FREDMGSG	Frederick Transit Center	Shady Grove	-			20	30
KPTNMGSG	Kemptown	Shady Grove				30	-
COM-MG-SG	COMSAT	Shady Grove				6	10

2.3 Alternative 4 (Alt. 6A): LRT with Highway Build 1

2.3.1 *Highway Component*

The highway assumptions are identical those described in Alternative 2.

2.3.2 *Transit Component*

The transit component of this alternative is nearly identical to Alternative 3 except the mode is LRT and the majority of feeder bus service terminates at a Transitway station (refer to Figure 2), requiring passengers to transfer. All the stations and facilities are the same. Signal preemption is assumed at intersections with low cross-street volumes, allowing the LRT to continue through the intersection without stopping. One trunkline route is proposed: COMSAT to Shady Grove with 6-minute headways during peak periods and 10-minute headways during off-peak periods. Table 5 provides the peak period station-station run times for the LRT service, station facilities, and connecting feeder service.

Table 5: Alternative 4 - LRT Travel Time, Station Facility, and Feeder Bus

Stations	Station-Station Dist	Station-Station Time	Avg. Spd w/dwell	Park and Ride	Feeder Bus Service
COMSAT				Yes	RO75, 82
Dorsey Mill	6,800 '	3.8 min	20.2	No	RO82, 83
Cloverleaf	5,100 '	3.0 min	19.6	No	RO83
Germantown	4,600 '	3.8 min	13.9	Exist	RO55, 61, 74, 75, 82, 83, 97, 98, 100
Metro Grove	16,900 '	5.8 min	33.4	Exist	RO61, 71, 78
NIST	6,500 '	3.3 min	22.2	No	RO56
Quince Orchard	4,500 '	2.9 min	17.5	Yes	RO56, 74, 76
Decoverly	9,900 '	3.9 min	29.2	Yes	RO74, 67
DANAC	1,600 '	1.5 min	12.2	No	RO66, 67, 74
Washingtonian	4,000 '	2.1 min	22.0	Yes	RO54
West Gaither Rd	4,300 '	2.5 min	19.7	No	
E. Gaither	3,200 '	1.7 min	21.3	No	
Shady Grove	2,850 '	1.8 min	17.8	Exist	*Many bus routes
Total	70,250 '	36.0 min	22.2		

The feeder bus service provides identical geographical coverage and frequencies as in Alternative 3, but with the majority of corridor routes terminating at an LRT station. Table 6 lists the bus services and frequencies.

Table 6: Alternative 4 - LRT Bus Service

	Current Terminals				Proposed Terminals			
Route	Start	End	2006 Headways Peak	2006 Headways Off-Peak	Start	End	Proposed 2030 TSM Headway Peak	Proposed 2030 TSM Headway Off-Peak
43	Traville Transit Ctr	Shady Grove	15	20	same		15	20
54	Lake Forest	Rockville	20	30	same		15	30
55	Germantown Transit Ctr	Rockville	15	30	same		10	20
56	Lake Forest	Rockville	20	30	same		15	30
58	Lake Forest	Shady Grove			same			
59	Montgomery Village	Rockville	15	30	same		10	20
61	Germantown Transit Ctr	Shady Grove	30	30	same		15	30
63	Shady Grove	Rockville	30	30	same		20	30
66	Traville Transit Ctr	Shady Grove	30	-	Decoverly	Shady Grove	20	30
67	Traville Transit Ctr	Shady Grove	30	-	Decoverly	Decoverly	20	30
70	Milestone	Bethesda/Med Ctr	15	-	same		15	
71	Kingview PnR	Shady Grove	30	-	Germantown	Metro Grove	20	
74	Germantown Transit Ctr	Shady Grove	30	30	Germantown Transit Ctr	Quince Orchard	20	30
75	Urbana	Germantown Transit Ctr	30	30	Urbana	COMSAT	20	30
76	Poolesville	Shady Grove	30	-	Poolesville	Quince Orchard	20	30
78	Kingview PnR	Shady Grove	30	-	Kingview PnR	Metro Grove	20	-
79	Milestone	Shady Grove	eliminated		eliminated			
82	Clarksburg	Germantown Tra Ctr/DOE	30	-	same		20	-
83	Milestone	Germantown Transit Ctr	15	30	same		15	30
90	Milestone	Shady Grove	30	30	Germantown Transit Ctr	Shady Grove	20	30
97	Germantown Transit Ctr	Germantown MARC	15	30	same		15	30
98	Germantown Transit Ctr	Seabreeze Ct	15	30	same		15	30
100	Germantown Transit Ctr	Shady Grove	5	15	same		5	15
124	Rt. 124 PnR (Rt 117 PnR)	Shady Grove	30	-	same		20	-
MTA 991	Hagerstown	Shady Grove/Rock Spring P	15	-	Hagerstown	Shady Grove/Rock Spring P	15	-
FT10	Frederick Towne Mall	Francis Scott Key Mall	30	40	same		30	40
FT20	Francis Scott Key Mall	Frederick Transit Center	30	60	same		30	60
FT30	Frederick Towne Mall	Frederick Transit Center	30	60	same		30	60
FT40	Frederick Towne Mall	Frederick Transit Center	30	60	same		30	60
FT50	Frederick Towne Mall	Frederick Transit Center	30	60	same		30	60
FT60	Frederick Community College	Frederick Transit Center	30	60	same		30	60
FT70	College Park Plaza	Frederick Transit Center	60	60	same		60	60
FT80	Frederick Community College	Frederick Towne Mall	30	60	same		30	60
FT-EC Shuttle	Spring Ridge Apts	Dept of Aging			same			
FT-BJ Shuttle	Frederick Transit Center	Brunswick MARC station	180	-	same		180	-
FT-ET Shuttle	Emmitsburg	Frederick Transit Center	120	-	same		120	-
FT-85 Shuttle	Bowmans Industrial Pk	Frederick Transit Center			same			
FT-POR Shuttle	Frederick Shopping Ctr	Point of Rocks MARC	40		same		40	
FT-Fd/MARC Shuttle	Frederick Towne Mall	Frederick Transit Center	60	-	same		60	-
FT-Walk/MARC Shuttle	Walkersville	Frederick Transit Center	60	-	same		60	-
FT-Walk Shuttle	Walkersville	Frederick Transit Center	60	120	same		60	120
FREDSG					Frederick Transit Center	Shady Grove	15	-
FRED-COM					Frederick Transit Center	COMSAT	20	30
KPTN-COM					Kemptown	COMSAT	30	-

2.4 Alternative 5 (Alt. 6B): BRT with Highway Build 1

2.4.1 *Highway Component*

The highway assumptions are identical those described in Alternative 2.

2.4.2 *Transit Component*

Alternative 5 includes a BRT using the dedicated Transitway (refer to Figure 2) along the alignment from COMSAT to Shady Grove. BRT service would begin at a new park-and-ride lot at COMSAT in north Germantown and continue within the median of Observation Drive, via the Transitway alignment across I-270, then via the median of Century Blvd to the Germantown Transit Center. BRT service then follows the Transitway through the US Department of Energy campus then along the west side of I-270 to an expanded park-and-ride lot at the MARC Metropolitan Grove station. After crossing Clopper Road at MD 124, the BRT service continues on the Transitway along the south side of Quince Orchard Road to a new station and park-and-ride lot near Great Seneca Highway.

The BRT service continues along the east side of Great Seneca Highway, crossing over to the west side on an aerial structure at Muddy Branch Road, serves a new park-and-ride lot at Decoverly Road, turns left to cross over Great Seneca Highway again to the median of Decoverly Road, serving the DANAC station, turning east into the median of Fields Road, and crossing I-270 on an aerial structure. On the east side of I-270, the BRT service continues on the Transitway which follows the median of King Farm Boulevard, crossing MD 355 at-grade or on an aerial structure to new bus bays on the west side of the Shady Grove Metro station.

BRT service consists of one trunkline bus route operating on the Transitway augmented with many feeder bus routes joining the Transitway at appropriate stations and continuing to Shady Grove. The BRT bus route in this alternative would operate on a 6-minute peak period headway from COMSAT to Shady Grove Metro, making all Transitway stops. During off-peak periods, the BRT service would operate at 10-minute headways, augmented by existing feeder bus routes. Table 7 provides peak period station-station travel times for the BRT service, station facilities, and connecting feeder service.

