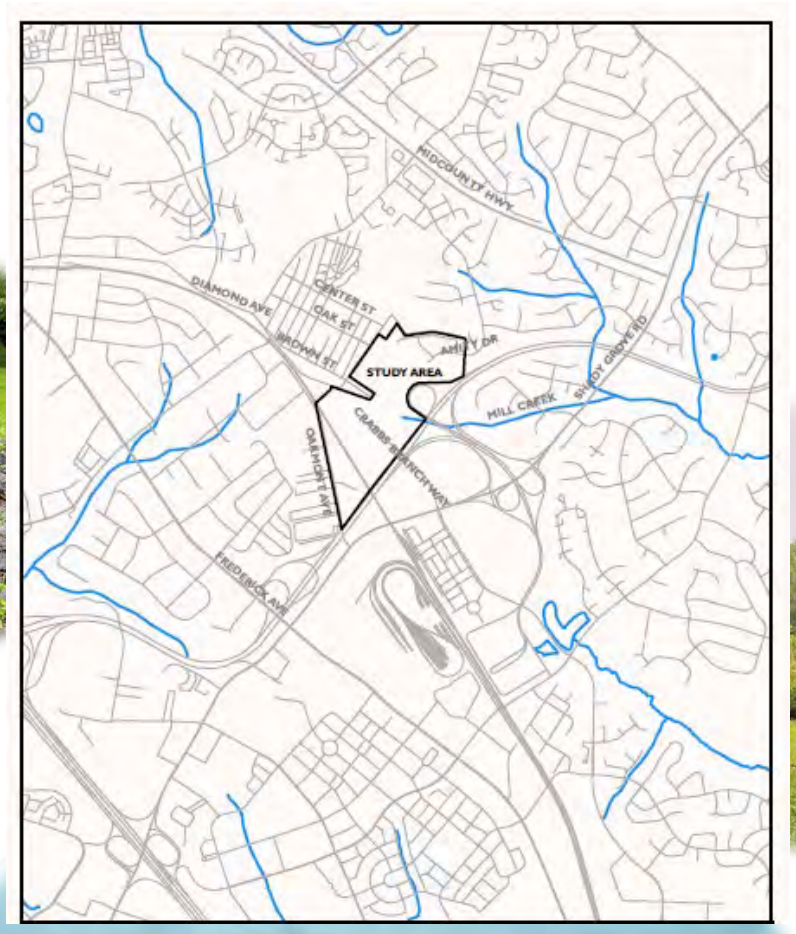
WASHINGTON GROVE CONNECTOR
AND
CRABBS BRANCH WAY EXTENSION

PHASE I FACILITY PLANNING REPORT
MCDOT – DIVISION OF TRANSPORTATION ENGINEERING

October 2022



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1. Executive Summary

The Washington Grove Connector is a master planned bicycle and pedestrian trail connection from Crabbs Branch Way to the Town of Washington Grove and Amity Drive in Montgomery County, Md. The study area is bounded by[i]. The Park is bounded by Ridge Road to the west, residential subdivisions to the north, Crabbs Branch Way to the south, and Route 370 ramps to the east.

The Crabbs Branch Way Extension (to Amity Drive) was identified in the 2006 Shady Grove Sector Master Plan[ii], as a road connection to Amity Drive with an accompanying bicycle and pedestrian path running alongside. This extension would link to the Washington Grove Connector.

The proposed neighborhood connector extension alignment was proposed to run east of Washington Grove Conservation Park and contains sensitive wetlands, forests, and cultural resources. The topography of the site is such that water drains across the site in an easterly direction. Therefore, drainage amenities along the trail or raised wooden trails would be required to prevent ponding of water along the trail. This would result in hydrological impacts to the existing wetland and forest areas. The environmental impacts on the forests, wetland, floodplain and archeological by the proposed trails are quantified Section 4.

Based on community inputs, four trail alignments for the Washington Grove Connector and the Crabbs Branch Way Extension were studied and are presented in this report. These alignments along the western boundary of the park are designed to minimize the environmental impact of the trail project to the forest conservation areas, wetland, and streams, which are detailed under the Trail Alternatives Section in this report.

2. Project Purpose

The purpose of Phase I Feasibility Study is to study potential connection alignments that address community needs for a direct pedestrian and bicycle link between the end of Crabbs Branch Way (on the east) and Town of Washington Grove (on the west), including adjoining communities while minimizing potential impacts to the natural and man-made environment. Also included in this

Report is the Crabbs Branch Way Extension (to Amity Drive) and the corresponding Master Planned Trail Connector that runs parallel to the road.

The layouts of the potential trail connections included in the Report, graphically super imposed on-site plans will guide stakeholders to understand the pros and cons of different alternative alignments.

3. Feasibility Study Overview

Montgomery County Department of Transportation (MCDOT) commenced with a Phase I Facility Planning Study in February 2020 to address community needs for connection between the Town of Washington Grove and residential neighborhoods around Amity Drive Neighborhood Park located west of Shady Grove Road and primarily commercial areas and metro rail transport hub east of shady Grove Road.

After the initial public meeting, the community identified three connections from Crabbs Branch Way to the Town of Washington Grove. These connections included Ridge Road, Railroad Street, and Brown Street. A fourth connection between Picea View Court and Ridge Road was also identified. All of these alignments were analyzed from a cost, environmental impact, and feasibility perspective.

This Report discusses the pros and cons of trail alignments and the potential impacts to existing natural and environmental conditions. The Feasibility study is based upon County GIS mapping and any existing natural and man-made environmental data, including historical and archeological information compiled from available sources. From the project outset “only visual review of the site was performed” during the development of this report.

The limits of the study area are bounded by Amity Drive on the north, Railroad Street/Ridge Road on the west, I-370 ramps on the east, and Crabbs Branch way on the south, which is the beginning point to all connections west and north. Bounded within these limits is the park reserve, the wetlands and streams that need to be considered to attain the trail connections.

As part of the analysis to identify potential viable trail connections, four (4) alternatives were considered, including the alignment depicted in the Master Plan running parallel to the Crabbs Branch Way Extension.

All Trail Connections considered have the following common features:

- Southerly end point is the existing sidewalks on Crabbs Branch Way.
- Paving will either be pervious/impervious asphalt or concrete over the drylands.
- Elevated wooden structure with railings will be used for stream and wetland crossings.
- Clear paved trail width is 10 feet with 2-foot shoulders on each side.
- This project will include pedestrian and bike alignments only. Trailhead design will be included in the final design.
- No improvements are considered at all trails start and end points- Crabbs Branch Way, Ridge Road, Brown Street and Ridge Road/Railroad Street.

This project will analyze four trail options:

- Alignment 1: Crabbs Branch Way to Railroad Street
- Alignment 2- Crabbs Branch Way to Ridge Road
- Alignment 3- Crabbs Branch Way to Brown Street
- Alignment 4- Ridge Road to Picea View Court

4. Trail Connection Options and Impacts

4.1 Alignment #1 - Railroad Street

This connection proceeds north from the starting point at Crabbs Branch Way, crosses an existing stream and wetland within the park reserve. It then heads towards Ridge Road/Railroad Street intersection area along Washington Suburban Sanitary Commission (WSSC) easement (west) located between salt storage area and residential neighborhoods.

Impacts include:

- Stream crossings, including 100-year floodplain- Minimal, one crossing near Crabbs Branch Way and associated Floodplain.
- Forest- Minimal, near the east end of Brown Street.
- Wetlands- none
- Land Acquisition– Significant, this Alignment requires acquisition of property from Robert's Oxygen.
- Unsightly as trail would be located between the salt storage area and residential neighborhoods.

Environmental Impacts of Alignment #1 are listed below: total length of trail = 1,425 feet (approx.)

Impact	Length (LF)	Area (SF)	Remarks
100-year Floodplain	100	1,400	14-foot width, 10-foot plus 2-foot shoulders
Forest	135	3,250	24-foot width to LOD
Wetland	na		none
ROW/Easement	285	3,990	14-foot width

LEGEND

- TRAIL 1B CENTER LINE
- TRAIL 1B SHOULDER LINE
- LOD — TRAIL 1B LIMIT OF DISTURBANCE
- TRAIL 1B AREA
- LIMIT OF STUDY
- WETLAND AREA
- CONSERVATION EASEMENT
- SS — SANITARY SEWER
- PARCEL LINE / ROW
- 500 — CONTOURS

MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION

WASHINGTON CONECTOR /
CRABBS BRANCH WAY
OPTION 1

PROPOSED TRAIL

Date: MARCH 2022 | SCALE : 1" = 100' | SHEET No.

4.2 Alignment #2 - Ridge Road

This connection proceeds north from the starting point at Crabbs Branch Way, and within the park reserve crosses an existing stream and wetland and stays on a northerly alignment past the WSSC easement and a Storm Water Management (SWM) pond (located at the east end of Brown Street). It then makes a sharp turn heading west to its ending point at Ridge Road, behind residential developments located on the north side of Brown Street.

Impacts include:

- Stream crossings, including 100-year floodplain- Minimal, one crossing near Crabbs Branch Way and associated Floodplain.
- Forest- Moderate, near the east end and north of Brown Street.
- Wetlands- none
- Land Acquisition – Moderate, at Town of Washington Grove and Maryland- National Capital Park property north and east of the salt storage area

Environmental impacts of Alignment #2 are listed below: total length of trail = 1,380 feet (approx.)

