Tier 2 Environmental Assessment
I-66 Transit/TDM Technical Report

Appendix A

Transit & Park-and-Ride Demand Forecasting Methodology Memorandum

DRAFT – MAY 2015

INTRODUCTION

This technical memorandum summarizes the methodology and assumptions for developing demand forecasts for future transit service and park-and-ride facility use for the I-66 Corridor Improvements Project, or Transform 66 Outside the Beltway (the project). This document is an appendix to the Tier 2 Transit/TDM Technical Report, which is a supporting document to the Tier 2 Environmental Assessment.

Transit Demand

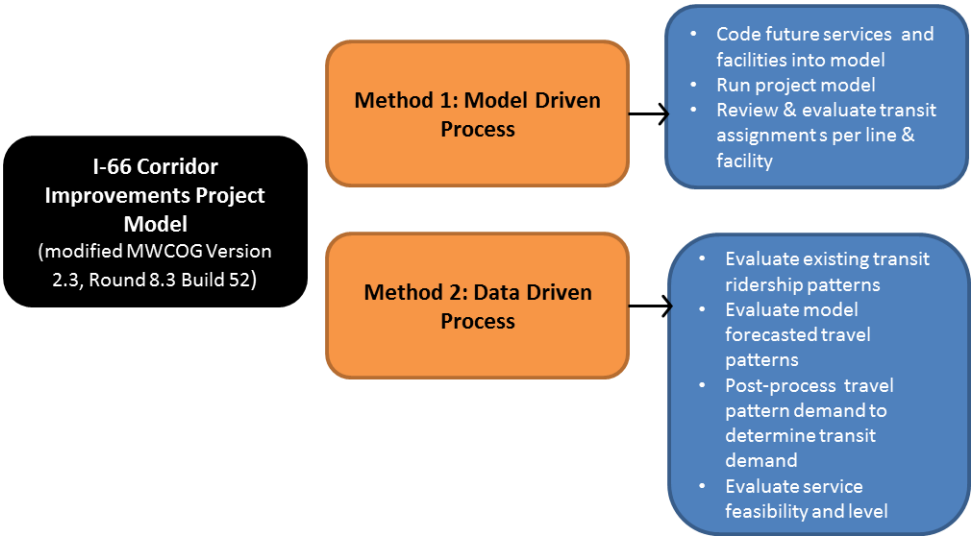
To develop transit service recommendations, the travel patterns in the I-66 corridor and the greater Northern Virginia region were evaluated. Transit service was planned to meet current and anticipated travel needs in the corridor and regionally. Travel demand models, like the one maintained by the Metropolitan Washington Council of Governments (MWCOG) for the greater Washington, DC area, are the best available tools for understanding regional travel patterns and their effects. When looking at a specific corridor, such as I-66, it is important to use additional analysis methods to further refine the data obtained from the travel demand model. These two steps of this demand forecasting are described in this section.

Transit Demand Assessment and Potential Service Identification

The evaluation of transit demand and the development of transit and associated facility recommendations relied upon two methods of demand development and assessment (**Figure A.1**):

- **Method 1: Travel Demand Model Process**, which coded potential future transit services and facilities into the model and assessed performance on a route-by-route and facility-by-facility basis. This method provided important transit inputs into the development of traffic volume forecasts used for the project. It also provided insight in the planning process as to transit facility and service patterns that were of greater and lesser attractiveness.
- **Method 2: Data-Driven Process**, which extended from the regional travel demand model and focused on assessing travel flows (between origins and destinations) associated with the I-66 corridor and identifying transit services and facilities to serve potential demand. This method provided specific data for the development of transit service and facility recommendations.

Figure A.1: Summary of Transit Demand Assessment



Travel Demand Model Process

As part of the project, the MWCOG travel demand model was modified to increase the level of detail of its inputs and accuracy in development of forecasts for the project.[1] **Figure A.2** summarizes the model update and modification process, which is an industry-standard practice for corridor studies of this type.