Table 7: Alternative 5 - BRT Travel Time, Station Facility, and Feeder Bus

Stations	Station-Station Dist	Station-Station Time	Avg. Spd w/dwell	Park and Ride	Feeder Bus Service
COMSAT				Yes	RO75, 82
Dorsey Mill	6,800 '	3.9 min	22.4	No	RO82, 83
Cloverleaf	5,100 '	3.3 min	17.5	No	RO83
Germantown	4,600 '	3.9 min	15.6	Exist	RO55, 61, 74, 75, 82, 83, 97, 98, 100
Metro Grove	16,900 '	5.9 min	32.7	Exist	RO61, 71, 78
NIST	6,500 '	3.4 min	21.5	No	RO56
Quince Orchard	4,500 '	3.1 min	19.9	Yes	RO56, 74, 76
Decoverly	9,900 '	4.0 min	29.3	Yes	RO74, 67
DANAC	1,600 '	1.5 min	11.8	No	RO66, 67, 74
Washingtonian	4,000 '	2.4 min	18.8	Yes	RO54
West Gaither Rd	4,300 '	2.5 min	19.2	No	
E. Gaither	3,200 '	2.0 min	18.3	No	
Shady Grove	2,850 '	2.0 min	15.8	Exist	*Many bus routes
Total	70,250 '	38.1 min	21.0		

BRT offers the opportunity to provide one-seat rides for many passengers, with feeder bus routes joining the Transitway and running to an appropriate terminal station. During peak periods, most of the radial feeder bus routes will operate locally when off the Transitway. Once on the Transitway, they will operate as limited stop service, making stops only at proposed BRT Transitway stations. During off-peak periods, some of the feeder bus routes may terminate at a Transitway stop, requiring a transfer to the trunkline service. This can reduce operating costs by tailoring capacity to demand.

Table 8 lists the bus services and frequencies for this alternative.

Table 8: Alternative 5 - BRT Bus Service

Route	Current Terminals Start	End	2006 Headways Peak	2006 Headways Off-Peak	notes	Proposed 2030 TSM Headway Peak	Proposed 2030 TSM Headway Off-Peak
43	Traville Transit Ctr	Shady Grove	15	20		15	20
54	Lake Forest	Rockville	20	30		15	30
55	Germantown Transit Ctr	Rockville	15	30		10	20
56	Lake Forest	Rockville	20	30		15	30
61	Germantown Transit Ctr	Shady Grove	30	30		15	30
63	Shady Grove	Rockville	30	30		20	30
66	Traville Transit Ctr	Shady Grove	30	-	off-pk dir only	20	30
67	Traville Transit Ctr	Shady Grove	30	-	pk dir only	20	30
68	MARC-German	return	eliminated				
69	MARC	return	eliminated				
70	Milestone	Bethesda/Med Ctr	15	-	not all stops	15	
71	Kingview PnR	Shady Grove	30	-	pk dir only	20	
72	Germantown Commons	Shady Grove	eliminated				
73	Milestone	Shady Grove	eliminated				
74	Germantown Transit Ctr	Shady Grove	30	30		20	30
75	Urbana	Germantown Transit Ctr	30	30	not all stops in off-pk	20	30
76	Poolesville	Shady Grove	30	-	not all stops in off-pk	20	30
77	Germantown Commons	Shady Grove	eliminated				
78	Kingview PnR	Shady Grove	30	-	pk dir only	20	-
79	Milestone	Shady Grove	30	-	pk dir only	20	-
82	Clarksburg	Germantown Tra Ctr/DOE	30	-	pk dir only	20	-
83	Milestone	Germantown Transit Ctr	15	30	MARC station in pk	15	30
90	Milestone	Shady Grove	30	30	different routings throughout day	20	30
97	Germantown Transit Ctr	Germantown MARC	15	30	loop	15	30
98	Germantown Transit Ctr	Seabreeze Ct	15	30	loop	15	30
100	Germantown Transit Ctr	Shday Grove	5	15	express via I-270	5	15
124	Rt. 124 PnR (Rt 117 PnR)	Shady Grove	30	-	express via I-270	20	-
MTA 991	Hagerstown	Shady Grove/Rock Spring P	15	-		15	-
FT10	Frederick Towne Mall	Francis Scott Key Mall	30	40		30	40
FT20	Francis Scott Key Mall	Frederick Transit Center	30	60		30	60
FT30	Frederick Towne Mall	Frederick Transit Center	30	60	loop	30	60
FT40	Frederick Towne Mall	Frederick Transit Center	30	60		30	60
FT50	Frederick Towne Mall	Frederick Transit Center	30	60	loop	30	60
FT60	Frederick Community College	Frederick Transit Center	30	60	loop	30	60
FT70	College Park Plaza	Frederick Transit Center	60	60	loop	60	60
FT80	Frederick Community College	Frederick Towne Mall	30	60		30	60
FT-EC Shuttle	Spring Ridge Apts	Dept of Aging			4 round trips/day		
FT-BJ Shuttle	Frederick Transit Center	Brunswick MARC station	180	-	4 round trips/day	180	-
FT-ET Shuttle	Emmitsburg	Frederick Transit Center	120	-	2 round trips/day	120	-
FT-85 Shuttle	Bowmans Industrial Pk	Frederick Transit Center			2 round trips/day		
FT-POR Shuttle	Frederick Shopping Ctr	Point of Rocks MARC	40		pk dir only	40	
FT-Fd/MARC Shuttle	Frederick Towne Mall	Frederick Transit Center	60	-	pk dir only	60	-
FT-Walk/MARC Shuttle	Walkersville	Frederick Transit Center	60	-	pk dir only	60	-
FT-Walk Shuttle	Walkersville	Frederick Transit Center	60	120		60	120
FREDSG	Frederick Transit Center	Shady Grove	-			15	-
FREDMGSG	Frederick Transit Center	Shady Grove	-			20	30
KPTNMGSG	Kemptown	Shady Grove				30	-
COM-MG-SG	COMSAT	Shady Grove				6	10

2.5 Alternative 6 (Alt. 7A): LRT with Highway Build 2

2.5.1 *Highway Component*

This alternative includes the Highway Build Option 2, which includes 4 general purpose lanes and 2 express toll lanes (ETL) on the Montgomery County portion of I-270 and 2 general purpose lanes and 2 ETL lanes on the Frederick County portion of I-270. Figure 5 shows a cross section of the two lane configurations.

2.5.2 *Transit Component*

The transit assumptions are identical to those described in Alternative 4.