Impact	Length (LF)	Area (SF)	Remarks
100-year Floodplain	150	2,100	14-foot width, 10-foot plus 2-foot shoulders
Forest	350	4,900	24-foot width to LOD
Wetland	na		none
ROW/Easement	780	10,920	14-foot width


TRAIL 2
BROWN STREET
CHERRY AVENUE
RIDGE ROAD
RAILROAD STREET
PARCEL H
12.01 Ac.
PARCEL B
4.04 Ac.
PARCEL D
4.75 Ac.
OUTLOT A
SAND FILTER
METRO ACCESS
FOREST LINE
EX. WETLAND
100 FLOODPLAIN
25' SSWR EASEMENT L. 2742 F. 595
20' RIGHT OF WAY EASEMENT L. 44330 F. 134
25' SSWR EASEMENT L. 2658 F. 200
FUTURE AMITY DRIVE RIGHT OF WAY
CONSERVATION EASEMENT LINE
CONSERVATION EASEMENT PART 1 L. 43055 F. 468
CONSERVATION EASEMENT PART 2 L. 43055 F. 468
SWM EASEMENT PART 1
SWM EASEMENT PART 2
SWM EASEMENT
STREAM CL
WATER EDGE
CRABBS BRANCH WAY
36"RCP
30"HDPE
15"HDPE
8"X3"RCP
8" S
8" W
10" W
10" PUE
18" S
P660
P747
P743
P850
LEGEND
TRAIL CENTER LINE
TRAIL SHOULDER LINE
LOD
TRAIL LIMIT OF DISTURBANCE
TRAIL AREA
LIMIT OF STUDY
WETLAND AREA
CONSERVATION EASEMENT
SANITARY SEWER
PARCEL LINE / ROW
500
CONTOURS
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONECTOR / CRABBS BRANCH WAY OPTION 2
PROPOSED TRAIL
Date MARCH 2022
1" = 100'

4.3 Alignment #3 - Brown Street

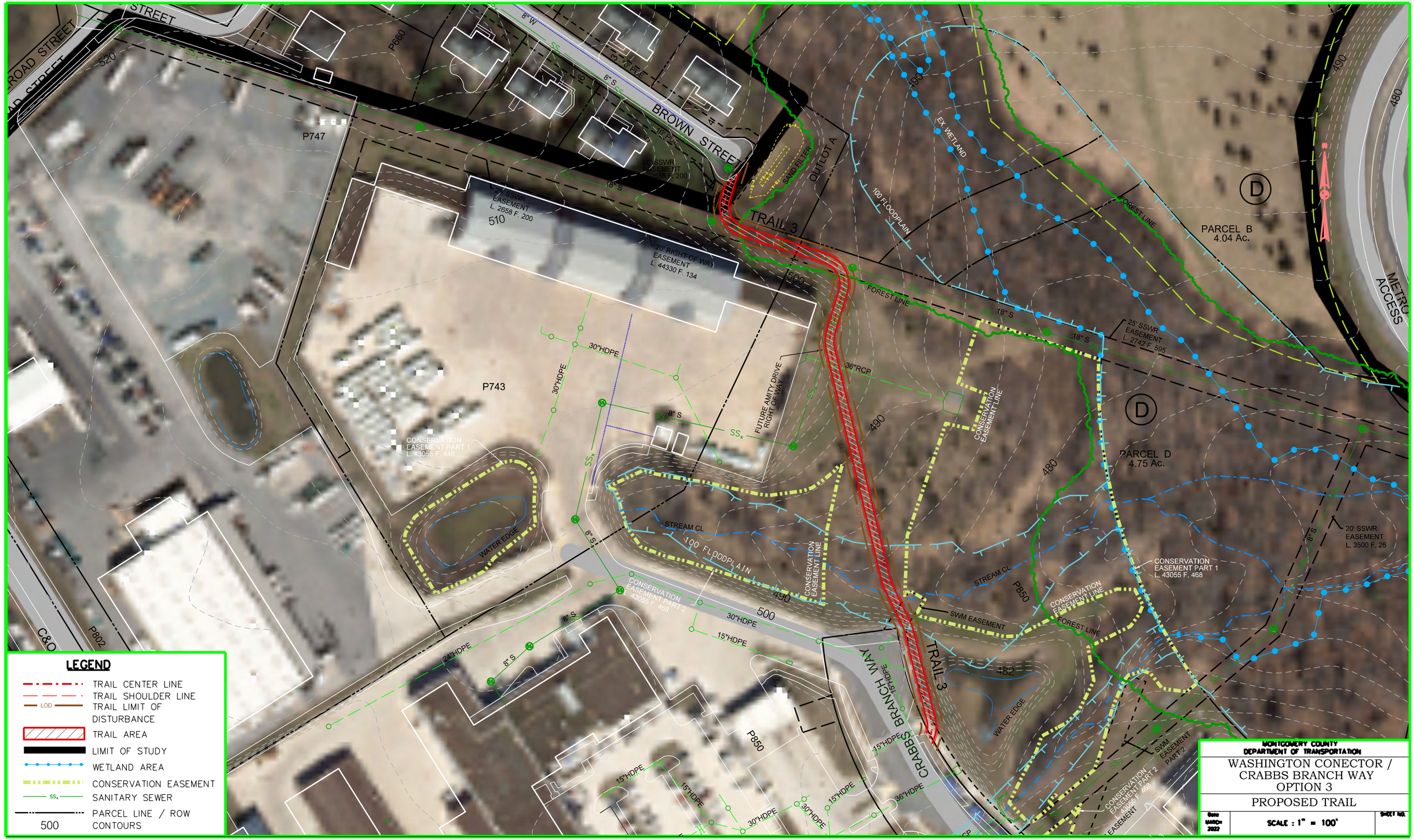
This connection proceeds north from the starting point at Crabbs Branch Way, crosses an existing stream and wetland, and continues north past WSSC easement and then makes a sharp turn west prior to a SWM pond (located at the east end of Brown Street) to its end point at Brown Street.

Impacts include:

- Stream crossings, including 100-year floodplain- Minimal, one crossing near Crabbs Branch Way and associated Floodplain.
- Forest- Minimal, near the east end of Brown Street.
- Wetlands- none
- Land Acquisition – Minimal, at Town of Washington Grove property north of the salt storage area at the end of Brown Street.

The environmental impacts of Alignment #3 are listed below: total length of trail = 750 feet (approx.)

Impact	Length (LF)	Area (SF)	Remarks
100-year Floodplain	100	1,400	14-foot width 10-foot plus 2-foot shoulders
Forest	135	3,240	24-foot width to LOD
Wetland	na		none
ROW/ Easement	40	560	14-foot width 10-foot plus 2-foot shoulders


BROWN STREET
TRAIL 3
OUTLOT A
SAND FILTER
EX. WETLAND
100 FLOODPLAIN
FOREST LINE
PARCEL B
4.04 Ac.
PARCEL D
4.75 Ac.
METRO ACCESS
20' SSWR EASEMENT L. 2658 F. 200
20' RIGHT OF WAY EASEMENT L. 44330 F. 134
25' SSWR EASEMENT L. 2742 F. 595
20' SSWR EASEMENT L. 3500 F. 26
CONSERVATION EASEMENT PART 1 L. 43055 F. 446
CONSERVATION EASEMENT PART 2 L. 43055 F. 468
CONSERVATION EASEMENT LINE
FUTURE AMITY DRIVE RIGHT OF WAY
30"HDPE
36"RCP
24"HDPE
15"HDPE
36"HDPE
STREAM CL
WATER EDGE
SWM EASEMENT
CRABBS BRANCH WAY
P747
P743
P850
P802
C&O
510
500
490
480
482
520
LEGEND
TRAIL CENTER LINE
TRAIL SHOULDER LINE
LOD TRAIL LIMIT OF DISTURBANCE
TRAIL AREA
LIMIT OF STUDY
WETLAND AREA
CONSERVATION EASEMENT
SS SANITARY SEWER
PARCEL LINE / ROW
500 CONTOURS
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONECTOR / CRABBS BRANCH WAY
OPTION 3
PROPOSED TRAIL
Date MARCH 2022
SCALE : 1" = 100'
SHEET No.

4.4 Alignment #4 – Picea View Court Connector

This connection proceeds north from the starting point at Picea View Court/Castanea Lane sidewalk crossing Picea View Court to the sidewalk to the north.

Impacts include

- Stream crossings and Floodplain- none
- Forest- none
- Wetlands- none
- Land Acquisition – minimal, at Shady Grove Crossing HOA property between Picea View Court and Ridge Road.

Approximate length of trail = 130 feet.

Impact	Length (LF)	Area (SF)	Remarks
100-year Floodplain	na		
Forest	na		
Wetland	na		
ROW/ Easement	85	1,190	14-foot width 10-foot plus 2-foot shoulders


RIDGE ROAD
TRAIL CONNECTOR
CROSS WALK
PICEA VIEW COURT
CASTANEA LANE
AMITY DRIVE
PARCEL A
PARCEL B
PARCEL C
PARCEL D
PARCEL E
PARCEL F
2.21 Ac.
0.23 Ac.
ENVIRONMENTAL BUFFER
EX. WETLAND
FOREST LINE
STORMWATER MANAGEMENT EASEMENT
MCSF A
MCSF B
490
480
LEGEND
TRAIL CENTER LINE
TRAIL SHOULDER LINE
LOD
TRAIL LIMIT OF DISTURBANCE
TRAIL AREA
LIMIT OF STUDY
WETLAND AREA
CONSERVATION EASEMENT
SANITARY SEWER
PARCEL LINE / ROW
500
CONTOURS
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONECTOR / CRABBS BRANCH WAY
PICEA RIDGE CONNECTOR
Date MARCH 2022
SCALE: 1" = 100'
1 of 1

5. Crabbs Branch Way Extension

5.1 Crabbs Branch Way Extension

Under the Master Planned Road connection, a two-lane extension will be provided from Crabbs Branch Way to Amity Drive. The road will assume 2-10.5-foot-wide lanes with 6-foot buffers, a 10-foot bike path and 6-foot sidewalk.

The Crabbs Branch Way Extension connection proceeds north from the starting point at Crabbs Branch Way, crosses an existing stream and wetland, and continues north past WSSC easement and continues north to Amity Drive.

Impacts include

- Stream crossings- Minimal, two crossings (one near Crabbs Branch Way and one near Amity Drive).
- Environmental Buffer- Moderate, at end of Amity Drive
- Floodplain- Significant, 2 areas along the road length
- Forest- Moderate, 2 areas along the road length
- Wetlands- Moderate, one wetland crossing approximately 75 feet long x 50 feet wide
- Land Acquisition – Significant, at Town of Washington Grove and Maryland- National Capital Park property between Crabbs Branch Way and Amity Drive and the trail to Brown Street.

