

Draft Environmental Impact Statement for Washington  
Union Station Expansion Project

# **Appendix A3h – Final Concept Development and Evaluation Report Appendix H: *Bus Terminal Capacity Technical Memorandum***

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U.S. Department of Transportation  
Federal Railroad Administration

July 13, 2016

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# Appendix H

## Bus Terminal Capacity Technical Memorandum

July 13, 2016

# Introduction

The Draft Concept Development and Evaluation Report (CDR) was originally issued on June 14th, whereas the Bus Terminal Capacity Technical Memorandum was released on June 30th, 2016. The purpose of this preface is to outline what may be potentially required to coordinate between both the CDR and the subsequently issued bus memo.

Over the course of the concept design development process, several programming options were developed for a new Bus Terminal facility and presented to the Partners. As shown in Appendix A of the CDR, nearly 32 design options were developed as part of the design and planning of the new terminal, including a few off-site locations. The CDR contains detailed descriptions for all four of the preferred bus options that were carried forward. It also addresses the extent to which they can be modified to increase the active program, including converting the upper level dedicated to layovers into active bays and modifying sawtooth slips into angled parking.

The subsequently prepared bus memo included here, implies a potential shift in the balance of the active and layover bus program. This may have implications for the options outlined in the CDR. Any revisions to the bus options to accommodate a modified bus program would likely have impacts on other project features such as the Train Hall options. In addition, the revised program may create complications regarding traffic operations within and around the Bus Terminal. Should the active bus program increase, the design modifications and their respective implications per bus option are summarized below. Specifically, this preface addresses two questions related to an expanded active bus program: the potential to add more levels and the potential to consider different bus bay configurations. A full understanding of the planning implications will be developed for the alternatives that are carried forward into the next phase:

## Bus On The South Above East-West Train Hall Integrated With The Concourse A

Two levels of active bus slips would currently not be possible as the option only has one level to limit view shed impacts. The current layout could be designed with all angled bays with the possibility of expanding the footprint to the north in order to have three rows of active angled bays to reach the increased numbers.

## Bus On South-East Of H Street

Two levels of active bus slips would be possible as stated in the Concept Design Report. While a third level could be added to allow for layovers, this would create operational issues given the multiple active levels in addition to a reduction of above grade parking. The current layout could be designed with all angled bays, widening the overall facility footprint given the increased bay depth and drive aisle widths required by angled parking. A wider bus facility would require a severe scale reduction to the North-South Train Hall, to the degree where the Train Hall concept becomes severely compromised to the point of incompatibility with the project Goals and Objectives.

## Bus On South-West Of H Street

Two levels of active bus slips would be possible as stated in the Concept Design Report. While a third level could be added to allow for layovers, this would create operational issues given the multiple active levels in addition to a reduction of above grade parking. Note that this option is already significantly challenged in terms of capacity and bus circulation. An increase in program would only aggravate these issues. The current layout could be designed with all angled bays, widening the overall facility footprint given the increased bay depth and drive aisle widths required by angled parking. A wider bus facility would require a severe scale reduction to the North-South Train Hall, to the degree where the Train Hall concept becomes severely compromised to the point of incompatibility with the project Goals and Objectives.

## Bus On North Of H Street

Two levels of active bus slips would be possible as stated in the Concept Design Report. A third bus level could be added to allow for layovers, however, this would create operational issues given the multiple active levels. Additionally, there would be a reduction of available volume for above grade parking, given the height restrictions at the north of the site. Due to the geometry of the site on the north end, the current layout is presently designed with all angled bays. Alternatively, the footprint could be expanded, reintroducing the double loop configurations. The tour and charter bus pick-up and drop off lanes adjacent to Concourse A at the deck level, could incorporate a second lane to increase the capacity.



## Memo

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**DATE:** July 7, 2016

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**REFERENCE#:** Washington Union Station Expansion

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**SUBJECT:** Bus Terminal Capacity Technical Memorandum

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The bus terminal is a key element in the Washington Union Station (WUS) Expansion Project (Project). This memorandum discusses the data collected to assess the existing conditions of the Washington Union Station Bus Terminal, describes the policy considerations needed to plan for the station's future, and outlines an approach taken to project the future capacity needs of the terminal. The existing conditions and the projections have been previously described in other reports and are further developed and refined in this document.<sup>1</sup> There are also a number of policy recommendations that affect the future programming of the Terminal. The findings of this bus capacity analysis will determine the space requirements for the Bus Terminal to be addressed in refined Station Concepts and EIS Alternatives.