2.6 Alternative 7 (Alt. 7B): BRT with Highway Build 2

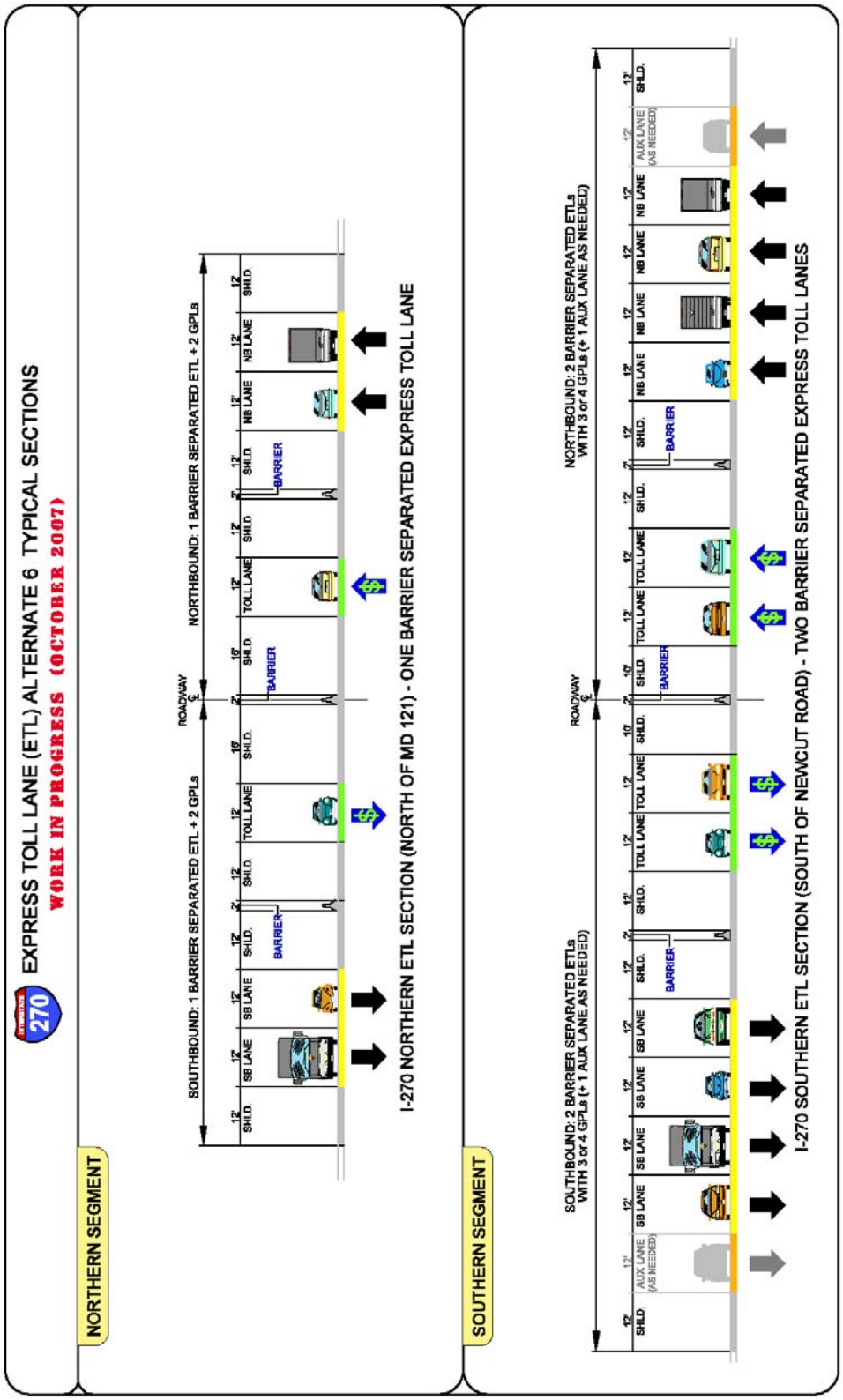
2.6.1 *Highway Component*

The highway assumptions are identical those described in Alternative 6.

2.6.2 *Transit Component*

The transit assumptions are identical to those described in Alternative 5.

Figure 5: Highway "Build 2" – Cross Sections



3 Forecasts by Alternative

This chapter summarizes revised major transit demand forecast results and findings for various CCT alternatives, based on adjusted estimates from the MDAA (Version 3, dated 02/05/08). The model does not account for alternative specific effects for BRT and LRT alternatives, which will be estimated off-line to account for the potential benefits from Transitway characteristics, attributes, and service amenities. The FTA's "Reporting Instructions for the Section 5309 New Starts Criteria" (dated May 2007) provided guidance in preparation of this summary. In particular, the associated *Travel Forecasts Template* was used to summarize the model results for different alternatives. Transit boardings, new transit trips, and user benefits are summarized in Table 9.

All forecasts are presented as a range of possible values to account for uncertainty in the accuracy of the MDAA model to predict feeder bus demand. Daily boardings for LRT fixed guideway alternatives are forecasted to be 30,000 as the upper bound, and 24,000 as the lower bound, assuming a lower bound being 20% less than the upper bound. Daily boardings for BRT fixed guideway alternatives are forecasted to be between 27,000 and 21,000 as the lower bound. Daily boardings for the TSM alternative under Highway Build 1 are considerably lower than LRT and BRT alternatives, ranging from 6,000 to 7,000 boardings, assuming again an uncertainty of 20%. Daily travel time savings (capped user benefits) vary ranging from 5,500 to 7,000 hours for LRT alternatives and 5,900 to 7,500 hours for BRT alternatives - relative to the TSM alternative. TSM travel time savings are from 5,000 to 6,300 hours, relative to the No-Build alternative (Alternative #2).

Table 9: Year 2030 Average Weekday Demand Forecasts

Alternative	CCT Boardings (thousands)	New Transit Trips (hundreds)	Travel Time Savings* (hundreds of hours)
#1-HwyNB/Transit NB	0	0	0
#2-HwyB1/Transit NB	0	0	0
#3-HwyB1/TSM	6—7	61—76	50—63
#4-HwyB1/LRT	24—30	70—87	55—69
#5-HwyB1/BRT	21—26	75—93	59—74
#6-HwyB2/LRT	24—30	71—88	56—70
#7-HwyB2/BRT	22—27	75—94	60—75

*Savings are defined as being relative—TSM versus No-Build, Alternatives (BRT/LRT) versus TSM. The upper bound values are the model estimates adjusted downward by 20% to account for over-estimation of feeder bus boardings. The lower bound assumes a 20% uncertainty.

New (linked) transit trips vary slightly by alternatives, ranging from 7,000 to 8,800 trips for LRT alternatives and 7,500-9,400 for BRT alternatives, relative to TSM alternatives. Alternative #3 TSM generates 6,100-7,600 new transit trips, relative to the transit No-Build alternative.

Approximately 45% of the total boardings along the CCT system involve transfers at Shady Grove station between the CCT and Metro Red Line, 15% transfer to buses or have their destinations at Shady Grove, and the remaining represent activities along the CCT system stations between COMSAT and Shady Grove. This result indicates significant demand for local trips between COMSAT and Shady Grove, as well as demand for longer trips and connectivity to Metro at Shady Grove. The most heavily used transit stations include Shady Grove, West Gaither, Washingtonian, Quince Orchard, Metropolitan Grove, Germantown, and COMSAT. West Gaither and Metropolitan Grove are particularly strong as destination stations. At the end of this chapter, Figures 7 to 11 show daily estimated boardings and alightings at each of thirteen stations along the CCT, for LRT, BRT, and TSM alternatives. Station-to-station boardings are presented in Tables 17 to 20. Note that totals may vary due to reporting method and rounding.

User benefits are mostly consistent with the expectations for potential transit markets to be served by the Build alternatives. Travel time savings by commuters account for 70% of all benefits. District-to-district reports show that new trips and user benefits accrue (from BRT and LRT Build alternatives) in Montgomery and Frederick districts, particularly in Gaithersburg, Germantown, Rockville, and Frederick. Most benefits are experienced by Montgomery County residents (83%), with Frederick County residents accounting for 11%. The majority of user benefits accrue to CCT travel markets (shown in Figure 6) as follows:

- CCT corridor to areas served by Metrorail 16%
- From areas served by Metrorail to CCT Corridor 11%
- Within CCT Corridor 36%
- Rest of Montgomery County to CCT Corridor 22%