The environmental impacts of Crabbs Branch Way Extension are listed below: total length of trail = 1,650 feet (approx.)

Impact	Length (LF)	Area (SF)	Remarks
100-year Floodplain	350	17,500	50-foot width, 2ea-10.5ft lanes with 2ea-6ft buffers, 10ft bike lane and 6ft sidewalk
Environmental Buffer	270	13,500	50-foot width
Forest	475	35,625	75-foot width to LOD
Wetland	75	3,750	50-foot width
ROW/ Easement	1,230	61,500	50-foot width + 14-foot trail

RAILROAD STREET
RIDGE ROAD
BROWN STREET
PARCEL H
12.01 Ac.
PARCEL C
7.68 Ac.
PARCEL A
5.74 Ac.
PARCEL F
2.21 Ac.
PARCEL E
PARCEL B
PICEA VIEW COURT
CASTANEA LANE
AMITY DRIVE
PARCEL A
PARCEL B
PARCEL C
4.28 Ac.
PARCEL D
4.54 Ac.
CRABBS BRANCH WAY EXTENSION
CRABBS BRANCH WAY
OSX TRANSFORMATION
WATER LODGE
STREAM
WETLANDS
30AM EASEMENT PART 1
30AM EASEMENT PART 2
MARYLAND STATE ROUTE 200
P920
P741
P743
P930
P936
P938

LEGEND

- TRAIL AREA
- ROADWAY AREA
- SIDEWALK AREA
- LIMIT OF DISTURBANCE
- WETLAND AREA
- CONSERVATION EASEMENT
- SANITARY SEWER
- PARCEL LINE / ROW
- CONTOURS

MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION

CRABBS BRANCH TO AMITY DR
ROADWAY_TRAIL TO WASHINGTON
GROVE CONNECTION - VICINITY

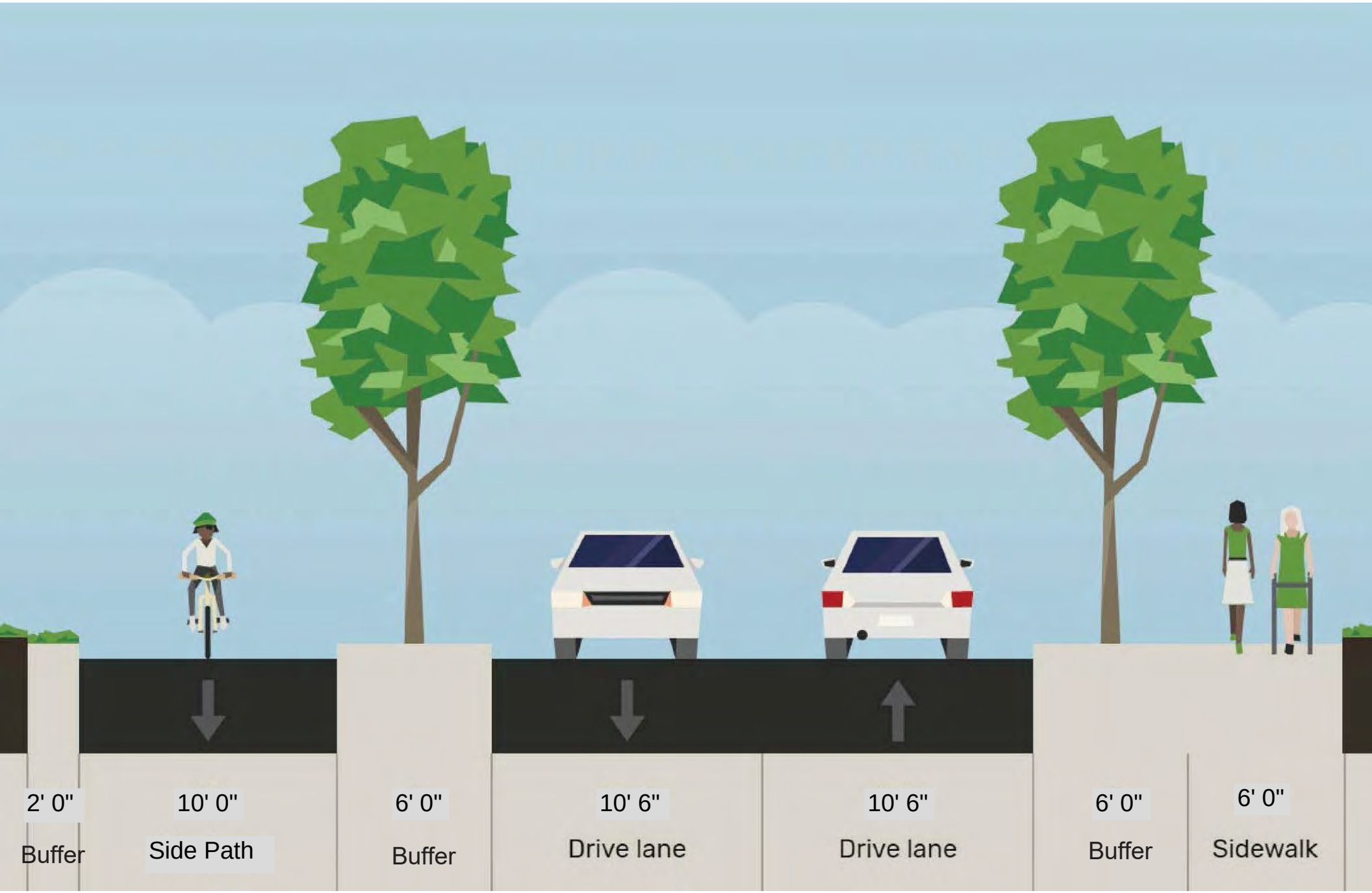
PROPOSED TRAIL

Date
JUNE
2022

SCALE : 1" = 200'

SHEET No.

Road and Trails Cross Section



5.2 Crabbs Branch Way Trail

Under the Master Plan Option, trail connections will be provided from Crabbs Branch Way to Amity Drive.

The Crabbs Branch Way to Amity Drive trail will run parallel to the Crabbs Branch Way Extension. This trail alignment could be constructed prior to the construction of the Crabbs Branch Way Connector.

Impacts include

- Stream crossings- Minimal, two crossings (one near Crabbs Branch Way and one near Amity Drive).
- Environmental Buffer- Minimal, at end of Amity Drive
- Floodplain- Minimal, 2 areas along the road length
- Forest- Moderate, 2 areas along the road length
- Wetlands- Minimal, one wetlands crossing approximately 75 feet long x 15 feet wide
- Land Acquisition – Significant, at Town of Washington Grove and Maryland- National Capital Park property between Crabbs Branch Way and Amity Drive and the trail to Brown Street.
- The environmental impacts of Crabbs Branch Way Extension are listed below: total length of trail = 1,650 feet (approx.)

Impact	Length (LF)	Area (SF)	Remarks
100-year Floodplain	350	4,900	14-foot width 10-foot plus 2-foot shoulders
Environmental Buffer	135	1,890	14-foot width to LOD
Forest	475	11,400	24-foot width to LOD
Wetland	75	1,050	14-foot width
ROW/ Easement	1,230	17,220	14-foot width

RAILROAD STREET
RIDGE ROAD
BROWN STREET
PICEA VIEW COURT
CASTANEA LANE
AMITY DRIVE
MARYLAND STATE ROUTE 200
CRABBS BRANCH WAY
NORTH SPUR OF CSX
PARCEL H 12.01 Ac.
PARCEL A 5.74 Ac.
PARCEL B 4.54 Ac.
PARCEL C 4.28 Ac.
PARCEL F 2.21 Ac.
PARCEL C 7.68 Ac.
PARCEL D 2.89 Ac.
PARCEL A
PARCEL B
PARCEL C
PARCEL D
PARCEL E
PARCEL F
PARCEL G
PARCEL H
P741
P743
P590
P938
WATER EDGE
STREAM CL
WETLAND
WETLAND BUFFER
SWM EASEMENT PART 1
SWM EASEMENT PART 2
SWM EASEMENT 3,927 SF
CONSERVATION EASEMENT 1,000 SF
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370

LEGEND

- TRAIL AREA
- LIMIT OF DISTURBANCE
- WETLAND AREA
- CONSERVATION EASEMENT
- SANITARY SEWER
- PARCEL LINE / ROW
- CONTOURS

MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION

CRABBS BRANCH TO AMITY DR
TRAIL TO WASHINGTON
GROVE CONNECTION - VICINITY

PROPOSED TRAIL

Date JUNE 2022 | SCALE : 1" = 200' | SHEET NO.

6. Natural Environmental Features

6.1 Groundwater and Soils

The Groundwater Atlas of the United States, Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, Wester Virginia (USGS, 1997) indicates the geology of the study area is located within the Piedmont Physiographic Province, which is underlain by dense, highly impermeable bedrock. The topography is comprised of low, rolling hills and subdued topography. The impermeable bedrock is crystalline rock and undifferentiated sedimentary-rock aquifers. Recharge within the with Piedmont Province takes place primarily in interstream areas via precipitation and moves laterally and discharges to a stream or depression [ii].

Soil information in the study area was collected from the USDA Web Soil Survey and is indicated on the Soils Map (Figure 3). Nine different soil types were identified within the study area:

Table 1: Soil Types

Soil Type	Percent Slope
Gaila silt loam (1B)	3 to 8 percent slopes
Gaila silt loam (1C)	8 to 15 percent slopes
Glenelg silt loam (2B)	3 to 8 percent slopes
Baile silt loam (6A)	0 to 3 percent slopes
Neshaminy silt loam (27B)	3 to 8 percent slopes
Chrome and Conowingo soils (35B)	3 to 8 percent slopes
Travilah silt loam (37B)	3 to 8 percent slopes
Wheaton-Urban land complex (66UB)	0 to 8 percent slopes
Urban land (400)	NA

The majority of the study area is comprised of 2A - Glenelg silt loam, 3 to 8 percent slopes (2B). The wetland areas are primarily characterized as 6A - Baile silt loam, 0 to 3 percent slopes (6A). The Gaila silt loam and the Wheaton-Urban land complex soils are listed as hydric soils per the "Hydric Soils of the United States [iii]." Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Most the soils in the study area are well draining with the exception of the urban land soils in the southern portion of the study area.