The bus capacity analysis has found that 47 active slips are needed to meet the 2040 capacity needs for intercity, charter/tour, and District of Columbia circulator bus operations at Washington Union Station. The analysis to reach this conclusion was comprised of three steps, described in further detail below:

- 1) Collecting Data to Assess Existing Conditions
- 2) Defining Terms and Addressing Policy Decisions
- 3) Projecting Growth to Determine Future Capacity Needs

### **Step 1: Data Collection to Assess Existing Conditions**

Data was provided from a variety of sources, including Union Station Redevelopment Corporation (USRC), Union Station Parking Garage, LLC (USPG), intercity bus operators, and the District Department of Transportation (DDOT). The bus operators provided information about their existing operations, including number of passengers, schedules and number of trips, and vehicle specifications. USPG provided data on monthly intercity bus ridership between August 2013 and December 2015. USPG supplemented that information with daily counts of intercity and charter/tour bus reservations between May 26 and June 17, 2016 and reservation logs measuring reservation duration from May 23 to June 19, 2016. In addition to this data, the team conducted several site visits of the bus terminal to assess current operations. In particular, an initial site visit was conducted on October 15, 2015, between 8 am and 12 pm. Subsequent visits were conducted on January 23, 2016, from 9 am to 2:30 pm, and on June 22-23, 2016, between 4 pm and 6 pm. The data and site visits allowed the team to assess the current operational profile of the terminal and present peak capacity needs. **Based on analysis of current facility usage by intercity, tour, charter, sightseeing, shuttles, and DC Circulator buses, it is estimated that 35 active, and 12 layover, spaces are currently required for the facility at any one time.**

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<sup>1</sup> Previous reports discussing the bus program include the Multimodal Analysis Methodology Memorandum, the Multimodal Transportation Existing Conditions Report, and the Concept Development and Evaluation Report

### Summary of Findings

There are presently 61 bus slips in the bus terminal.<sup>2</sup> Thirty are permanently reserved (by intercity, tour, and shuttle providers), four are available for pick ups and drop offs, and 18 are available for hourly and daily use and rental.<sup>3</sup>

Currently, five types of buses make use of the Terminal:

- 1) Intercity buses operated by Greyhound/Peter Pan, Bolt Bus,<sup>4</sup> Megabus, and Washington Deluxe/Best Bus.
- 2) Charter and tour buses
- 3) Shuttles
- 4) DC Circulator
- 5) Other

The findings for these specific types of vehicles are described below.

#### Intercity Bus

Based on the August 2013 to December 2015 data provided by USRC, the Bus Terminal saw between 130,000 and 284,000 monthly riders over those two years. In that time period, ridership peaked in August 2014, when it reached 284,544 across all operators.<sup>5</sup> Megabus consistently has the highest ridership, followed by Greyhound, Bolt Bus, Washington Deluxe, and Best Bus. Greyhound reports that they served 754,632 passengers in calendar year 2014 and that Bolt served 392,994.<sup>6</sup> Megabus reported 1,478,472 passengers in that same time period.<sup>7</sup> Ridership has decreased from 2012 peaks, which may be partially attributable to falling gas prices.<sup>8</sup>

Greyhound-Bolt have stated that the number of slips (10 total) that they have is sufficient for their current operations, though extra slips are sometimes rented during busy seasons. In conversations in October 2015, Megabus said they envisioned 11 slips (7 active and 4 layover) to meet demand for the next decade.<sup>9</sup> They currently have 8 slips that fit their double decker buses.<sup>10</sup>

The intercity bus companies operate a fairly regular schedule. Based on information taken from the three large providers (Megabus, Greyhound, and Bolt), the bus movements in the terminal peak at around 8 pm. The bus movements peak at 19 per hour at that time (see Chart 1). Based on that data and the comments from the operators that the present 19 spaces meet their current operational needs, the estimated current demand for intercity bus services is 19 spaces.

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<sup>2</sup> Only 52 are numbered. The other nine do not carry a number and are largely located on the corners of the facility.

<sup>3</sup> Buses that use the lot for less than two hours are currently not charged a rental fee.

<sup>4</sup> Bolt Bus is a separate trade name owned and operated by Greyhound that provides “curbside service” in the Northeast Corridor, the Pacific Northwest, and the Desert Southwest.

<sup>5</sup> USRC.