Figure 6: CCT Travel Markets

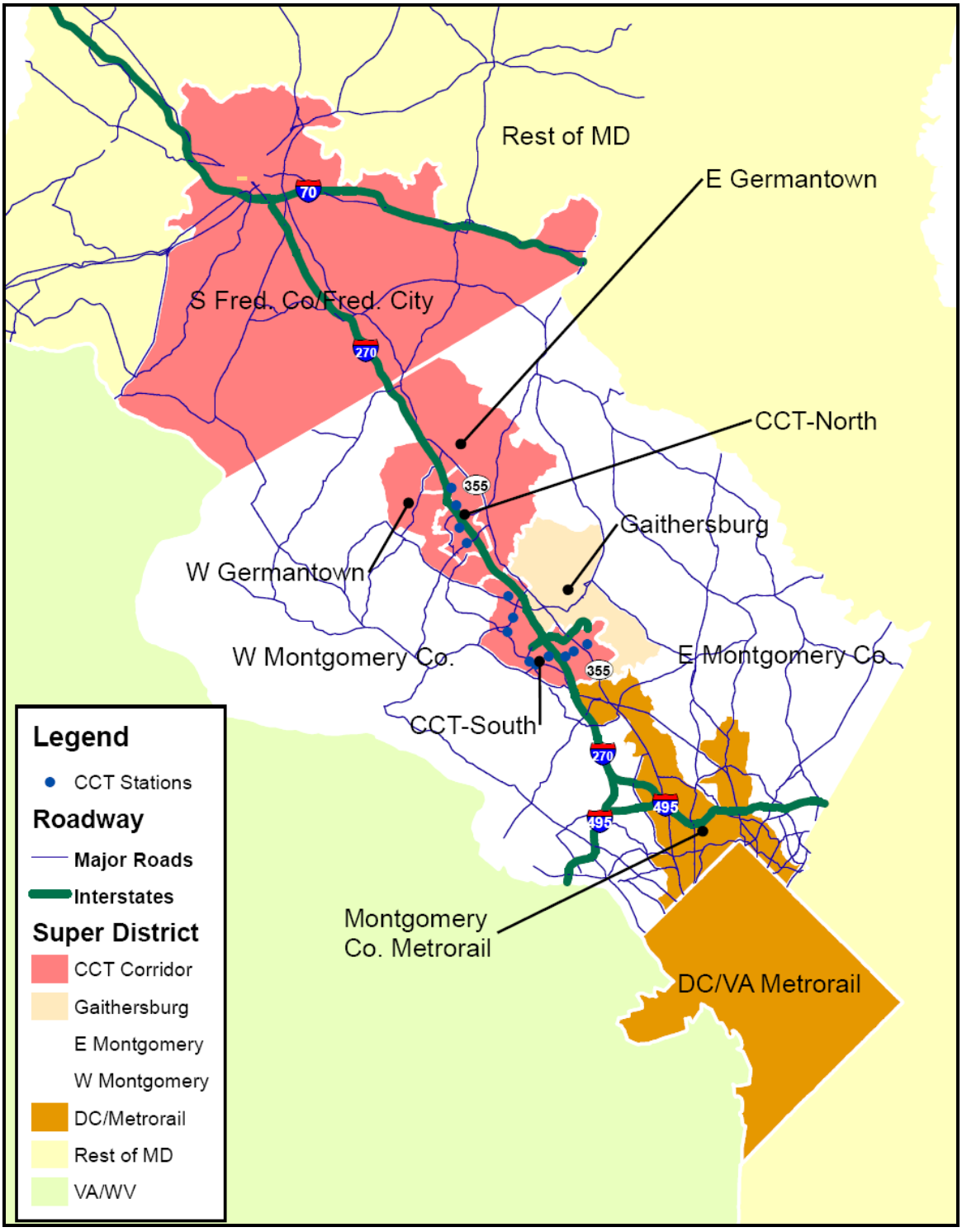


Table 10 shows the daily boardings by transfer mode for each alternative. The boardings for trips primarily using the CCT account for more than half of total boardings for build alternatives. Less than half of total boardings are those boardings for trips primarily using the Metrorail and using the CCT for part of the trip, for build alternatives. The boardings for trips primarily using MARC and using the CCT for part of the trip are relatively small.

Table 10: Year 2030 CCT Daily Boardings by Transfer Mode

Alternative	CCT	CCT via Metrorail	CCT via MARC	Total
#3-HwyB1/TSM	4,800	2,600	50	7,450
#4-HwyB1/LRT	15,900	14,200	300	30,400
#5-HwyB1/BRT	13,700	12,800	300	26,800
#6-HwyB2/LRT	15,700	14,400	300	30,400
#7-HwyB2/BRT	13,600	13,000	300	26,900

Table 11: Year 2030 Metrorail & MARC Average Weekday Boardings

Alternative	Shady Grove Station (Metrorail)	Rockville Station (Metrorail)	Brunswick Line (MARC)
#1-HwyNB/Transit NB	13,800	7,300	10,800
#2-HwyB1/Transit NB	13,700	7,300	10,800
#3-HwyB1/TSM	15,400	7,200	10,400
#4-HwyB1/LRT	17,500	6,900	9,600
#5-HwyB1/BRT	17,500	6,900	9,700
#6-HwyB2/LRT	17,600	6,900	9,600
#7-HwyB2/BRT	17,500	6,900	9,700
2000 Observed	9,767	3,844	5,272
2000 Model Estimated	11,315	8,536	7,755

*****The projected boardings under different alternatives are the model estimates adjusted to account for over-estimation in Year 2000, rounded to 100.

Metrorail boardings at Shady Grove vary by alternative as shown in Table 11. No-Build alternatives have the lowest number of daily boardings, while Build alternatives will increase the daily boardings to approximately 15,000 for TSM alternative and 18,000 for BRT/LRT alternatives. Daily boardings at Rockville Metro Station are nearly 7,000, similar under various alternatives. MARC Brunswick Line will have nearly 11,000 boardings per day under No-Build and TSM alternatives, while its daily boardings will decrease to below 10,000 under the BRT/LRT alternatives. The results seem to suggest that some MARC Brunswick Line riders may switch to the CCT LRT/BRT system under the transit Build alternatives. Also shown in Table 11 are the model-estimated and observed boardings for Year 2000 at Shady Grove and Rockville Metro Stations and MARC Brunswick Line. The model results over-estimate boardings, particularly more than double the observed boardings for Rockville Station. This over-simulation bias is taken into account in adjusting forecasts downward. This identified issue for the current MDAA model will be addressed in subsequent model development and forecasts.

Drive access to BRT/LRT stations shows guideway station parking demand under no parking constraint condition (Table 12). Parking demand is strong at COMSAT, Germantown, Quince Orchard, and Washingtonian stations.

Table 12: Year 2030 CCT Drive Access Trips

Station	Alternative #4 HwyB1/LRT	Alternative #5 HwyB1/BRT	Alternative #6 HwyB2/LRT	Alternative #7- HwyB2/BRT
COMSAT	1,000	1,200	1,100	1,300
Dorsey Mill	-	-	-	-
Cloverleaf	-	-	-	-
Germantown	1,200	1,000	1,200	900
Metro Grove	500	500	500	500
NIST	-	-	-	-
Quince Orchard	1,600	1,500	1,500	1,400
Decoverly	700	500	700	600
DANAC	-	-	-	-
Washingtonian	1,400	1,500	1,400	1,600
West Gaither Rd	-	-	-	-
E. Gaither	-	-	-	-
Shady Grove	300	300	300	300

Daily and peak period bus boardings in the study area change under various alternatives, as shown in Table 13. Overall, LRT/BRT alternatives have approximately 3,000 more bus boardings in the study area than the highway Build/transit No-Build alternative. As expected, the TSM alternative has the highest number of bus boardings. Most bus routes show similar boardings across alternatives, except for a few such as Ride-On 74, 75, 76, 90, and 100, which may have different terminals for different alternatives.

Table 13: Year 2030 CCT Corridor Bus Routes Average Weekday Boardings

	#**1**-HwyNB/Transit**NB**		#**2**-HwyB1/Transit**NB**		#**3**-HwyB1/**TSM**		#**4**-HwyB1/**LRT**		#**5**-HwyB1/**BRT**		#**6**-HwyB2/**LRT**		#**7**-HwyB2/**BRT**	
Route #	PK	24H	PK	24H	PK	24H	PK	24H	PK	24H	PK	24H	PK	24H
43	643	1,039	631	1,011	540	834	586	1,013	479	808	581	1,008	479	807
54	1,829	2,376	1,806	2,358	1,719	2,249	1,394	1,885	1,296	1,741	1,394	1,884	1,299	1,743
55	9,012	12,468	8,980	12,436	9,190	12,542	9,212	12,570	9,134	12,496	9,171	12,535	9,097	12,462
56	1,583	2,176	1,681	2,362	1,578	2,161	1,910	2,732	1,599	2,234	1,913	2,737	1,591	2,222
58	1,105	1,687	1,099	1,686	1,190	1,804	1,181	1,783	1,200	1,825	1,173	1,776	1,192	1,815
59	3,342	5,614	3,319	5,602	3,441	5,654	3,327	5,536	3,298	5,511	3,301	5,509	3,273	5,485
61	4,304	5,523	4,342	5,642	4,200	5,281	4,607	5,777	4,193	5,263	4,609	5,781	4,204	5,275
63	845	1,157	834	1,146	772	1,077	893	1,246	800	1,112	901	1,253	805	1,117
66	170	247	172	249	146	213	115	178	101	161	115	179	101	161
67	391	545	395	554	289	411	541	649	268	386	544	651	269	386
70	796	796	789	789	802	802	822	822	798	798	818	818	798	798
71	227	227	244	244	187	187	114	114	90	90	113	113	89	89
74	1,601	2,449	1,572	2,420	1,346	2,044	456	676	1,327	2,070	455	676	1,302	2,041
75	541	806	581	836	596	850	48	78	667	982	47	78	661	975
76	1,389	1,959	1,408	1,986	1,134	1,525	229	356	929	1,369	230	358	934	1,372
78	640	640	671	671	593	593	174	174	473	473	172	172	470	470
79	39	39	38	38	37	37	NA	NA	15	15	NA	NA	15	15
82	69	69	40	40	38	38	267	267	83	83	259	259	84	84
83	979	1,148	923	1,085	786	911	1,033	1,233	962	1,165	1,019	1,220	954	1,156
90	610	1,006	601	988	638	1,058	1,782	2,388	668	1,079	1,767	2,376	665	1,077
97	755	1,115	746	1,103	859	1,286	1,112	1,663	1,025	1,498	1,101	1,655	1,019	1,492
98	541	754	492	701	449	636	614	928	513	792	605	923	511	790
100	2,370	2,758	2,281	2,672	2,350	2,732	1,678	1,844	1,722	2,004	1,685	1,851	1,731	2,014
124	11	11	11	11	12	12	18	18	12	12	18	18	12	12
FREDSG	NA	NA	NA	NA	3,107	3,107	3,398	3,398	3,115	3,115	3,162	3,162	2,894	2,894
FREDMGSG	NA	NA	NA	NA	1,299	1,857	1,514	2,043	1,972	2,606	1,321	1,873	1,771	2,340
KPTNMGSG	NA	NA	NA	NA	2	2	0	0	203	203	0	0	203	203
COM-MG-SG	NA	NA	NA	NA	3,527	5,572	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL	**33,792**	**46,608**	**33,654**	**46,632**	**40,828**	**55,475**	**37,026**	**49,372**	**36,941**	**49,889**	**36,471**	**48,866**	**36,422**	**49,296**

*Feeder buses FREDSG, FREDMGSG, and KPTNMGSG are not available for transit No-Build alternatives (#1 and #2). COM-MG-SG is only available for the TSM alternative. PK=peak periods, including AM and PM peak periods. 24H= 24-hour or daily. Forecasts reflect a downward adjustment to account for overestimation.