6.2 Watersheds and Wetlands

The study area drains to an unnamed tributary of Mill Creek. Mill Creek is located within the Upper Rock Creek sub-watershed which flows into Rock Creek and eventually into the Potomac River. The entire study area is located within the Mill Creek watershed which is identified as a Class Use IV - Recreational Trout Waters [iv].

The station at Mill Creek was sampled in 2012 by Montgomery County and was observed to be in Fair Condition. Fair condition watersheds are impacted by androgenic stressors and major agricultural development. The streams still support biological communities and are comprised of species which can survive most conditions. However, sensitive species are less common due to the high anthropogenic impacts [v]. Wetlands designated by Maryland DNR are located within the study area. Unnamed tributaries run easterly across the park reserve with additional wetland areas designated along the northern boundary of the park (see Environmental Feature Map - Figure 4).

Potential habitat for Forest Interior Dwelling Species (FIDS) exists within the conservation area. These areas have not been field test or field verified. The area is designated for the purposes of planning and analysis only. FIDS require habitat conditions in the interior of forests for optimal reproduction and survival [vi]. The same area is designated as Tier 5 – Significant for Biodiversity Conservation under BioNet which is a digital map tool developed for prioritizing areas for terrestrial and freshwater biodiversity conservation. Tier 5 BioNet areas are significant to conserve for maintenance of habitat according to Maryland Department of Natural Resources website.ii No known sensitive species have been identified within the study area.

6.3 Floodplains

The one hundred floodplain is mapped at the site according to a Natural Resources Inventory and Forest Stand Delineation conducted in 2001 for the Piedmont Crossing Development plans. The 100-year floodplain is not mapped by FEMA nor is it recorded on the County plats. However, the FSD report from the Piedmont Crossing development plans states disturbance to this area would require joint permitting through the US Army Corp of Engineers and MD DNR. Impact to the floodplain for the proposed alternatives has been minimized to maximum extent possible.

6.4 Forests and Parks

The forests within the parks are Category 1 easements which are considered the most protective easement type which prohibits clearing of any tree, bush, or vegetation. A forest stand delineation was conducted in 2001 as part of the development approvals for the northern subdivision development at Piedmont Crossing which was formerly known as the Casey Property at Mill Creek. The report indicates there are 6 forest stands, totaling 29.21 acres. The FSD found there are some stands of high quality due to the age, species diversity, large caliper trees, moderately steep slopes, and location adjacency to stream and wetlands. It was recommended that these areas be preserved. The other forest stands were of low priority however still provide benefit to wildlife habitat.

The Forest Conservation Easement and Parks Map (Figure 6) indicates the areas of Washington Grove Conservation Park and Piedmont Crossing that are dedicated as parks and forest conservation. Washington Grove Conservation Park was deeded to the Town of Washington Grove in 2010. The municipal limits to the town could include the open space in the future [viii]. It is categorized as Legacy Open Space (LOS) – Natural Area and contains 12.0112 acres of land [ix]. The Park meadow is currently maintained by the M-NCPPC.

Piedmont Crossing Local Park was also deeded to MNCPPC in 2010. The county mapped forest conservation areas and park area exclude portions of the formerly proposed right-of-way for the Amity Drive – Crabbs Branch Way Extension within the Piedmont Crossing Local Park as indicated in the Forest Conservation and Parks Map.

There are several trails mapped within the Washington Grove Conservation Park and the Piedmont Crossing Local Park. These trails are mapped under the Park Information data set of the Montgomery County Atlas website (see Appendix 15.24).

7. Historical and Cultural Resources

Located adjacent to the Washington Grove Conservation Park is Washington Grove Historic District, a 200-acre incorporated town within its own forest preserve. The woodlands consist of two tracts East Woods and West Woods which are 45 acres and 47 acres respectively [x]. The town served as a religious camp retreat for several Methodist Church retreats in the 1870s and is recognized for its cottage style architecture and well-guarded forest landscape [xi]. A portion of the property of the Washington Grove Conservation Park meets the Heritage Resources criteria due to its importance as a rural setting for the Town of Washington Grove. 13 acres of meadow were dedicated as a "Heritage Resource" to the 2001 M-NCPPC Legacy Open Space Master Plan [xii].

No known cultural or historical resources are mapped within the study area. According to a presentation given by M-NCPPC in 2012 on park planning for the WGCP however, a prehistoric steatite mine located within the park may have historical significance. The M-NCPPC recommended queuing the site for researching archeological artifacts of the mine. However, it is unknown if the research had been conducted since then as there are no mapped historical resources within the park. (See Appendices: 15.25 Montgomery County Parks, Preliminary Archeological Review Form,15.26 Land Acquisition Agreement Deed, 15.27 Town Washington Grove, Historic Preservation Report by Robinson & Associates, Inc., and 15.28 National Registration of Historic Places Form)

8. Archeological Resources

Part of the project site, particularly the area located from Picea View Court on the west to I-370 ramps on the east and extending 200 feet to the south Amity Drive is located potentially within a High Potential Prehistoric Zone.

This area primarily impacts the Master Plan Alignment connecting with Amity Drive. However, it is recommended that archaeological testing needs to be conducted during the next phase of study, Facility Planning Phase II to establish impacts from the preferred alternatives connecting Crabbs Branch Way with Ridge Road, Rail Road Street Brown Street. (See Appendix:15.25 Montgomery County Parks, Preliminary Archeological Review Form)

9. Land Use

The study area is comprised of three areas zoned as Moderate Industrial (IM), Employment Office (EOF), and Residential (R-90) (see Zoning and Land Use Maps – Figure 5 and Figure 6). Subdivisions with residential lots are located to the north, east and west. Interstate 370 is located along the southern boundary of the study area. The area within the Washington Grove Conservation Park (WGCP) and Piedmont Crossing is also zoned as Residential. The Moderate Industrial zoning area is comprised of auto dealership services, warehouses and building supplies [xiii]. The adjacent Employment Office zone includes an operations facility for the Maryland Transportation Authority.

TABLE 2: ZONING TYPES IN STUDY AREA

Zoning Type	Description
Moderate Industrial (IM)	The IM zone is intended to provide land for industrial activities where major transportation links are not typically necessary and noise, dust, vibration, glare, odors, and other adverse environmental impacts are usually minimal.
Employment Office (EOF-0.5 and EOF-0.75)	The EOF zone is intended for office and employment activity combined with limited residential and neighborhood commercial uses. Building
Residential (R-90)	The R-90 Zone results in medium density residential neighborhoods. Properties zoned R-90 are typically found in down-County areas away from transportation hubs.

The study area is comprised of a variety of land uses including single family attached and single-family detached homes, open space and recreation at the Amity Drive neighborhood, and research and development, retail, offices, and warehouses in the industrial area. The MTA properties are mapped as vacant currently according to the MCATLAS website.

10. Utilities

The study area in proximity to the proposed trails contains several underground utilities including sewer and water. An 18-inch sanitary sewer runs west to east along the northern boundary of the Maryland Transportation Authority property adjacent to the Brown Street subdivision. A 25-foot county owned easement also exists for the sanity sewer. Brown Street includes a water sewer line as well as a stormwater sand filter. The sand filter is located at the east end of Brown Street. The Maryland Transportation Authority property includes a variety of underground stormwater detention and Contech CDS systems, and Storm Filter systems in the right of way along Crabbs Branch Way.[iii] No other known utilities were identified in the area of the Project.

11. Traffic Analysis

11.1 Introduction

This report documents the traffic analysis and findings for the proposed Crabbs Branch Way Extension, a road connecting Crabbs Branch Way to Amity Drive, south of Washington Grove, Maryland. The Crabbs Branch Way Extension between Crabbs Branch Way and Amity Drive is master planned as a Primary Residential Street in the Master Plan of Highways and Transitways. This planned connection was included in the 2006 Shady Grove Sector Plan and has been continued as a recommendation in the recent Minor Master Plan Amendment. The planned street is classified as Primary Residential. Access to the proposed roadway extension would be through Amity Drive in the north and Crabbs Branch Way to the south. The general site plan of the proposed extension is shown in Appendix 15.3 (Exhibit 1). For this study, the Existing conditions

are based on year 2021 traffic volumes. The design year for the Crabbs Branch Way Extension is 2040; therefore, the traffic analysis for the future year conditions are based on projected year 2040 volumes. Intersection capacity was analyzed using the Highway Capacity Analysis (HCM) method.

The study scope, methodologies, and parameters were established with the representatives of Montgomery County Department of Transportation (MCDOT).

11.2 Existing Conditions

11.2.1 Analysis of Existing Conditions

The study area consists of Washington Grove Lane to the northwest, Midcounty Highway to the northeast, Shady Grove Road to south and Oakmont Avenue to west. Washington Grove Lane is a two-lane undivided roadway and classified as Urban Minor Arterial, in the vicinity of the study area. Midcounty Highway is a four-lane divided highway and classified as Urban Principal Arterial Other, in the vicinity of the study area. Shady Grove Road is a six-lane divided highway and classified as Urban Principal Arterial Other, in the vicinity of the study area. Oakmont Avenue is a two-lane undivided roadway and classified as Urban Local, in the vicinity of the study area. Amity Drive is a two-lane undivided roadway and classified as Primary Residential.