<sup>6</sup> Statistics provided to project team by Greyhound.

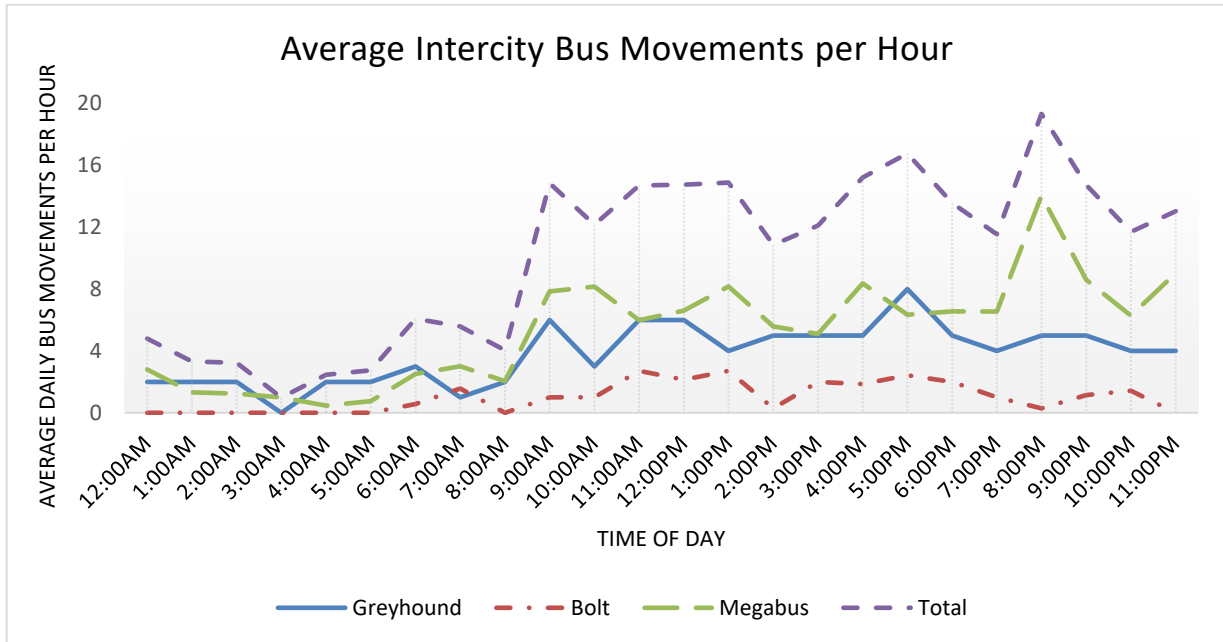
<sup>7</sup> Statistics provided to project team by Megabus.

<sup>8</sup> January 2016 letter from Bryony Chamberlain of Megabus to the Federal Railroad Administration.

<sup>9</sup> Conversations with bus operators October 19-October 20, 2015.

<sup>10</sup> Site visits June 22-June 23, 2016. In the October 2015 conversations, Megabus indicated that they had 3 slips that could fit single-decker buses that contracted partners could use during peak times.

**Chart 1: Average Intercity Bus Movements in an Hour<sup>11</sup>**



Charter/Tours/Sightseeing

A variety of charter and tour operators make use of the bus terminal. Thirty-one spaces are reserved for daily and hourly rentals. Buses may also load and unload passengers and depart in less than 20 minutes free of charge. Sightseeing vehicles also make use of the terminal. Old Town Trolley/Duck tours occasionally store vehicles in two bays in the far west of the terminal, while Grayline Tours operates two bays, from which they provide service to area landmarks like Mount Vernon. The Old Town Trolley tours are “hop-on/hop-off” sightseeing options, while the Grayline Tours offer a daily charter bus sightseeing experience. Hop-on/hop-off sightseeing buses generally operate from the historic WUS entrance, but store vehicles in the garage because of limited space in the front of the building. In addition to these charter, tour, and sightseeing uses, a variety of miscellaneous uses also make daily and hourly rentals in the terminal. These have been separated from charter buses and are described in the “Other” category below.