Tables 14 and 15 show respectively bus run time assumed in the model and route length in the CCT Corridor for peak and off-peak periods.

Table 14: CCT Corridor Bus Route Run Time (in Minutes)

	Transit NB		TSM		LRT		BRT	
Route #	PK	OP	PK	OP	PK	OP	PK	OP
43	22	21	22	21	22	21	22	21
54	42	40	42	40	42	40	42	40
55	64	57	64	57	64	57	64	57
56	63	50	63	50	63	50	63	50
58	30	25	30	25	30	25	30	25
59	52	45	52	45	52	45	52	45
61	44	43	44	43	44	43	44	43
63	32	20	32	20	32	20	32	20
66	26	26	26	26	26	26	26	26
67	25	25	25	25	21	21	25	25
70	32	0	32	0	32	0	32	0
71	30	0	30	0	10	0	30	0
74	35	30	35	30	15	12	35	30
75	31	20	31	20	25	11	31	20
76	20	18	20	18	12	11	20	18
78	33	0	33	0	15	0	33	0
79	26	0	26	0	0	0	26	0
82	28	0	28	0	28	0	28	0
83	25	20	25	20	25	20	25	20
90	23	30	23	30	40	32	23	30
97	24	21	24	21	24	21	24	21
98	24	24	24	24	24	24	24	24
100	16	16	16	16	16	16	16	16
124	14	0	14	0	14	0	14	0
FREDSG	NA	NA	59	0	59	0	59	0
FREDMGSG	NA	NA	71	71	36	36	71	71
KPTNMGSG	NA	NA	66	0	31	0	66	0
COM-MG-SG	NA	NA	60	60	NA	NA	NA	NA

*Feeder buses FREDSG, FREDMGSG, and KPTNMGSG are not available for transit No-Build alternatives (#1 and #2). COM-MG-SG is only available for the TSM alternative. PK=peak periods, including AM and PM peak periods. OP=off-peak periods.

Table 15: CCT Corridor Bus Route Distances (in Miles)

	Transit NB		TSM		LRT		BRT	
Route #	PK	OP	PK	OP	PK	OP	PK	OP
43	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
54	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
55	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
56	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
58	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
59	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
61	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
63	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
66	4.3	4.3	4.3	4.3	4.2	4.3	4.3	4.3
67	10.2	10.2	10.2	10.2	8.5	8.4	10.2	10.2
70	18.3	0.0	18.3	0.0	18.3	0.0	18.3	0.0
71	9.7	0.0	9.7	0.0	2.9	0.0	9.7	0.0
74	15.3	15.3	15.3	15.3	6.3	6.3	15.3	15.3
75	12.8	6.6	12.8	6.6	9.9	3.6	12.8	6.6
76	18.7	18.7	18.7	18.7	11.6	11.6	18.7	18.7
78	12.6	0.0	12.6	0.0	5.7	0.0	12.6	0.0
79	10.1	0.0	10.1	0.0	0.0	0.0	10.1	0.0
82	6.8	0.0	6.8	0.0	6.8	0.0	6.8	0.0
83	6.6	5.8	6.6	5.8	6.6	5.8	6.6	5.8
90	12.2	21.7	12.2	21.7	22.9	22.9	12.2	21.7
97	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
98	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
100	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
124	5.7	0.0	5.7	0.0	5.7	0.0	5.7	0.0
FREDSG	NA	NA	28.4	0.0	28.4	0.0	28.4	0.0
FREDMGSG	NA	NA	30.6	30.6	16.3	16.3	30.6	30.6
KPTNMGSG	NA	NA	30.6	0.0	16.4	0.0	30.6	0.0
COM-MG-SG	NA	NA	18.7	18.7	NA	NA	NA	NA

*Feeder buses FREDSG, FREDMGSG, and KPTNMGSG are not available for transit No-Build alternatives (#1 and #2). COM-MG-SG is only available for the TSM alternative. PK=peak periods, including AM and PM peak periods. OP=off-peak periods.

A quality control review, based on the FTA's technical guidance on New Starts projects, indicates that the alternatives have been consistently defined and that accrued benefits and the increase transit shares are reasonable:

- Increases in "off-diagonal" benefits (coverage related - due to Build vs. TSM) are 12-24% of total benefits, meeting or close to the FTA guideline (20%). This result indicates that the Build alternatives (LRT or BRT) are defined consistently with the baseline (TSM) alternative in terms of coverage and service levels.
- Reductions in "off-diagonal" benefits (elimination/reduction of transit services - Build versus TSM) are well below 10% of total benefits, the FTA recommended benchmark. This result indicates again consistent definitions of service coverage between TSM and Build alternatives and a lack of major network coding errors that may contribute high disbenefits. A few zones suffer from disbenefits because of reduction in transit services or a slight reduction in transit trips.
- User benefits lost due to "capping" are 14%-15% overall for different alternatives, and less than 10% for home-based work trips. Capping eliminates some larger user benefits in the study area, particularly in home-based other and non-home based trip categories. The degree of loss is moderate and is reasonable for home-based work trips.
- Transit modal shares for the Build alternatives are reasonable for the market areas. Transit trip increase due to the Build alternatives represents less than 1% of regional transit trips 2030, and in Montgomery County, transit trips are expected to increase by approximately 4%, comparing Build and TSM alternatives.

As expected, the major daily market is peak period home-based work travel. As an example, Table 16 shows the composition of user benefits by trip purpose for the TSM alternative. Home-based work trips during the peak period account for nearly three quarters of total user benefits, while off-peak home-based work trips contribute to 12% of total user benefits. Only 14% of total user benefits go to non-work trips. User benefit loss due to capping is 8.6% of total user benefits.

Table 16: Daily User Benefits by Trip Purpose – Hwy B1/Tran TSM

	HBWPK	HBWOP	HBOPK	HBOOP	NHBPK	NHBOP	TOTAL
Total User Benefits	287,877	56,002	23,614	24,061	13,172	9,800	414,526
Capped User Benefits	280,719	43,946	16,806	15,948	12,406	8,850	378,676
Percent of Total	74.1%	11.6%	4.4%	4.2%	3.3%	2.3%	100.0%
Percent Capped	2.5%	21.5%	28.8%	33.7%	5.8%	9.7%	8.6%

*Benefits in minutes
HBW – Home-Based Work; HBO – Home-Based Other; NHB – Non Home-Based
PK – Peak Period; OP – Off Peak Period

Several issues are still outstanding and may change the forecasting results:

- Lack of recent survey data for Metrorail services
- These results reflect transit demand under no transit capacity constraint. The supply of transit capacity will be compared with transit demand, and the capacity will be adjusted to match demand, with subsequent changes in operating and maintenance costs.
- Subsequent model development will address several outstanding issues, including over-simulation of bus ridership. Further investigations are needed to evaluate and remedy estimates for Rockville station boardings and MARC Brunswick Line boardings in a systematic way.

Figure 7

CCT DAILY STATION ACTIVITY - ALT #3 HWY B1 / TRAN TSM

Headway 6 min. (Peak); 10 min. (Off-Peak) Total Runtime 60 min.