This project-specific model included adjustments to the highway network and traffic analysis zones (TAZs) as well as modifications to the transit network. For reference, TAZs are defined areas within a travel demand model that contain socioeconomic data such as numbers of residents and jobs and are usually defined based on geographic features such as major roads, parks, or bodies of water. Some of the TAZs from the project model that are located in the vicinity of the study area are shown in **Figure A.4**.

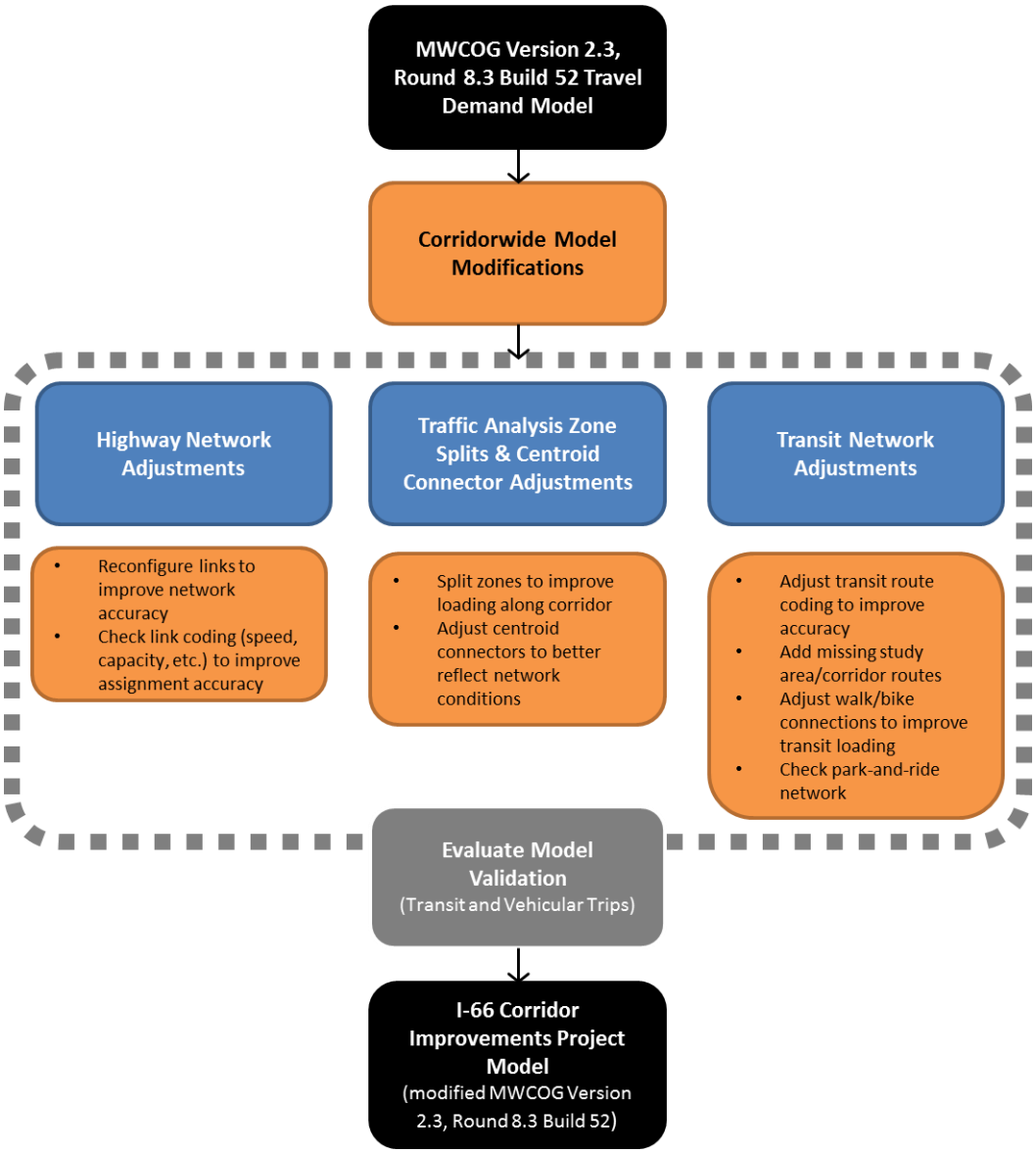
Transit network modifications made during the model update process were important in enhancing model accuracy in producing transit forecasts for the I-66 corridor. Modifications included:

- Adjusting transit network characteristics (routes, headways, speeds, etc.).
- Adjusting walk/bike connections within the model network to improve transit loading.
- Review and modification of park-and-ride facilities/network.