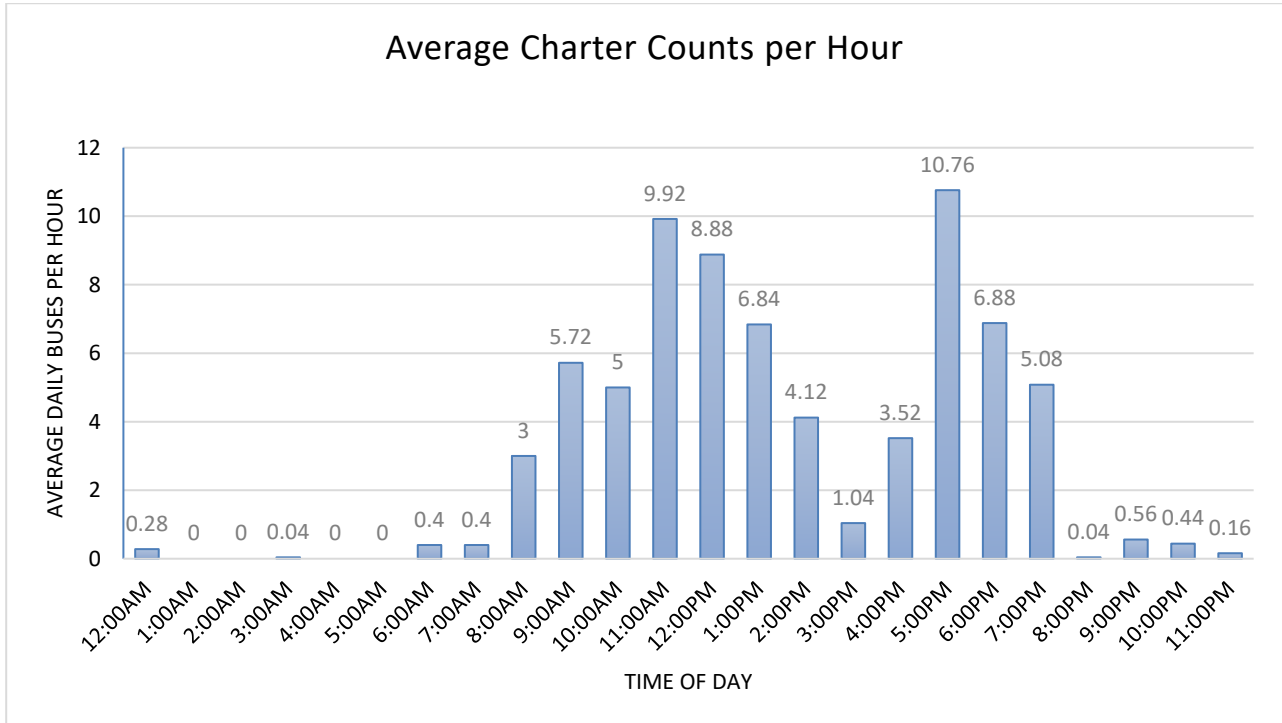
Rental data from three successive Mays (2013-2015) indicate that between 2,100 and 2,381 buses rented a spot per month. The daily bus counts taken by USPG between May 26 and June 17 found that loads peaked around lunch (11 am – 12 pm) and dinner (5 pm). The average daily initial peak at 11 am is 9.92 buses in an hour. The average daily evening peak at 5 pm is 10.76 buses in an hour. The weekday and weekend data are fairly similar. On weekdays, the initial peak comes in the 11 am hour and averages 10.75 buses/hour, while the evening peak happens at 5 pm with 11.625 buses/hour. On weekends, the midday peak arrives in the 12 pm hour with 9.11 buses/hour and the evening peak happens at 5 pm with 9.22 buses/hour. In any one hour, the number of reservations peaked at 27.<sup>12</sup> Facility use is very low in the overnight hours. The period of 8:00 pm to 7:00 am averaged fewer than one bus per hour for the study period.

<sup>11</sup> Source of data: schedules provided by Greyhound and Bolt and entry/exit data from Megabus. Span of data: 2015.

<sup>12</sup> This data does not include daily drop-off/pick-up buses that do not reserve a space and are in and out in 20 minutes.



**Chart 2: Average Charter Counts per Hour<sup>13</sup>**



Based on data from USPG of 294 vehicles that made reservations at the facility between May 23, 2016 to June 19, 2016, the average length of stay for reserved vehicles was 14.87 hours. The median stay was 7.5 hours. The longest stay was 137 hours and 38 buses (12.93% of the total) stayed longer than 24 hours. The data indicate a large degree of long-term storage of buses in the Terminal.