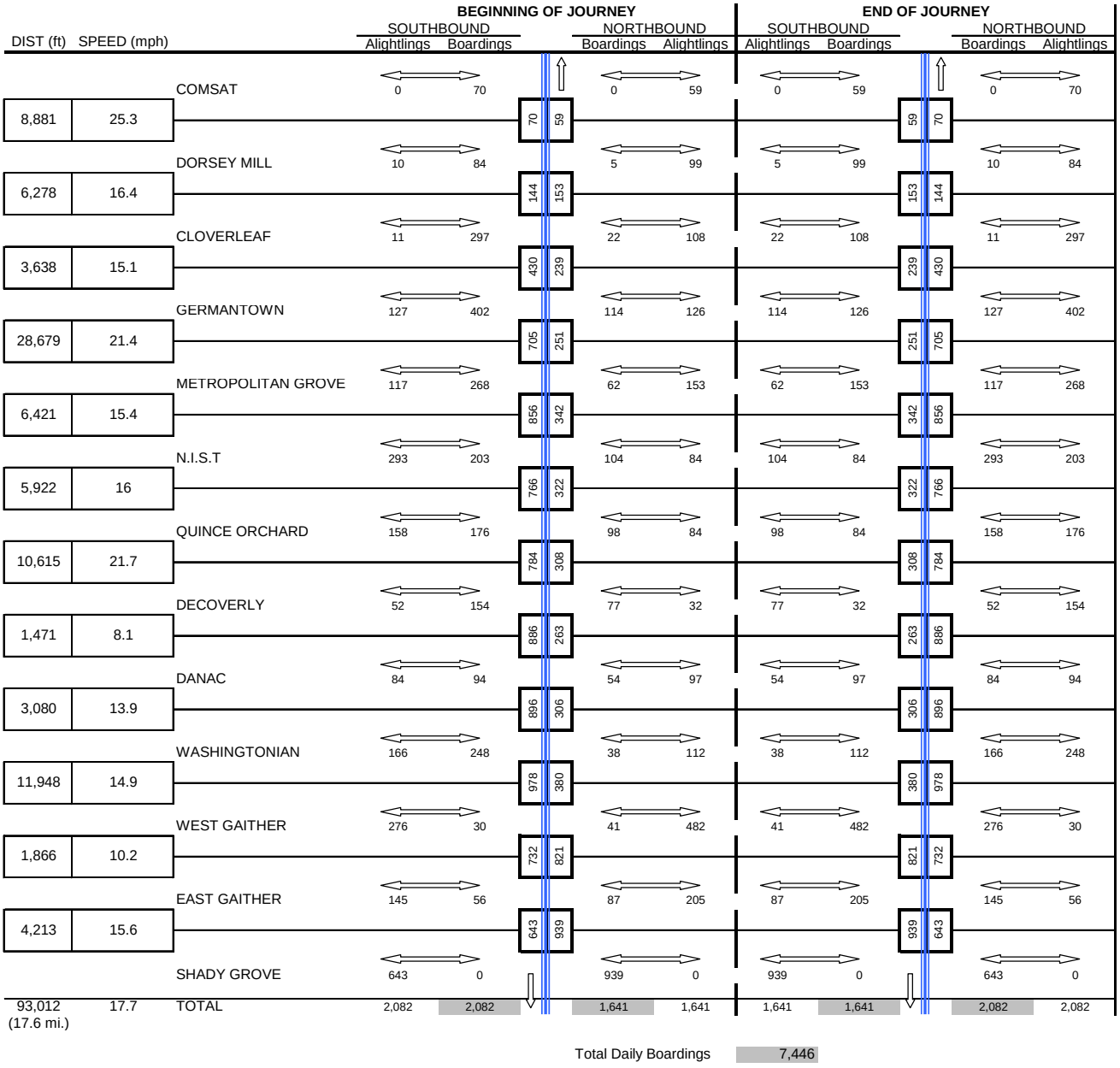


Figure 8

CCT DAILY STATION ACTIVITY - ALT #4 HWY B1 / TRAN LRT

Headway 6 min. (Peak); 10 min. (Off-Peak) Total Runtime 36 min.

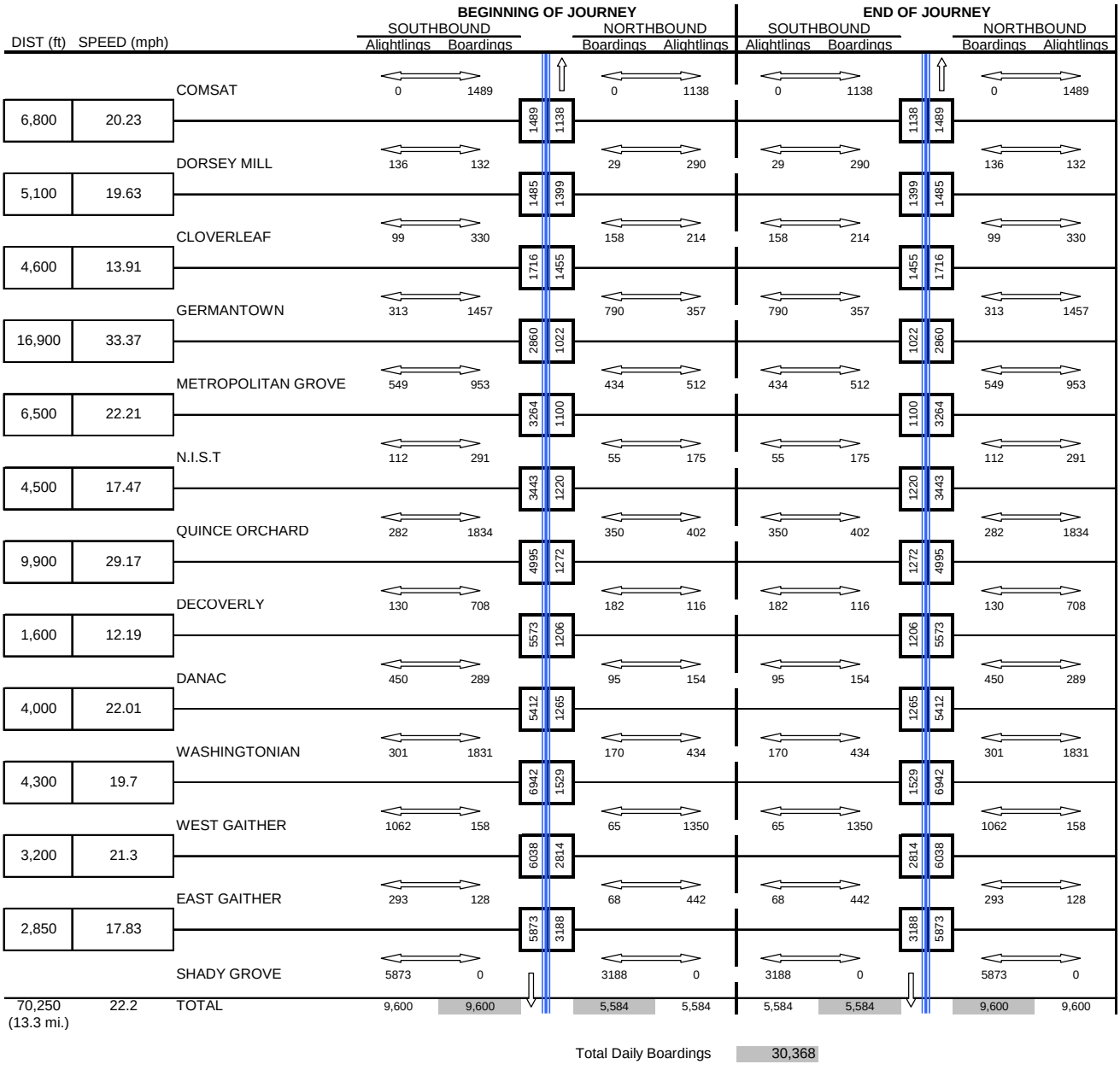


Figure 9

CCT DAILY STATION ACTIVITY - ALT #5 HWY B1 / TRAN BRT

Headway 6 min. (Peak); 10 min. (Off-Peak) Total Runtime 38 min.