The study area intersections and existing lane configurations are shown in Appendix 15.4 (Exhibit 2). Turning movements counts were conducted at the following locations during the AM and PM peak periods:

1. Midcounty Highway and Shady Grove Road
2. Shady Grove Road and Tupelo Drive
3. Shady Grove Road and Crabbs Branch Way
4. Shady Grove Road and Oakmont Avenue
5. Amity Drive and Epsilon Drive
6. Midcounty Highway and Washington Grove Lane
7. Amity Drive and Washington Grove Lane
8. Washington Grove Lane and Railroad Street

All intersections are signalized except two. The two unsignalized intersections are Amity Drive at Epsilon Drive and Amity Drive at Washington Grove Lane. Vehicle turning movement counts were conducted on Thursday, June 3rd, 2021, at the study intersections from 6:00 to 9:00 AM and from 3:30 to 6:30 PM. The traffic counts consisted of four vehicles classes, automobiles, buses, single unit trucks and trailers. The traffic counts also captured bicycles and pedestrians using the roadway facility. The data was analyzed to develop AM and PM peak hours. The traffic count data is included in Appendix 15.19 (Appendix A). The AM and PM peak hour traffic volumes are shown in Appendix 15.4 (Exhibit 2). Traffic data was also collected on Amity Drive, south of Epsilon Drive on June 28th and June 29th 2022, to verify data from 2021 was reasonably close to the existing traffic conditions. This data was used to compute the K-Factor for Amity Drive and to estimate the ADT. Table 1 below shows the AM and PM Peak hour data matches reasonably well with June 2021 counts. Synchro model for the study area was developed that included the existing signal timing and phasing information from Montgomery County Department of Transportation (MCDOT).

Table 1: Spot Check Comparison of Traffic Counts on Amity Drive

NB			
Time Period	6/3/2021	6/28/2022	6/29/2022
AM Peak Period	66	56	56
PM Peak Period	47	60	57
SB			
AM Peak Period	22	15	16
PM Peak Period	84	87	79

11.2.2 Intersection Level of Service Standards and Thresholds

This section presents the methodologies used to perform peak hour intersection capacity analysis for signalized and unsignalized intersections.

The signalized intersections were analyzed using the Highway Capacity Manual 2000 (HCM) with Synchro 11 software package. This allowed for analyzing intersections with non-standard National Electrical Manufacturing Association (NEMA) phasing using operational analysis procedure outlined in the 2000 HCM. This method defines Level of Service (LOS) in terms of delay (average stopped delay per vehicle). This technique uses 1,900 vehicles per hour per lane (VPHPL) as the maximum saturation volume of an intersection. This saturation volume is adjusted to account of lane width, on-street parking, pedestrians, traffic composition (truck percentage), and shared lane movements. The level of service thresholds used for this method are shown in Appendix 15.5 (Exhibit 3).

Unsignalized intersections were analyzed using the HCM 2000 unsignalized intersection methodology with Synchro 11 software package. The LOS for a two-way stop controlled (TWSC) intersection is determined by the computed or measured control delay and is defined for each minor movement. Appendix 15.5 (Exhibit 3) summarizes the level of service thresholds utilized for unsignalized intersection analysis.

11.2.3 Capacity and Queue Analysis

The traffic data were analyzed using the method contained in the Highway Capacity Manual 2000 (HCM) with Synchro 11 software package. Synchro analyzes each of the intersections and estimates how each intersection would operate for the given conditions. The turning-movement data (automobiles, heavy vehicle percentages) and geometrics (lane configuration, storage length, gradient, speed limit etc.) of each intersection are coded into the software to make this determination. The existing heavy truck percentages for individual movements at study intersections are shown in the Synchro output sheets in Appendix 15.20 (Appendix B).

They range between 0% and 18%, and slightly higher for low volume movements. Single unit trucks or trailers were not observed on Amity Drive during the AM and PM peak hours. It is assumed that the extension road will carry similar mix of vehicles as seen on Amity Drive. Based on the input data, the Level of service (LOS), average vehicle delay, and length of the queue on each approach can be estimated. The existing operational analysis results (levels of service, delay and 95th percentile queues) are presented in Appendix 15.20 (Appendix B). The overall delay and level of service (LOS) information for the eight study intersections are summarized in Table 2. The LOS and delay information by individual movements for the eight intersections are summarized in Appendix 15.6 (Exhibit 4). The results of the Existing Conditions intersection capacity analysis are as follows:

Table 2: Existing Conditions Overall Intersection Level of Service (LOS) and Delays

INTERSECTION	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
1. Midcounty Hwy & Shady Grove Rd	C	32.4	C	28.4
2. Shady Grove Rd & Tupelo Dr	B	16.3	B	15.7
3. Shady Grove Rd & Crabbs Branch Way	C	31.0	D	46.7
4. Shady Grove Rd & Oakmont Ave	C	29.4	D	36.9
5. Amity Drive & Epsilon Drive	A	7.4	A	7.6
6. Midcounty Hwy & Washington Grove Ln	D	36.5	D	36.3
7. Amity Drive & Washington Grove Lane	A	3.7	A	4.5
8. Washington Grove La & Railroad St	B	13.9	B	16.8

Approach Level of Service:

Midcounty Highway & Shady Grove Road: All approaches are currently operating at LOS D or better during the AM and PM peak hour, except the northbound left turn movement which is currently operating at LOS F during the AM peak hour.

Shady Grove Road & Tupelo Drive: The eastbound approach is currently operating at LOS F during the AM peak hour and LOS E during the PM peak hour. The westbound approach is currently operating at LOS E during the AM and PM peak hours. The eastbound right and southbound left turn movements are operating at LOS F during the AM peak hour. All other approaches are currently operating at LOS B or better during the AM and PM peak hour.

Shady Grove Road & Crabbs Branch Way: The northbound and southbound approaches are currently operating at LOS E for both the AM and PM peak hours. All other approaches are operating at LOS D or better during the AM and PM peak hour.

Shady Grove Road & Oakmont Avenue: The northbound approach is currently operating at LOS E for both the AM and PM peak hours. All other approaches are operating at LOS D or better during the AM and PM peak hour.

Amity Drive & Epsilon Drive: All the approaches are currently operating at LOS A for both the AM and PM peak hours.

Midcounty Highway & Washington Grove Lane: The northbound approach is currently operating at LOS E for both the AM and PM peak hours. All other approaches are operating at LOS D or better during the AM and PM peak hour.

Amity Drive & Washington Grove Lane: All the approaches are currently operating at LOS C for both the AM and PM peak hours.

Washington Grove Lane & Railroad Street: All the approaches are currently operating at LOS C for both the AM and PM peak hours.

Appendix 15.6 (Exhibit 4) also summarizes the 95th percentile queues at study intersections. The signalized intersection results are reported using the synchro model, while the stop-controlled intersection results are reported HCM 2010. The 95th percentile queue is typically defined as the maximum back of queue with 95th percentile traffic volumes.

The 95th percentile queue lengths do not exceed the available storage lengths at all intersections, except for intersection of Shady Grove Road and Crabbs Branch Way. At this intersection, the 95th percentile queue exceeds the available storage length for the southbound and westbound left turn lanes during the PM peak hour.

11.3 2040 Total Conditions

11.3.1 2040 Traffic Forecast

The generalized traffic projection methodology for the analysis year 2040 is described in this section. The historical Annual Average Daily Traffic (AADT) volumes on area roadways were downloaded from the State Highway Administration's (SHA) Internet Traffic Monitoring System (I-TMS) and is shown in Appendix 15.7 (Exhibit 5). Growth rate and average k-factor were computed from this data and is shown in Table 3 below. The average growth rate for all roadways is about 0.23% for years between 2012 and 2018. The traffic data for the post COVID recovery year 2021 was not considered for computation purposes because the volumes were lower than 2018 volumes.

Table 3: Growth Rate and K-factor on Area Roadways

SHA Count Locations	Growth (2012-2018)	Average K-factor
SHADY GROVE RD-.20 MI S OF MIDCOUNTY HWY	0.30%	8.33
CRABBS BRANCH WAY - .05 MILE NORTH OF SHADY GROVE RD	--	8.01
CRABBS BRANCH WAY - .10 MI SOUTH OF SHADY GROVE RD	0.46%	8.41
SHADY GROVE RD-.10 MI N OF MD355	-3.45%	7.65
MIDCOUNTY HWY-.10 MI S OF WASHINGTON GROVE LA	0.99%	9.10
WASHINGTON GROVE LA - BETWEEN AMITY DR & MIDCOUNTY HWY	0.86%	8.79
RAILROAD ST - BETWEEN E DIAMOND AVE & HICKORY RD	0.92%	9.02
E DIAMOND AVE - .10 MI WEST OF RAILROAD ST	1.52%	8.80

The year 2040 traffic volume projections on area roadways were obtained from Maryland-National Capital Park and Planning Commission (M-NCPPC) which were based on the Metropolitan Washington Council of Governments (MWCOG) Regional Travel Demand Model using Round 9.1 Cooperative Land Use Forecasts. The 2040 model network incorporates growth in the area, planned roadway configurations, employment data and other variables. The model output is included in Appendix 15.21 (Appendix C).

Table 4 shows the comparison of Average Daily Traffic volumes for the year 2016 and year 2040. The model output indicate that the volumes will drop on Shady Grove Road and Midcounty Highway by the year 2040.There are several factors for lower volumes in the year 2040. Some of them are as follows: Crabbs Branch Way Extension, network updates in 2040 which significantly reduces the free flow speeds on some of the roadways as desired by the planning board, change to free flow speed on Shady Grove Road from 50 miles per hour to 35 miles per hour between Crabbs Branch Way and Midcounty Highway, change to free flow speed on Crabbs Branch Way between Shady Grove Road and Indianola Drive from 35 miles per hour to 25 miles per hour, consistent with Vision Zero Principles and the Geographic Location (Urban Road Code),incorporating centroid connectors in Metro Station Policy Area to reduce travel time to metro, revised land use data in the 2040 model, the model assumes all Bus Rapid Transit Lines within the Constrained Long-Range Plan (CLRP) exist by 2040, including: Veirs Mill Transitway, MD 355 Transitway (north and south segments), North Bethesda Transitway, Randolph Road Transitway, US 29 Transitway, MD 650 Transitway etc.