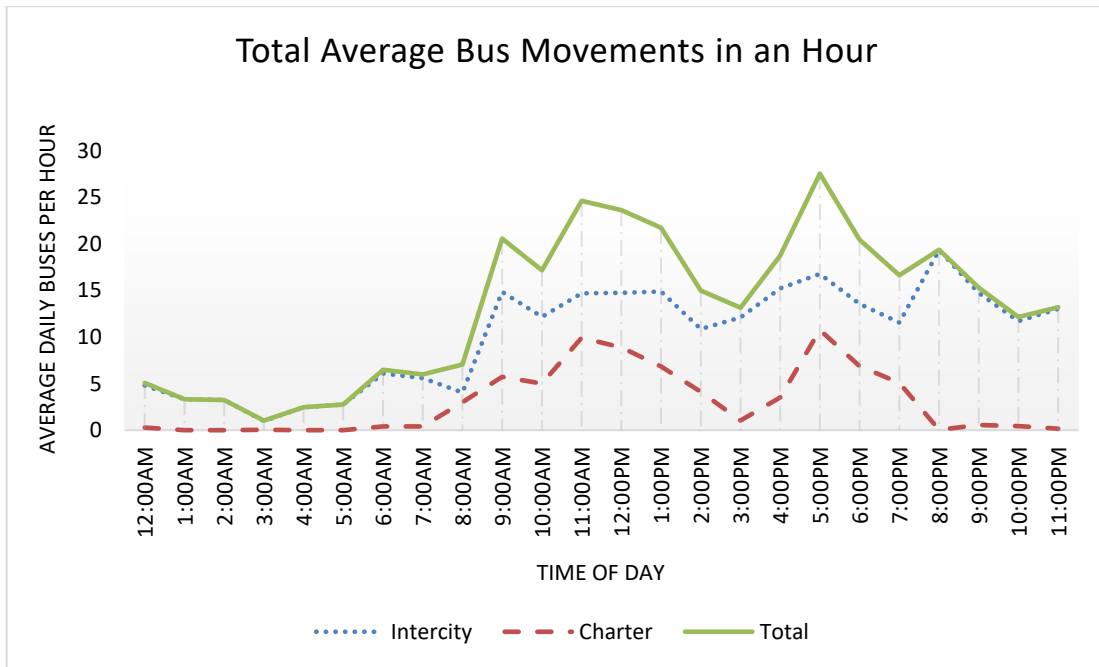
Site visits on June 22-23, 2016 found that, during the evening peak, there were a mix of buses providing short-term drop-off and pick-up and vehicles engaged in longer-term storage. However, unlike intercity buses, the demand was quite variable. On Day 1, all of the use could have been accommodated by 6 active spaces and 4 layover spaces. On Day 2, all of the use in the two-hour period could have been accommodated by 2 active spaces and 2 layover spaces. This unpredictability makes projecting current and future demand more difficult.

To determine the current demands, first reservation data was used to calculate the layover needs of the facility. Based on the number of occupied slip hours across the 29-day period, around 7 layover spaces per day are needed to accommodate the long-term reservation demands.

USPG estimated that the number of active spaces presently needed is 8. To validate that number, data was examined from the peak hours of 11-1 and 5-7. In those time periods, the 90<sup>th</sup> percentile of peaks did not exceed 15 buses in an hour. With 7 layover spaces needed, the current demand for active slips would be 8. Additionally, data provided by USPG from January-April 2016 indicated that around 57% of use of the Terminal was short-term, and 43% was long-term reservations. That ratio further suggests that 8 active spaces and 7 layover spaces could capture the current use of the facility.

<sup>13</sup> Source of data: USPG daily charter counts. Span of data: May 26 to June 17, 2016.

**Chart 3: Daily Charter and Intercity Bus Movements in an Hour<sup>14</sup>**



Shuttles

Two shuttles—one from Gallaudet and one from United States Citizenship and Immigration Services (USCIS)—operate from their own slips in the terminal.

DC Circulator

The DC Circulator operates on a ten-minute frequency 7 am to 9 pm, seven days a week. The October 7 field visit found that the Circulator stages at three bays, and then accepts passengers from Bay 42. A bus dispatch supervisor indicated in October 2015 that policy is to keep only two buses in the terminal at one time.<sup>15</sup> During the June site visits, there were regularly at least four buses present. Three to four buses were used for loading passengers and one bus was laid over, with operators making use of that bus to rest.