The collective result of the modification process (**Figure A.2**) was a project-focused travel demand model for use in vehicular traffic and transit forecast development.

[1] Version 2.3, Round 8.3 Build 52

Figure A.2: Summary of Project-Related Modifications to the MWCOG Travel Demand Model



Data-Driven Process

The data-driven process begins with the results obtained from the project travel demand model. The first step after this data was obtained was to look at the trip flows and understand travel patterns between origins and destinations. These patterns were then used to determine the appropriate pairs of origins and destinations to serve with transit and to what extent. Next, route patterns and networks were formed, which created initial transit service scenarios. These initial scenarios were refined into a draft preferred alternative.

Figure A.3 summarizes the flow of this process.

Figure A.3: Transit Scenario Development Process Summary

Trip Flow Analysis

The trip flow analysis was used to identify potential origin and destination pairs to serve with transit and TDM services. To conduct this analysis, TAZs were strategically grouped for both origin and destination ends for potential transit trips. Destination-end TAZ groupings were advised by MWCOG-designated activity centers and other existing and future major trip attractors. Origin-end TAZ groupings were developed based on travel sheds leading to the I-66 corridor.

The Washington, DC (District) groups were evaluated using regional travel model data for home-based work (HBW) and total daily trip flows between origin-destination (District) pairs for 2025 and 2040.

Figure A.4 shows a map of the districts and activity centers used as pairs in this analysis as well as individual TAZ boundaries.

Demand and Service Level Assessment

The goal of the demand and service level assessment was to determine which of the origin-destination pairs warranted transit service.

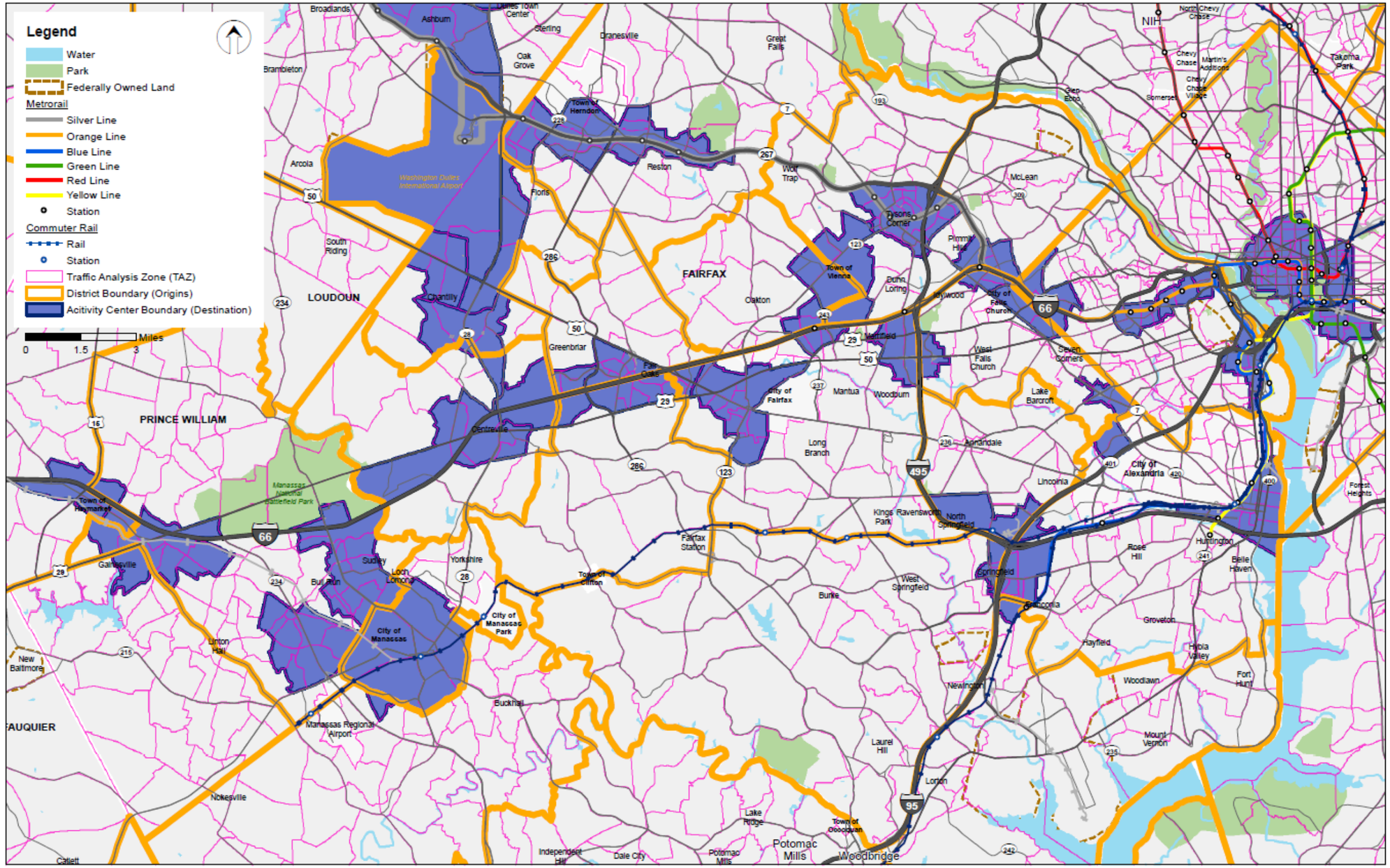
Factors derived from an analysis of existing transit services were applied to travel demand between origin-destination pairs to determine the number of buses that would be required to service any particular origin-destination pair. The following assumptions were made to develop the number of peak bus trips from the daily HBW trips:

- 90 percent of the HBW trips occur during peak period.
- Commuter buses have a 57-passenger capacity.
- Peak periods were assumed to be 3 hours in the a.m. and 3 hours in the p.m.

Origin-destination pairs demanding (based on trip flows) one or more buses per hour in peak periods were identified as initial potential transit service markets for the corridor. To begin the process of developing initial transit service scenarios, two sets of assumptions were employed to calculate this number of trips. Using comparisons between existing ridership on PRTC services and data from the travel demand model, two scenarios were developed for the amount of trips that were required. The first set of assumptions (ultimately used in Scenario B—see “Transit Service Plan Development” section below) required at least 1,860 daily total HBW trips to warrant one bus per hour. This was consistent with existing service. The second scenario (Scenario C) required about 930 daily total HBW trips. The increase in number of total trips captured by transit for the second scenario assumed an increase in service reliability and attractiveness due to a predictable travel time using the Express Lanes and the availability of park-and-ride lots in the future.

Specifics of service including route and frequency were determined in the steps that follow.

Figure A.4: I-66 Map of Transit Demand Districts and Activity Centers



Develop Route Patterns

In this step of the process, specific characteristics of the service were identified including stops, type (Rapid Bus Service or commuter), span (peak only, off peak, or all day), and headway (frequency). Considerations such as overlap between services and routes, balancing demands for park-and-ride facilities, access to the Express Lanes, connections to intersecting and complementary services, and configuration of existing and other planned services were weighed.

Transit Service Plan Development

Three scenarios (discussed in detail in **Chapter 6**), developed were developed for evaluation. Understanding financial, schedule, and infrastructure implications, the scenarios considered different levels of transit service in terms of type, span, frequency, and coverage:

- **Scenario A** consisted of the most limited transit service, relying primarily on providing one-seat rides to only the highest demand origin-destination pairs and connecting with other existing and planned transit service in the region to serve other regional destinations.
- **Scenario B** increased service levels and provided more one-seat rides and services to destination with modest (but reasonable) levels of transit demand.
- **Scenario C** further expanded the network to provide additional one-seat rides between origin and destination and increased service frequencies from those assumed in Scenarios A and B. Scenario C provided the most service and covered the greatest number of origin-destination pairs.