Table 4: M-NCPPC ADT Comparison (2016 – 2040)

INTERSECTIONS		M-NCPPC ADT (2016)			
		East Leg	West Leg	North Leg	South Leg
#1	Midcounty Hwy & Shady Grove Rd		31,354	40,033	45,970
#2	Shady Grove Rd & Tupelo Dr				
#3	Shady Grove Rd & Crabbs Branch Way	23,074	22,914		5,768
#4	Shady Grove Rd & Oakmont Ave				
#5	Amity Drive & Epsilon Drive				
#6	Midcounty Hwy & Washington Grove Ln				
#7	Amity Drive & Washington Grove Lane		11,941		
#8	Washington Grove La & Railroad St	11,289			
INTERSECTIONS		M-NCPPC ADT(2040)			
		East Leg	West Leg	North Leg	South Leg
#1	Midcounty Hwy & Shady Grove Rd		28,895	35,659	36,951
#2	Shady Grove Rd & Tupelo Dr				
#3	Shady Grove Rd & Crabbs Branch Way	12,122	21,612		4,242
#4	Shady Grove Rd & Oakmont Ave				
#5	Amity Drive & Epsilon Drive			9,732	

#6	Midcounty Hwy & Washington Grove Ln				
#7	Amity Drive & Washington Grove Lane		12,773		
#8	Washington Grove La & Railroad St	12,158			
INTERSECTIONS		Growth Rate (2016 - 2040)			
		East Leg	West Leg	North Leg	South Leg
#1	Midcounty Hwy & Shady Grove Rd		-0.43%	-0.61%	-1.14%
#2	Shady Grove Rd & Tupelo Dr				
#3	Shady Grove Rd & Crabbs Branch Way	-3.33%	-0.31%		-1.60%
#4	Shady Grove Rd & Oakmont Ave				
#5	Amity Drive & Epsilon Drive				
#6	Midcounty Hwy & Washington Grove Ln				
#7	Amity Drive & Washington Grove Lane		0.36%		
#8	Washington Grove La & Railroad St	0.39%			

The average historical growth rate based on SHA data for study area roadways is about 0.23% per year between 2012 and 2018. On an average, the Montgomery County model resulted in -0.83% per year negative growth for the roadway links in the study area. For this study, it was therefore conservatively assumed that the traffic in the area will increase at 1% per year between 2021 and 2040. K-factors computed from MDSHA data and traffic counts done by MCV on Amity Drive was used with bi-directional PM peak hour volumes to develop the ADT for the year 2021. The volumes were grown at 1% between the years 2021 and 2040 to obtain ADT for the year 2040. The k-factor and ADT data for the years 2021 and 2040 are shown in Appendix 15.8 (Exhibit 6).

11.3.2 No-Build Condition

This scenario analyzes traffic conditions at area intersections without the Crabbs Branch Way Extension for the year 2040. The 2040 ADT was used to estimate turning movement volumes based on the existing count patterns and directional distribution of traffic during peak hours. The growth in traffic volumes on study area intersections are shown in Appendix 15.9 (Exhibit 7). The 2040 traffic volumes for the study area intersections are shown Appendix 15.10 (Exhibit 8). The same methodology was adopted as in the existing conditions to estimate roadway capacity, delays, and queues using the HCM methodologies and Synchro model. The Peak Hour Factor (PHF) that was higher of 0.92 or the existing PHF was used for the 2040 analysis. The 2040 No-Build Conditions operational analysis results (levels of service, delay and 95th percentile queues) are presented in Appendix 15.22 (Appendix D). The level of service (LOS) information for the eight study intersections are summarized in Table 5. The LOS and delay information by individual movements for the eight intersections are summarized in Appendix 15.11 (Exhibit 9). The results of the 2040 No-build Conditions intersection capacity analyses are as follows:

Table 5: 2040 No-Build Conditions Overall Intersection LOS and Delays

INTERSECTION	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
1. Midcounty Hwy & Shady Grove Rd	D	41.8	C	31.3
2. Shady Grove Rd & Tupelo Dr	B	18.6	B	16.2
3. Shady Grove Rd & Crabbs Branch Way	C	33.7	E	56.0
4. Shady Grove Rd & Oakmont Ave	C	34.1	C	34.6
5. Amity Drive & Epsilon Drive	A	7.5	A	7.6
6. Midcounty Hwy & Washington Grove Ln	D	37.3	D	37.4
7. Amity Drive & Washington Grove Lane	A	3.2	A	4.2
8. Washington Grove La & Railroad St	B	13.7	B	17.8

Approach Level of Service:

Midcounty Hwy & Shady Grove Road: All approaches are projected to operate at LOS D or better during the AM and PM peak hour, except the northbound left turn movement which is projected to continue operating at LOS F during the AM peak hour.

Shady Grove Road & Tupelo Drive: The eastbound approach is projected to continue operating at LOS F during the AM peak hour and LOS E during the PM peak hour. The westbound approach is projected to continue operating at LOS E during the AM and PM peak hours. The eastbound right and southbound left turn movements are projected to continue operating at LOS F during the AM peak hour. All other approaches are projected to continue operating at LOS B or better during the AM and PM peak hour.

Shady Grove Road & Crabbs Branch Way: The northbound and southbound approaches are projected to continue operating at LOS E for both the AM and PM peak hours. The eastbound approach is projected to operate at LOS E during the PM peak hour. All other approaches are projected to continue operating at LOS D or better during the AM and PM peak hour.

Shady Grove Road & Oakmont Avenue: The northbound approach is projected to continue operating at LOS E for both the AM and PM peak hours. All other approaches are projected to operate at LOS D or better during the AM and PM peak hour.

Amity Drive & Epsilon Drive: All the approaches are projected to continue operating at LOS A for both the AM and PM peak hours.

Midcounty Highway & Washington Grove Lane: The northbound approach is projected to continue operating at LOS E for both the AM and PM peak hours. All other approaches are projected to operate at LOS D or better during the AM and PM peak hour.

Amity Drive & Washington Grove Lane: All the approaches are projected to continue operating at LOS C for both the AM and PM peak hours.

Washington Grove Lane & Railroad Street: All the approaches are projected to continue

operating at LOS C for both the AM and PM peak hours.

Appendix 15.11 (Exhibit 9) also summarizes the 95th percentile queues at study intersections. The 95th percentile queue lengths do not exceed the available storage lengths at all intersections, except for intersection of Shady Grove Road and Crabbs Branch Way. At this intersection, the 95th percentile queue exceeds the available storage length for the northbound and southbound left turn lanes during the PM peak hour and westbound left turn lane during the AM and PM peak hour.

11.3.3 Build Conditions- with Crabbs Branch Way Extension

This scenario analyzes traffic conditions at area intersections with the Crabbs Branch Way Extension for the year 2040. The 2040 ADT was used to estimate turning movement volumes based on the existing count patterns and directional distribution of traffic during peak hours. A portion of the residential traffic from Amity Drive accessing the only two access points of entry/exit within the network was diverted to/from the Crabbs Branch Way Extension. The detailed methodology is described in the following sections.

11.3.4 Crabbs Branch Way- Rerouted Trips

The residential traffic from Amity Drive has two access points of entry/exit within the network as shown in Appendix 15.12 (Exhibit 10). On the north, Amity Drive intersects with Washington Grove Lane to form the first access point. To the south, it intersects with Epsilon Drive which in turn connects to Shady Grove Rd to the east, forming the second access point. Turning movement counts at the intersection of Amity Drive and Washington Grove Ln and Epsilon Drive and Shady Grove Rd were used to compute the trips entering and exiting Amity Drive during the AM and PM peak hour. A total of 395 trips were generated during the AM peak hour and 638 trips were generated during the PM peak hour from within the neighborhood during the existing conditions. To determine the peak hour trips per residential unit, the number of trips were divided by the number of residential units within the neighborhood. About 882 units were estimated within the neighborhood. This included all the Single Family Detached Homes and Apartment/Condominium units. The trip generation rate per unit was found to be 0.45 trips/unit during the AM peak hour and 0.72 trips/unit during the PM peak hour for the existing conditions.

The existing trips to/from the neighborhood were grown at 1% for the 2040 conditions. The growth assumption is very conservative as residential subdivisions usually do not have new residential units built and no new trips are generated because of it. A total of 476 trips were estimated for the AM peak hour and 771 trips for the PM peak hour from within the neighborhood during the 2040 Build conditions. The trip generation rate per unit was estimated to be 0.54 trips/unit during the AM peak hour and 0.87 trips/unit during the PM peak hour for the 2040 Build conditions.

To estimate the traffic diversion potential of Crabbs Branch Way Extension, the existing trip distribution pattern of trips originating and ending inside the neighborhood was computed. The turning volume percentages into and out of Amity Drive and Epsilon Drive was calculated and is shown in Appendix 15.13 (Exhibit 11). About 43% of the AM peak hour and 33% of the PM

peak hour trips exit Epsilon Drive onto Shady Grove while 20% of the trips turn west onto Washington Grove Lane during the AM and PM peak hours from Amity Drive. About 27% of the AM peak hour and 34% of the PM peak hour trips exit Amity Drive onto Washington Grove Lane going east. Similar trip patterns were observed for vehicles entering the neighborhood on Amity Dr and Epsilon Drive.

To estimate the trips on Crabbs Branch Way Extension, it was assumed that 65% of the trips originated on Amity Drive, North of Epsilon Drive, 25% of the trips originated on Epsilon Drive and 10% of the trips originated on Amity Drive, South of Epsilon Drive. This assumption was based on the density and distribution of residential units on Amity Drive and Epsilon Drive. These trips were then distributed to the network based on the trip distribution assumption shown in Appendix 15.10 (Exhibit 8). This distribution was based on existing trip patterns, distance between origin and destination, general speed limit of roadways and estimated travel times, access to the metro, proximity to the major roadways such as MD 200, MD 355 and I-270. As such, most of the trips diverted to Crabbs Branch Way Extension are going south in the existing conditions. It was also assumed, that Shady Grove Metro station was the origin/destination of about 5.6% of the trips from/to the neighborhood during the peak hours. This was based on the mode split assumptions within Local Area Transportation Review Guidelines (LATR) for Derwood policy area. The 2040 rerouted trips are shown in Appendix 15.14 (Exhibit 12).