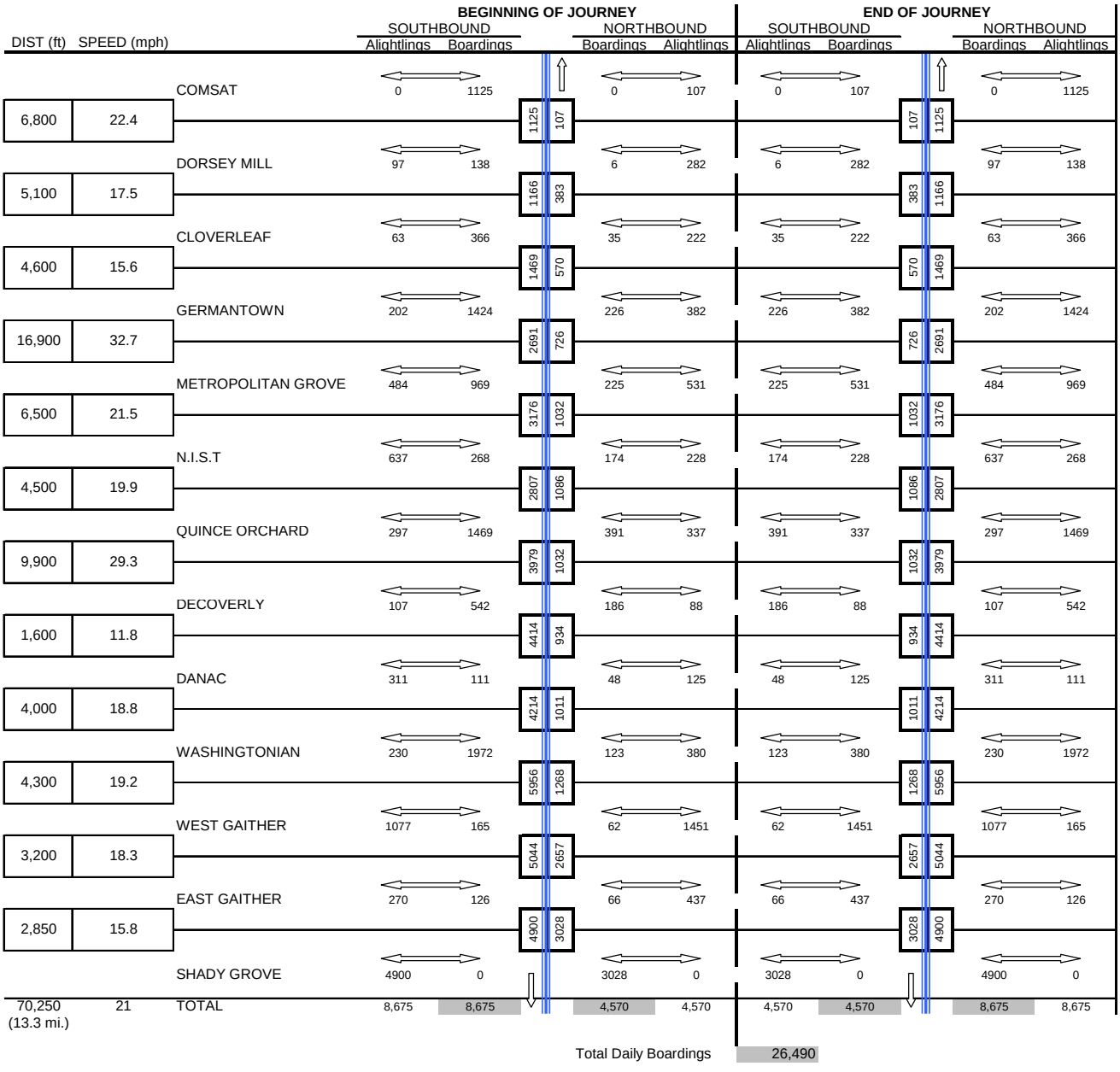


Figure 10

CCT DAILY STATION ACTIVITY - ALT #6 HWY B2 / TRAN LRT

Headway 6 min. (Peak); 10 min. (Off-Peak) Total Runtime 36 min.

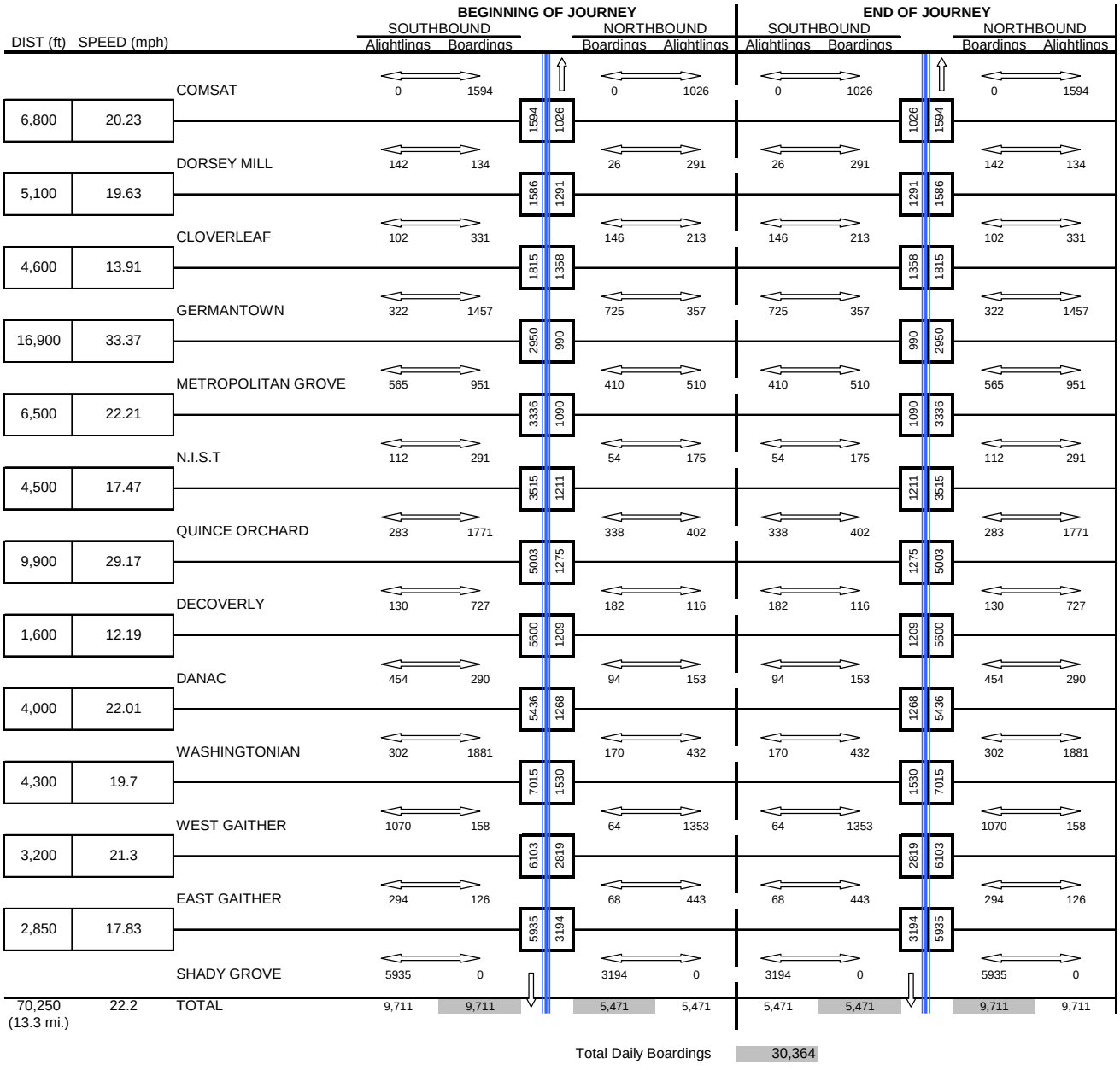


Figure 11

CCT DAILY STATION ACTIVITY - ALT #7 HWY B2 / TRAN BRT

Headway 6 min. (Peak); 10 min. (Off-Peak) Total Runtime 38 min.