The three scenarios were compared to identify the most effective and important elements from each that would be incorporated into a draft preferred service plan. This service plan laid out an expansive cost-effective route structure and took into account feedback for regional stakeholders and the public. The draft preferred service plan also incorporated a phasing plan (ramp up) from opening year to 2040 in five-year increments, using the 2025 and 2040 scenarios as guidance.

The preferred plan is described in detail in **Chapter 7**.

Park-and-Ride Demand

This section describes the process used to forecast the future number of spaces required for study area park-and-ride facilities. The process primarily used the MWCOG travel demand model and a comparison with analogous park-and-ride facilities in the region.

Future Park-and-Ride Demand Estimation

To provide guidance for the parking requirements of park-and-ride facilities in the I-66 corridor, estimates of the future demand were developed. The introduction of express lanes, modification of HOV-2 to HOV-3, and corresponding increase in transit service are likely to contribute to considerable increases in demand for corridor park-and-ride parking. Broadly, to estimate park-and-ride parking demand for the project, the following was undertaken:

- Identification of existing facilities in Northern Virginia with transit service profiles similar to those expected to be implemented in the I-66 corridor.
- Analysis of existing park-and-ride facilities use considering market area demographics analysis.
- Development of parking generation rates to apply to park-and-ride facilities based on analysis of existing analogous facilities in the region.

- Application of parking generation rates (factors used to convert number of people in a given area to number of parking spaces required) to forecast population within defined project park-and-ride facility catchment areas.
- Post-processing of forecast parking demand to fine-tune facility-by-facility assignments of demand and subtract overlapping demand among facilities.

Baselining Process

As a part of the parking demand development for the project's park-and-ride facilities, HOV-accessible park-and-rides along other analogous regional corridors, such as I-95 and the Dulles Toll Road, were evaluated. The demand generation rates of these facilities serve as benchmarks for predicting future usage at the proposed lots.

In general, park-and-ride facilities with regular transit service of at least hourly or better commuter bus frequency during the peak hours were selected for evaluation. Several of the evaluated facilities have higher frequencies of transit service and have significant slug and vanpool activity.

The Horner Road park-and-ride on I-95 was evaluated. This facility has direct HOV-access and serves thousands of daily commuters via bus, carpool, and slugging—similar to the perceived commuting dynamics that will be served in the I-66 corridor.

The park-and-ride facilities at US 1/Route 234 and at Garrisonville Road (Route 610) along the I-95 corridor also were analyzed. These facilities have transit service and access characteristics similar to lots proposed in the I-66 corridor.

Park-and-ride facilities along the State Route 267 (Dulles Toll Road) corridor also were evaluated, including:

- Herndon-Monroe.
- Dulles North Transit Center.
- Leesburg/Sycolin Road.

The Herndon-Monroe park-and-ride facility was viewed as supporting travel behaviors and transportation services similar to those expected in and planned along I-66 in Fairfax County.

A spatial analysis was conducted to analyze the market dynamics at the comparable case study lots. Five-mile areas were analyzed around each park-and-ride using 2010 MWCOG Round 8.3 TAZ data to compute the population and households within the respective market areas.

The facility activity (number of vehicles) was then compared to the market-area population and households, resulting in ratios that reflect the percent of area residents using the park-and-ride facility. While some park-and-ride users likely come from beyond this 5-mile market area, this type of analysis provided a reasonable planning basis for comparing typical utilization rates compared to the demographics of the surrounding area for each park-and-ride facility.

Based on the analysis of analogous lots, the market area size and the resulting ratios were determined to be reasonable based on those cited in other studies, such as the Metropolitan Council 2030 Park-and-Ride Plan for the Minneapolis metro area. **Table A.1** below illustrates the baseline market characteristics of the I-95 and Dulles Toll Road lots.