11.3.5 Crabbs Branch Way Extension- Cut-Through Trips

It was assumed that a certain portion of traffic, outside the neighborhood will use the extension road to cut-through and get around congested roads and intersections. The cut-through traffic percentage was conservatively assumed to be about 15% of the ADT on Amity Drive. The traffic distribution and volumes of the cut-through traffic for the peak hours are shown in Appendix 15.15 (Exhibit 13).

11.3.6 Capacity and Queue Analysis (Crabbs Branch Way Extension)

The rerouted and cut-through traffic volumes were added to obtain total traffic for the build conditions with Crabbs Branch Way Extension. The traffic volumes for the study intersections are shown in Appendix 15.16 (Exhibit 14). The same methodology was adopted as in the existing conditions to estimate roadway capacity, delays, and queues using the HCM methodologies and Synchro model. The Peak Hour Factor (PHF) that was higher of 0.92 or the existing PHF was used for the 2040 analysis. The 2040 Build Conditions operational analysis results (levels of service, delay and 95th percentile queues) are presented in Appendix 15.23 (Appendix E). The level of service (LOS) information for the eight study intersections are summarized in Table 6. The LOS and delay information by individual movements for the eight intersections are summarized in Appendix 15.17 (Exhibit 15). The results of the 2040 Build Conditions intersection capacity analysis are as follows:

Table 6: 2040 Build Conditions Overall Intersection LOS and Delays

INTERSECTION	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
1. Midcounty Hwy & Shady Grove Rd	D	38.6	C	30.8
2. Shady Grove Rd & Tupelo Dr	A	8.5	B	10.2
3. Shady Grove Rd & Crabbs Branch Way	D	41.1	E	56.3
4. Shady Grove Rd & Oakmont Ave	C	33.9	D	35.8
5. Amity Drive & Epsilon Drive	A	11.3	A	8.1
6. Midcounty Hwy & Washington Grove Ln	D	36.3	D	37.1
7. Amity Drive & Washington Grove Lane	A	2.8	A	3.7
8. Washington Grove La & Railroad St	B	13.4	B	17.8

Approach Level of Service:

Midcounty Highway & Shady Grove Road: All approaches are projected to operate at LOS D or better during the AM and PM peak hour, except the northbound left turn movement which is projected to continue operating at LOS F during the AM peak hour.

Shady Grove Road & Tupelo Drive: The eastbound approach is projected to improve from LOS F to LOS E during the AM peak hour. The eastbound approach is projected to continue operating at LOS E during the PM peak hour. The westbound approach is projected to continue operating at LOS E during the AM and PM peak hours. The eastbound right turn movement is projected to improve from LOS F to LOS E during the AM peak hour. The southbound left turn movement is projected to continue operating at LOS F during the AM peak hour. All other approaches are projected to continue operating at LOS B or better during the AM and PM peak hour.

Shady Grove Road & Crabbs Branch Way: The northbound and southbound approaches are projected to continue operating at LOS E for both the AM and PM peak hours. The westbound approach is projected to operate at LOS E during the PM peak hour. All other approaches are projected to continue operating at LOS D or better during the AM and PM peak hour.

Shady Grove Road & Oakmont Avenue: The northbound approach is projected to continue operating at LOS E for both the AM and PM peak hours. All other approaches are projected to operate at LOS D or better during the AM and PM peak hour.

Amity Drive & Epsilon Drive: All the approaches are projected to continue operating at LOS A for both the AM and PM peak hours.

Midcounty Highway & Washington Grove Lane: The northbound approach is projected to continue operating at LOS E for both the AM and PM peak hours. All other approaches are projected to operate at LOS D or better during the AM and PM peak hour.

Amity Drive & Washington Grove Lane: All the approaches are projected to operate at LOS B for both the AM and PM peak hours.

Washington Grove Lane & Railroad Street: All the approaches are projected to continue operating at LOS C for both the AM and PM peak hours.

Appendix 15.17 (Exhibit 15) also summarizes the 95th percentile queues at study intersections. The 95th percentile queue lengths do not exceed the available storage lengths at all intersections, except for intersection of Shady Grove Road and Crabbs Branch Way. At this intersection, the 95th percentile queue exceeds the available storage length for the northbound left turn lane during the PM peak hour and for the southbound and westbound left turn lanes during the AM and PM peak hours. The key comparative differences between the No-build and Build Conditions are as shown in Appendix 15.18 (Exhibit 16).

11.4 Traffic Analysis Summary

A detailed analysis of the proposed Crabbs Branch Way Extension was conducted, and the findings are summarized below:

- All intersections operate at satisfactory level of service in the existing conditions.
- Per the Local Area Transportation Review Guidelines (LATR), the HCM average vehicle delay standard for the Derwood Policy Area is 59 seconds per vehicle and the threshold for LOS E is 55 seconds per vehicle for signalized intersections. In the Existing Conditions, the minimum and maximum delay during the AM peak hour at all the studied intersections is 3.7 seconds and 36.5 seconds, respectively. The minimum and maximum delay during the PM peak hour at all the studied intersections is 4.5 seconds and 46.7 seconds, respectively. These delays are below the congestion threshold for the Derwood Policy Area.
- The forecasted Average Daily Traffic, which is the total daily traffic volume on the Crabbs Branch Way Extension in both directions of travel, is estimated to be about 3600 vehicles per day in the year 2040.
- The Crabbs Branch Way Extension would improve accessibility for area residents and other road users by providing a direct access option to Shady Grove Road bypassing Midcounty Highway.
- The Crabbs Branch Way Extension is expected to divert part of existing traffic on Epsilon Drive to the east, to Amity Drive to the south. As a result, the traffic on Epsilon Drive is expected to drop and Amity Drive, south of Epsilon Drive to increase moderately.
- A conservative 15% cut-through traffic was included in the forecasted traffic volume, as worse-case scenario to analyze impacts on study area intersections.
- The overall intersection LOS and delay for the eight study intersections for the two scenarios, 2040 No-Build and 2040 Build Conditions are

summarized in Table 7.

- Comparing the 2040 No-Build and 2040 Build Conditions, the overall intersection delay at six study intersections is projected to improve during the AM peak hour in the 2040 Build Conditions. The overall intersection delay at four study intersections is projected to improve during the PM peak hour in the 2040 Build Conditions.

Table 7: Comparison of 2040 No-Build and Build Conditions Overall Intersection LOS and Delays

INTERSECTION	2040 No-Build				2040 Build Alternative			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1. Midcounty Hwy & Shady Grove	D	41.8	C	31.3	D	38.6	C	30.8
2. Shady Grove Rd & Tupelo Dr	B	18.6	B	16.2	A	8.5	B	10.2
3. Shady Grove Rd & Crabbs	C	33.7	E	56.0	D	41.1	E	56.3
4. Shady Grove Rd & Oakmont Ave	C	34.1	C	34.6	C	33.9	D	35.8
5. Amity Drive & Epsilon Drive	A	7.5	A	7.6	A	11.3	A	8.1
6. Midcounty Hwy & Washington	D	37.3	D	37.4	D	36.3	D	37.1
7. Amity Drive & Washington Grove	A	3.2	A	4.2	A	2.8	A	3.7
8. Washington Grove La & Railroad	B	13.7	B	17.8	B	13.4	B	17.8

Improvement in Delay Deterioration in Delay No Change in Delay

- The intersection of Crabbs Branch Way and Shady Grove Road is projected to experience LOS E with an overall delay of 56 seconds per vehicle during the PM peak hour, in the 2040 No-Build Conditions. The delay increases by 0.3 seconds to 56.3 seconds per vehicle during the Build Conditions. The vehicle delays for northbound and southbound approaches at this intersection are projected to increase minimally due to the Crabbs Branch Way Extension. This increase in delay over the No-Build Conditions can be offset by increasing the green split for the northbound and southbound approaches. Leading Pedestrian Interval (LPI) is recommended at this intersection. According to the Federal Highway Administration (FHWA-SA-21-032), an LPI of 3-7 seconds will make pedestrians more visible to motorists and can potentially reduce pedestrian related incidents. As No Turn on Red has already been implemented at this intersection, no additional delay for right turning vehicles is anticipated in the 2040 conditions.The overall per-vehicle delay at all intersections, for all conditions analyzed, are projected to be well within the LATR congestion standards for the Derwood Policy Area of Montgomery County.

- The intersection of Shady Grove Road & Oakmont Avenue is currently operating at LOS D, with a delay of 36.9 seconds during the PM peak hour. In the 2040 No- Build and Build Conditions, the intersection is projected to operate at LOS C, with a delay of 34.6 seconds and LOS D, with a delay of 35.8 seconds during the PM peak hour, respectively. The Build Condition increase in delay over the No-Build Condition is only 1.2 seconds and will have minimal impact to the intersection.

- At the intersection of Shady Grove Road and Tupelo Drive, No Turn on Red is currently operational for the EB approach during the AM peak period. The overall delay in the 2040

Build Conditions is projected to improve by 48% during the AM peak hour and by 35% during the PM peak hour. The vehicular delay is projected to improve considerably with the Crabbs Branch Way Extension.

12. Public Input Summary

Public opinions regarding Washington Grove Connector trails and Crabbs Branch Road Extension were provided in the first Public Workshop held in February 2020. A second Public Workshop was held in February 2021 after which a survey was conducted. The majority in the survey voted for Alternate No. 3 which is Brown Street.

Washington Grove held a special town meeting on December 4, 2021 during which a non-binding vote went 92-24 in favor of the Brown Street connector.

On December 12, 2021, the Washington Grove Town Council voted unanimously to approve the Brown Street connector.

The following comments and chart represent the results of a survey conducted after the Public Workshop of 54 residents of the community.