Other

Site visits found television vans, white unmarked vans, and box trucks in the different corners of the bus bay. USPG also provided all of the advance reservation data from January 1, 2016 to July 25, 2016 for RVs, box trucks, and truck and trailers that rent to use the facility.<sup>16</sup> Forty-eight vehicles rented space during that time period, using spaces for 2,813 total hours. The average vehicle stayed for 58.6 hours, while the median vehicle stayed for 66 hours.<sup>17</sup> These miscellaneous vehicles are currently accommodated in unused parts of the terminal and provide additional revenue for USPG.

<sup>14</sup> Source of data: Combination of data from charts 1 and 2.

<sup>15</sup> Foursquare ITP site visit. October 7, 2015.

<sup>16</sup> This dataset does not include information about “other” renters who purchase their rental at the door instead of making an advance reservation.

<sup>17</sup> USPG.

## Step 2: Defining Terms and Addressing Policy Decisions

In order to properly assess the future needs of the Terminal, several key terms related to bus operations have been defined for the purposes of analysis. In addition, relevant stakeholders will need to make a number of policy decisions in order to fine tune the future programming needs of the Terminal.

### Definitions

**Active Operations** – For planning purposes, active operations include buses that actively enter the station, load or unload passengers, and depart the terminal within 0-2 hours. This timing is derived from interviews with operators in which they indicated that turning around a bus (including offloading passengers, allowing the driver to have a break, and onloading new passengers) takes up to 1.5 hours, though site visits and conversations with other operators suggest that buses often turn around more quickly. Buses engaged in active operations would make use of active spaces.

**Staging** – Staging is the parking of an intercity bus to prepare it for coming into service, to queue to enter facilities, to ramp up service to meet peak demand loads, or to provide backup service in the case of bus malfunction. Staging today currently happens at off-site locations. For example, Greyhound operates a facility in Tuxedo, MD (near U.S. 50 and the Baltimore-Washington Parkway) where buses are maintained and staged for entry into service.

**Layover** – Layover of the bus is the long-term storage of a bus after unloading passengers. For these purposes, “long-term” is defined as longer than two hours (longer than the active period). Intercity and charter buses remaining in the terminal longer than two hours would be considered to be laying over.

**Sawtooth Slip** – Sawtooth slips are gently angled spaces that allow buses to pull up to a space and then move forward to exit the space. Because the bus does not have to back up to exit the space with the help of a spotter, sawtooth slips are considered a safer design and reduce staffing costs. They take up more space than angled slips.

**Angled Slip** – Angled, or “pull-in and back-out,” slips pose safety concerns because of the need to back out of the space. However, they can accommodate more vehicles in a given space than a sawtooth setup.

### Policy Decisions

**Slip Design** – While sawtooth slips are desirable because of their safety and operational benefits, in order to meet the capacity needs of the terminal within a relatively tight footprint, it is recommended that both sawtooth and angled slips be considered in concepts and alternatives.

**Shuttles** – USRC has indicated that the shuttles are not essential to the purpose of the bus station component of the Project and need not be separately planned for in the future. To the extent that such pickup/drop-off can be accommodated in the future Circulator spaces, they could continue.

**TV Van and Other Vehicle Storage** – As noted above, there are sundry other vehicles that make use of the current facility. TV vans from a variety of outlets cluster in the northwest corner of the facility. USPG rents slips to box trucks and RVs to maximize revenue. It is not appropriate to plan for these uses in the future. The goal of this exercise is to meet current and future intercity and charter bus demands. Parking and storage of other vehicles is not essential to the purpose of the Project and would not be accommodated.

**Hop-on/hop-off Sightseeing Vehicles** – Hop-on/hop-off sightseeing vehicles generally use Columbus Circle and the WUS historic entrance to store their vehicles and load and unload passengers. There is also some passenger loading and storage of these vehicles within the bus terminal. These vehicles do make use of space in the congested area in front of the station, though having these buses in that location makes them easy to find for tourists leaving the station through its main entrance. Some stakeholders have indicated that they would prefer that the hop-on, hop-off buses be removed from the historic WUS entrance.

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It is recommended that if hop-on, hop-off buses are to remain in front of the building, a 15-minute waiting period (or similar) should be set, to prevent buses from sitting idle for extended periods of time. A broader restructuring of the current three drive aisles is also necessary to address current and future congestion at the historic WUS entrance. In addition to the front entrance, sightseeing vehicle demand could be accommodated elsewhere on site, likely at the potential drop-off areas on the deck level. The First and Second Street entrances may also provide a pick up and drop off option. It is not recommended that that sightseeing vehicle storage continue at the bus terminal (see layover policies below).