Table A.1: Existing Park-and-Ride Market Area Dynamics

Lot	Capacity	Occupancy	Utilization	Population within Market Area	Households within Market Area	Vehicles per Person	Vehicles per Household
Horner Road	2,142	2,409	112.5%	95,146	32,188	0.025	0.075
US 1/ Route 234	845	886	104.9%	62,154	20,142	0.014	0.044
Herndon-Monroe	1,835	1,815	98.9%	152,397	58,142	0.012	0.031
Dulles North Transit Center	759	781	102.9%	91,366	31,843	0.009	0.025
Garrisonville Road	890	880	98.9%	49,369	15,402	0.018	0.057
Leesburg Park-and-Ride/Sycolin Road	700	641	91.6%	50,633	16,828	0.013	0.038

Parking Demand Forecasting

Using the rates developed in the baselining process, forecasts were developed for proposed park-and-ride facilities in the project study area. For lots within Fairfax County [Monument (Monument Drive) and Stringfellow Road], the market area assumption was a 2.5-mile radius, due to the close proximity of other park-and-ride facilities and congested roadway network. For lots within Prince William County, the radius was assumed to be 5 miles.

The Haymarket (US 15) park-and-ride facility assumed a larger area, approximately 7 miles, focused westward. The market area for the Haymarket park-and-ride considers “long-distance commuters” who may be originating from points well west of the project limits.

In all cases, once the market areas were developed, areas where individual park-and-ride facility markets overlapped were adjusted to eliminate double counting of potential demand. This was undertaken corridorwide.

Following the development and adjustment of market areas, each was then intersected with the MWCOG socioeconomic data at the TAZ level to capture the future population and household data within each market area for the future forecast years (2025 and 2040). Following the intersection of the data, the market-area populations and households were multiplied by the ratios derived in the baselining process to develop estimates of future demand.

Results of the analysis for the 2025 forecast year are shown in **Table A.2** and results for the 2040 forecast year are shown in **Table A.3**. The increase in demand for park and ride spaces is consistent with overall population and household growth projections for the corridor.

Table A.2: 2025 Forecast Year Park-and-Ride Demand Analysis

Lot	Population in Market Area in 2025	Households in Market Area in 2025	Analogous Lots	Demand Estimate (90% utilization)
Monument (Monument Drive)	45,741	19,107	Herndon Monroe	627
Stringfellow Road[2]	58,627	21,619	Herndon Monroe	755
Manassas (Balls Ford Road)	57,370	20,735	Dulles North and Horner Road	1,197
Gainesville (Cushing Road/Route 234)	34,370	12,178	Dulles North and Horner Road	710
Gainesville (University Boulevard)	56,856	19,566	Horner and Leesburg	1,238
Haymarket (US 15)	44,330	14,417	US 1/Route 234 and Garrisonville	815
Total				**5,342**

Table A.3: 2040 Forecast Year Park-and-Ride Demand Analysis

Lot	Population in Market Area in 2040	Households in Market Area in 2040	Analogous Lots	Demand Estimate (90% utilization)
Monument (Monument Drive)	50,016	20,774	Herndon Monroe	684
Stringfellow Road[3]	63,452	23,505	Herndon Monroe	818
Manassas (Balls Ford Road)	64,061	23,533	Dulles North and Horner Road	1,348
Gainesville (Cushing Road/Route 234)	43,707	15,733	Dulles North and Horner Road	910
Gainesville (University Boulevard)	68,591	23,975	Horner and Leesburg	1,505
Haymarket (US 15)	54,095	17,799	US 1/Route 234 and Garrisonville	1,000
Total				**6,265**

[2] Stringfellow Road park-and-ride facility was initially considered as a potential expansion as part of the project. This location was removed from consideration as a project park-and-ride due to the planned expansion of the lot by Fairfax County, which is expected to provide sufficient capacity for the forecasted demand provided in this report.
[3] Stringfellow Road park-and-ride facility was initially considered as a potential expansion as part of the project. This location was removed from consideration as a project park-and-ride due to the planned expansion of the lot by Fairfax County, which is expected to provide sufficient capacity for the forecasted demand provided in this report.