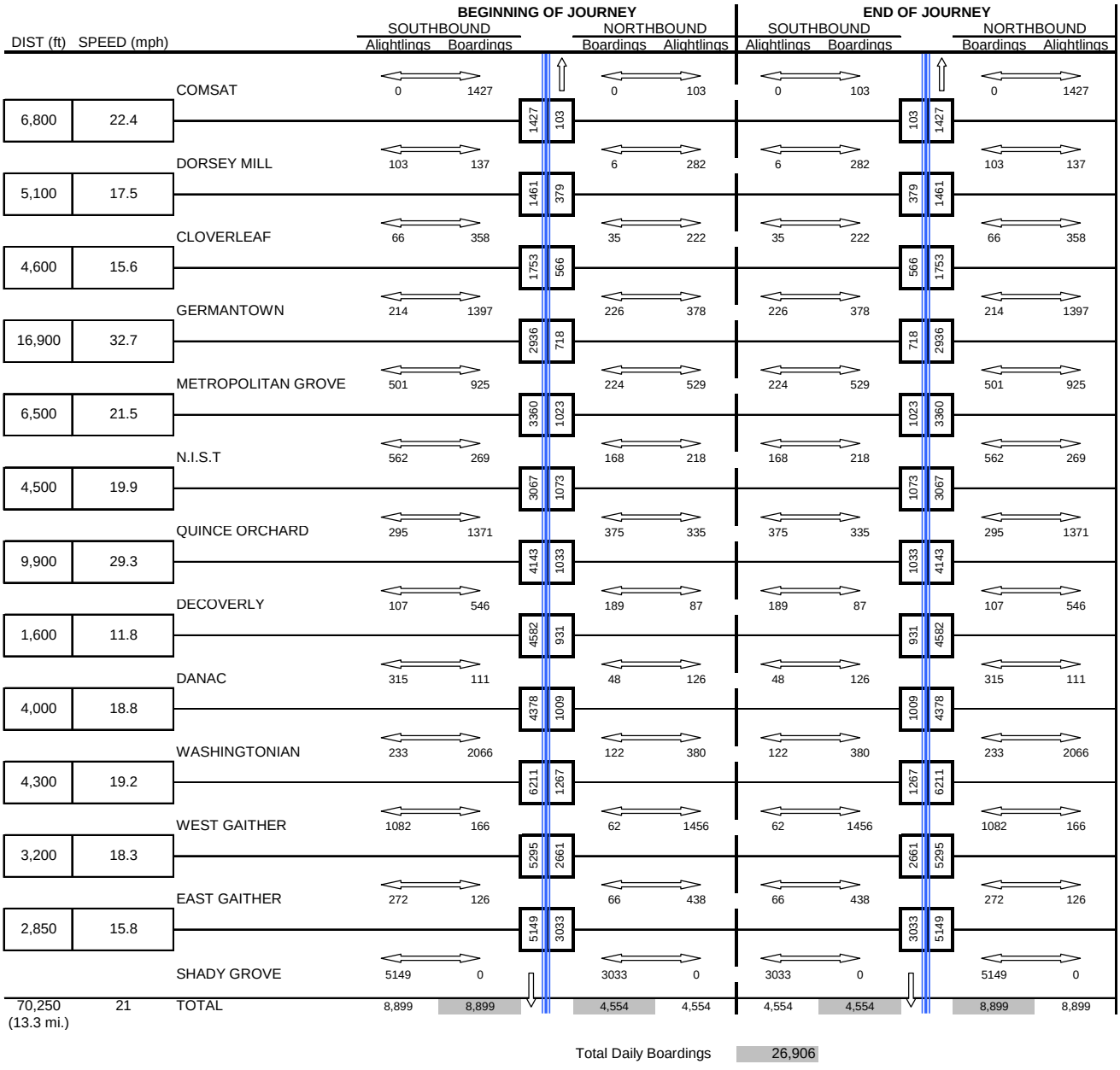


Table 17: Station to Station Boardings — Alt #4 Hwy B1/Tran LRT

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1 COMSAT	-	164	189	875	416	26	87	22	50	31	108	25	595	2,588
2 Dorsey Mill	164	-	25	119	89	6	23	12	14	14	16	5	96	584
3 Cloverleaf	189	25	-	107	93	8	29	12	22	18	42	9	203	757
4 Germantown	875	119	107	-	383	46	137	66	132	96	273	56	620	2,910
5 Metropolitan Grove	416	89	93	383	-	78	274	64	71	51	125	26	768	2,438
6 N.I.S.T	26	6	8	46	78	-	80	10	17	15	29	7	306	630
7 Quince Orchard	87	23	29	137	274	80	-	123	129	86	227	51	1,615	2,859
8 Decoverly	22	12	12	66	64	10	123	-	111	98	60	20	528	1,127
9 DANAC	50	14	22	132	71	17	129	111	-	59	31	14	334	983
10 Washingtonian	31	14	18	96	51	15	86	98	59	-	208	74	1,925	2,675
11 West Gaither	108	16	42	273	125	29	227	60	31	208	-	72	1,417	2,610
12 East Gaither	25	5	9	56	26	7	51	20	14	74	72	-	566	926
13 Shady Grove	595	96	203	620	768	306	1,615	528	334	1,925	1,417	566	-	8,973
Total	2,588	584	757	2,910	2,438	630	2,859	1,127	983	2,675	2,610	926	8,973	30,060

Table 18: Station to Station Boardings — Alt #5 Hwy B1/Tran BRT

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1 COMSAT	-	103	56	205	159	45	39	15	35	19	105	22	599	1,402
2 Dorsey Mill	103	-	24	113	79	33	24	12	10	10	17	4	91	520
3 Cloverleaf	56	24	-	109	93	68	32	12	13	13	44	9	194	667
4 Germantown	205	113	109	-	376	398	139	50	60	63	256	52	407	2,229
5 Metropolitan Grove	159	79	93	376	-	265	305	60	47	37	130	26	621	2,199
6 N.I.S.T	45	33	68	398	265	-	146	9	8	10	28	5	288	1,304
7 Quince Orchard	39	24	32	139	305	146	-	130	79	50	217	46	1,269	2,476
8 Decoverly	15	12	12	50	60	9	130	-	104	95	50	14	358	910
9 DANAC	35	10	13	60	47	8	79	104	-	50	18	8	158	592
10 Washingtonian	19	10	13	63	37	10	50	95	50	-	260	71	1,966	2,645
11 West Gaither	105	17	44	256	130	28	217	50	18	260	-	76	1,523	2,724
12 East Gaither	22	4	9	52	26	5	46	14	8	71	76	-	559	894
13 Shady Grove	599	91	194	407	621	288	1,269	358	158	1,966	1,523	559	-	8,034
Total	1,402	520	667	2,229	2,199	1,304	2,476	910	592	2,645	2,724	894	8,034	26,596

Table 19: Station to Station Boardings — Alt #6 Hwy B2/Tran LRT

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1 COMSAT	-	167	177	819	405	26	81	22	53	32	118	27	649	2,577
2 Dorsey Mill	167	-	25	121	89	6	23	12	14	14	17	5	97	589
3 Cloverleaf	177	25	-	107	93	8	29	12	22	18	43	9	203	746
4 Germantown	819	121	107	-	387	47	136	67	133	96	274	56	615	2,857
5 Metropolitan Grove	405	89	93	387	-	78	270	65	71	51	125	26	768	2,428
6 N.I.S.T	26	6	8	47	78	-	80	11	17	15	29	7	307	631
7 Quince Orchard	81	23	29	136	270	80	-	122	123	83	212	50	1,577	2,786
8 Decoverly	22	12	12	67	65	11	122	-	116	101	76	21	526	1,149
9 DANAC	53	14	22	133	71	17	123	116	-	59	31	14	335	987
10 Washingtonian	32	14	18	96	51	15	83	101	59	-	205	73	1,979	2,726
11 West Gaither	118	17	43	274	125	29	212	76	31	205	-	72	1,420	2,622
12 East Gaither	27	5	9	56	26	7	50	21	14	73	72	-	565	927
13 Shady Grove	649	97	203	615	768	307	1,577	526	335	1,979	1,420	565	-	9,040
Total	2,577	589	746	2,857	2,428	631	2,786	1,149	987	2,726	2,622	927	9,040	30,065

Table 20: Station to Station Boardings — Alt #7 Hwy B2/Tran BRT

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1 COMSAT	-	110	58	216	171	45	40	15	38	20	112	24	654	1,503
2 Dorsey Mill	110	-	24	113	79	31	24	12	10	10	17	4	92	525
3 Cloverleaf	58	24	-	109	93	60	32	12	13	14	44	9	194	662
4 Germantown	216	113	109	-	379	357	139	51	62	64	262	53	405	2,209
5 Metropolitan Grove	171	79	93	379	-	236	298	60	46	37	126	25	616	2,168
6 N.I.S.T	45	31	60	357	236	-	136	10	8	10	28	5	289	1,214
7 Quince Orchard	40	24	32	139	298	136	-	131	74	47	193	44	1,205	2,362
8 Decoverly	15	12	12	51	60	10	131	-	109	97	65	14	342	917
9 DANAC	38	10	13	62	46	8	74	109	-	50	18	8	158	595
10 Washingtonian	20	10	14	64	37	10	47	97	50	-	268	73	2,048	2,737
11 West Gaither	112	17	44	262	126	28	193	65	18	268	-	76	1,528	2,736
12 East Gaither	24	4	9	53	25	5	44	14	8	73	76	-	558	894
13 Shady Grove	654	92	194	405	616	289	1,205	342	158	2,048	1,528	558	-	8,089
Total	1,503	525	662	2,209	2,168	1,214	2,362	917	595	2,737	2,736	894	8,089	26,611