**DC Circulator** – As indicated above, DC Circulator now uses four slips for active loading and unloading of its buses and lays over one additional bus. More information is needed from DDOT to understand the long-term service plan for the Circulator, particularly with the introduction of streetcar service to Georgetown. That being said, it is recommended that the DC Circulator—with only its active slips—should remain in the future Bus Terminal. The Circulator helps meet the future vision of the Station as a multimodal hub with connectivity throughout the DC region. The layover slip should be eliminated (see layover policies below).

**Layover/Staging Policies** – In order to maximize the effectiveness of the terminal and to balance use of the limited space available in the project site, a similar standard is recommended for accommodation of bus and rail operations. All available space in the rail yard is needed to accommodate active train use. Train layover/storage of trains will only be accommodated with any residual capacity and cannot be guaranteed. A similar approach for accommodation of laying over and staging of buses is recommended.

Active buses are expected to remain within active spaces for a period of 0-2 hours. It is recommended that the staging of buses remain off-site. While preparing a bus for service could be done in an active space, the necessary size of facilities to accommodate bus staging, as indicated by the significant footprints of the intercity operators' existing facilities, could not be accommodated in a terminal setting. In order to meet heavy demand during peak seasons, operators could lease additional overflow spaces, as they do today.

Charter buses remaining in the terminal for longer than two hours cannot be reasonably accommodated in the Project. As indicated in the existing conditions section, charter buses that are currently reserving spaces tend to dwell in the station for several hours. The use of the Union Station Bus Terminal as a bus storage facility does not meet the long-term goals of the terminal as described in the Purpose and Need. The future terminal should be managed to discourage long-term parking/storage beyond two hours altogether, possibly with the use of pricing. Future space needs are projected in Step 3 based on a future restrictions of two hours.

From conversations with bus operators, it appears that while intercity bus operators would be interested in staging more vehicles within the facility, they do not intend to lay over at the facility since it is not cost-effective to have vehicles sit for long periods of time. It is expected that intercity buses would not be allowed to lay over in the facility.

### **Step 3: Growth Projections to Determine Future Capacity Needs**

With the current operational profile of the Terminal determined and policy issues addressed, future growth can be projected. Future capacity needs were calculated based on sector-specific growth factors. This analysis found that, in order to meet new demand, 47 active bus slips would be required in the terminal (see Table 1). This projection includes a total of 5 spaces that are described as “additional spaces for operational flexibility.” These additional spaces allow for growth beyond the 2040 time horizon and for extra capacity during peak periods like Christmas and Thanksgiving. The data collection and calculations to assess the needs of the different uses in the terminal are provided below.

**Table 1: Summary of Bus Growth Projections**

<b>Bus Type</b>	<b>2016 Active Spaces</b>	<b>2016 Layover Spaces</b>	<b>2040 Growth Factor</b>	<b>2040 Active Spaces</b>	<b>Additional 2040 Spaces for Operational Flexibility</b>	<b>2040 Total Active Spaces Needed</b>
Intercity	19	0	19%	23	2	25
DC Circulator Shuttle	4	1	0%	4	0	4
Tour/Charter	2	4	0%	0	0	0
Sightseeing	8	7	51%	12	2	14
	2	0	51%	3	1	4
<b>Total</b>	<b>35</b>	<b>12</b>		<b>42</b>	<b>5</b>	<b>47</b>

Intercity Bus

The data collection identified a need for 19 active spaces for intercity buses. The Federal Railroad Administration’s (FRA) NEC Future Tier I EIS studied future intercity bus demand along the Northeast Corridor.<sup>18</sup> The FRA estimates current DC yearly boardings and alightings to be 1,856,000 for trips within the Northeast study region. The Tier I EIS includes an estimate that DC bus ridership in 2040 in within the Northeast study region, assuming the construction of new high-speed rail capacity along the Northeast Corridor, will come to 2,215,000, 19% growth over the twenty-five-year period.

On that basis, the existing bus utilization of the WUS was inflated by the projected 19% growth and it is estimated that 4 additional active spaces would be needed to meet growth in bus travel demand, with two more spaces required to provide operational flexibility. These flex spaces would allow the operators the ability to ramp-up capacity to meet demand during high season and to mitigate rider inconvenience when buses malfunction or are delayed. Therefore, we estimate that there should be 25 spaces for intercity buses in the future bus terminal.

Charter/Tours and Sightseeing

The data collection estimated that 15 spaces, 8 active and 7 layover, are currently needed to meet peak demand in the facility. The future demand for tour/charter and sightseeing operations was calculated by combining Metropolitan Washington Council of Governments (MWCOCG) on bus parking needs and Destination DC data on tourism growth in the DC area. The 2015 MWCOCG study identified that the current off-street parking needs for tour/charter buses is 755 spaces and that an additional 305 spaces (for a total of 1060) would be needed to meet future demand in 2025.<sup>19</sup> That would indicate a 40% increase in parking needs by 2025. Historical DC visitor data from Destination DC from 2004 to 2014 indicates an average yearly growth in visitors of 2-3%. A 2 percent yearly growth in charter/tour demand would create a 61% increase in parking needs between 2016 and 2040. Averaging these two projections leads us to a prediction of a 51% growth in charter/tour bus parking needs by 2040 (See Table 2). With an existing 8 spaces actively used for tours and charters and 2 used for sightseeing, it is expected that 14 active spaces would be needed for tours and charters (12 to meet new demand and 2 for operational flexibility) and 4 spaces would be needed for sightseeing (3 to meet demand and 1 for operational flexibility). The total tour/sightseeing demand for active spaces will be 18 slips.

It is worth noting that this sightseeing projection assumes that hop-on, hop-off buses, which presently load and unload passengers from the historic WUS entrance, will not be relocated to the bus terminal.

DC Circulator

<sup>18</sup> Federal Railroad Administration. *NEC Future Tier 1 Draft EIS*. November 2015.

<sup>19</sup> Cambridge Systematics. *Regional Bus Staging, Layover, and Parking Location Study*. Metropolitan Washington Council of Governments. March 7, 2015. Page 57.

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It is expected that DC Circulator will continue to serve Union Station with the same 10-minute frequency it operates on today. It will therefore not require additional capacity. Therefore, 4 active spaces are projected for 2040 use by the Circulator. However, future streetcar service to Georgetown may replace the Circulator line that currently services the station.

### **Conclusion**

With the projected growth in demands on the bus terminal from intercity bus, tour and charter bus, and DC Circulator, the number of needed slips across all continued modes is expected to grow slightly from 45 to 47 over the study period. This projection could be affected by a number of future policy decisions outside the scope of this project. Namely:

- The terminal could adopt a dynamic management approach. This approach employs technology to allocate buses to available spaces based on current demand, as opposed to having particular bus lines permanently assigned to a particular slip. A dynamic approach reduces capacity needs through more efficient use of available bus slips. While there are no bus terminals managed dynamically in the United States, there are examples of this technology currently in operation in the UK and New Zealand.
- The US bus fleet could transition to the longer wheelbase vehicle used in Europe. Doing so would affect the size and turning radii of the buses, requiring adjustments in the sizing of the Terminal's facilities.

The current bus terminal has sufficient capacity to meet the present needs of its various users. Many of the current users, be they box trucks or charter buses, spend extended periods of time in the terminal. On average, total peak use across both intercity and charter buses arrives at around 5 pm, driven by heavy charter traffic, at 28. Intercity bus movements peak around 8 pm at 19. Based on the existing demands on the terminal, we estimate that today 17 total spaces are needed for tour/charter/sightseeing uses and 19 are needed for intercity bus.

Future growth is expected in both the intercity and the tour/charter markets. Based on the projections described above, we expect intercity bus demand to grow by 20% by 2040 and tour/charter/sightseeing demand to grow by 51% by 2040. With that growth and the continued use of the facility by DC Circulator, 47 active spaces will be needed in the future terminal. Therefore, the future terminal should have a similar capacity to today's terminal.

In order to create a more effective terminal in the future, charter/tour bus parking will need to be more effectively managed. The purpose of the terminal is to provide transfers across modes and to offer tourists access to the shops, restaurants, and amenities of historic Union Station. It is not designed as a vehicle storage facility. Strict layover policies—through time limits or pricing—should be established to minimize pressure on the terminal from long-term uses. Use of the terminal should be capped at two hours, the time needed to turn around an intercity bus or take a long stop for a meal. If no hard cap is employed, pricing policies should strongly discourage stays far beyond two hours. This change, along with a potential move to dynamic management, would help to make more efficient use of planned space in the terminal and better achieve the goals of a multimodal hub.