12.1 Alignment #1- Railroad Street Survey Comments

- Railroad Street is a dangerous road for walking and bicycling
- No bike or pedestrian infrastructure on Railroad Street
- Requires purchase of private land (Roberts Oxygen)
- Very close to backyards and eliminates buffer between homes and salt barn
- Least disruptive to neighborhood
- Would feel uncomfortable walking behind salt barns and Robert's Oxygen property when dark
- Least use of shared roadways
- Most expensive option
- Does not use Town of Washington Grove roads

12.2 Alignment #2 – Ridge Road Survey Comments

- Expensive and environmentally impactful to conservation meadow
- Close to backyards
- Requires paving parkland
- Sacrifices natural meadow to avoid Brown St
- Minimizes impact to Brown St residences

12.3 Alignment #3 – Brown St. Survey Comments

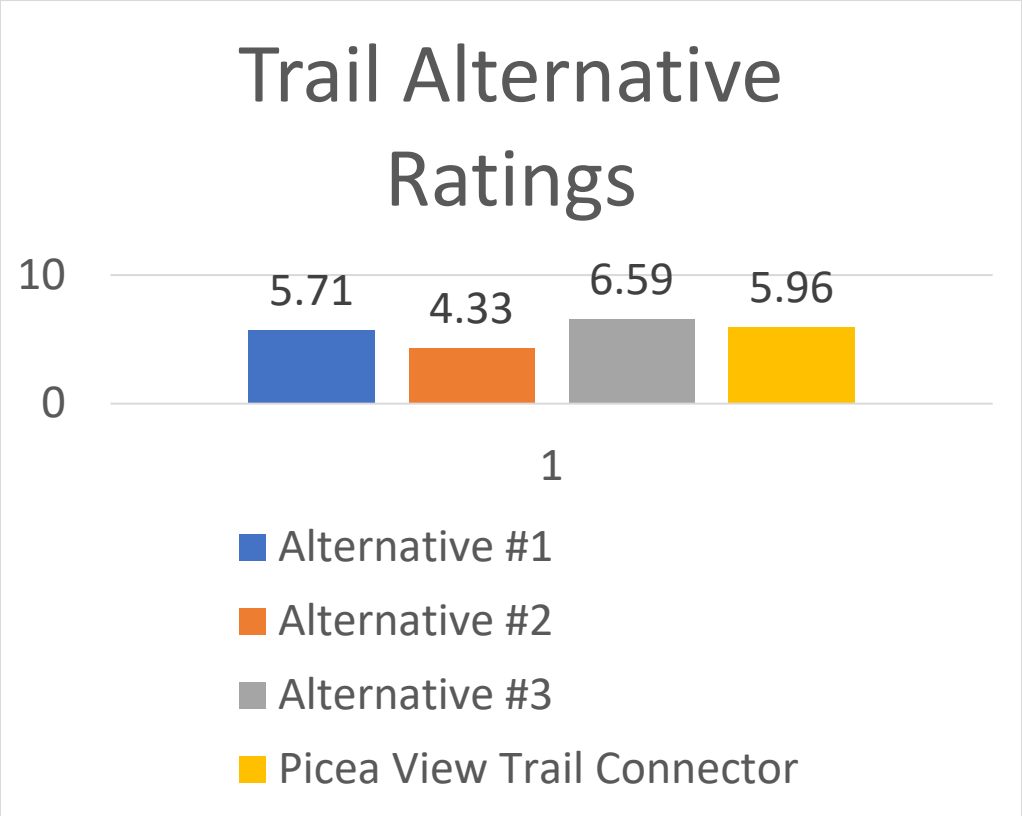
- Safest option
- Avoids backyards
- Shortest and least costly alternative
- Minimizes impact on trees

- Consistent with 1994 annexation agreement, adopted resolution, and conveyance of outlot
- Would increase traffic on Town of Washington Grove roads.

12.4 Crabbs Branch Way Extension Survey Comments

- Increase traffic on Amity Drive
- Creates a new cut-through rout
- Increased noise and light pollution
- Would destroy wildlife habitat
- Would reduce passive recreation area
- Would improve connectivity to Shady Grove Metro
- Access to Amity Drive Neighborhood Park would be more difficult with increased traffic.

12.5 Trail Alternative Rating Chart



13. Cost Estimate

13.1 Construction Estimate

An order of magnitude construction cost estimate has been provided for all proposed trails and Crabbs Branch Extension in Appendix 15.1.

13.2 Land Acquisition Estimate

For each of the trail alignment options Land Acquisition will be required.

- Alignment #1- Crabbs Branch Way to Railroad Street: Land Acquisition = $47,338
- Alignment #2- Crabbs Branch Way to Ridge Road: Land Acquisition = $27,563
- Alignment #3- Crabbs Branch Way to Brown Street: Land Acquisition = $12,500
- Picea View Connector: Land Acquisition = $2,567
- Crabbs Branch Way Extension: Land Acquisition = $538,300

	Permanent		Construction Access		
Alignment	**Area (AC)**	**Cost**	**Area (AC)**	**Cost**	**Total Cost**
No. 1	0.458	$43,890	0.818	$3,448	$47,338
No. 2	0.444	$25,536	0.792	$2,027	$27,563
No. 3	0.241	$12,500	0.430	$0	$12,500
Picea View	0.042	$2,380	0.075	$187	$2,567
CB Way Ext.- Road with Trail	3.068	$525,000	4.545	$0	$525,000
CB Way Ext.- Trail	0.270	$12,300	0.146	$1,000	$13,300

14. Conclusion

14.1 Trail Options:

Any of the alternative trail connections from Ridge Road, Railroad Street, Picea View Court and Brown Street will provide much needed connection between Town of Washington Grove and the nearby residential areas with the mass transit hub and commercial areas located east of Shady Grove Road.

Phase II Facility Planning will identify stream and wetland crossing structures in more detail, including their associated constructability and durability issues.

14.2 Crabbs Branch Way Extension Option:

The ADT for the proposed Crabbs Branch Way Extension is estimated to be about 3600 vehicles per day. The overall per vehicle delay at all intersections, for all conditions analyzed are well within the congestion standards of Montgomery County. Incorporating Vision Zero Principles of the county, such as LPI and No Turn on Red can improve pedestrian safety at the intersection of Shady Grove Road and Crabbs Branch Way.

Based on the current analyses and from a traffic perspective alone, the Crabbs Branch Way Extension roadway is expected to improve vehicular and pedestrian mobility within the community. Nevertheless, the County should compare the traffic analyses presented in this report to all other advantages and disadvantages of building the extension roadway, including overall goals, environmental and right-of-way constraints, the county master plan, and public input to assess the project's implementation.

15. List of Appendices and Exhibits

15.1 Cost Estimates
15.2 Soil Types
15.3 Exhibit 1: Site Plan
15.4 Exhibit 2: Weekday AM/PM Peak Hour Volumes & Lane Configuration – Existing Conditions
15.5 Exhibit 3: Intersection Level of Service Standards and Thresholds
15.6 Exhibit 4: Weekday AM and PM Peak Hour Level of Service, Delay and Queue lengths - Existing Conditions
15.7 Exhibit 5: MDSHA Historic Traffic Data for Area Roadways
15.8 Exhibit 6: K-Factors and Year 2021 & Year 2040 ADT
15.9 Exhibit 7: Weekday AM/PM Peak Hour Volumes & Lane Configuration – Traffic Growth
15.10 Exhibit 8: Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 No-Build Conditions
15.11 Exhibit 9: Weekday AM and PM Peak Hour Level of Service, Delay and Queue lengths – 2040 No-Build Conditions
15.12 Exhibit 10: Residential Trip Computation
15.13 Exhibit 11: Weekday AM/PM Peak Hour Trip Distribution to/From Amity Dr & Epsilon Dr
15.14 Exhibit 12: Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 Build Conditions (Rerouted Trips)
15.15 Exhibit 13: Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 Build Conditions (Estimated Cut-Through Traffic Volumes on Amity Dr)
15.16 Exhibit 14: Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 Build Conditions (Crabbs Branch Way Extension)
15.17 Exhibit 15: Weekday AM and PM Peak Hour Level of Service, Delay and Queue lengths – 2040 Build Conditions (with Crabbs Branch Way Extension)
15.18 Exhibit 16: Key Comparative Differences- 2040 No-Build and Build Conditions
15.19 APPENDIX A: TRAFFIC COUNT DATA
15.20 APPENDIX B: EXISTING CONDITIONS (SYNCHRO OUTPUT SHEETS)
15.21 APPENDIX C: M-NCPPC MODEL OUTPUT SHEETS
15.22 APPENDIX D: 2040 NO-BUILD CONDITIONS (SYNCHRO OUTPUT SHEETS)
15.23 APPENDIX E: 2040 BUILD CONDITIONS - CRABBS BRANCH WAY EXTENSION (SYNCHRO OUTPUT SHEETS)
15.24 Appendix Map A
15.25 Montgomery County Parks, Preliminary Archeological Review Form
15.26 Land Acquisition Agreement Deed
15.27 Town Washington Grove, Historic Preservation Report by Robinson & Associates, Inc
15.28 National Registration of Historic Places Form

15.1 Cost Estimate: Alignment #1 - Railroad Street

Crabbs Branch Way to Railroad Street	L (ft)	W (ft)	Thk (ft)	QTY	Unit	Unit Cost	Total Cost	Remarks
MOB							$5,000.00	Assume
Tree Clearing	135	25		0.08	AC	$15,000.00	$1,162.19	Use medium trees
Clearing & Grubbing	1,425	25	na	0.82	AC	$5,025.00	$4,109.63	assume 24ft width- trail plus earthwork
Rough Grading	1,425	25	na	35,625	SF	$4,150.00	$4,150.00	
Aggregate Base	1,425	14		2,217	SY	$9.71	$21,521.62	use 6" thk 3/4" stone base course
Paving- binder course	1,425	10		1,583	SY	$14.90	$23,585.33	use 2.5" thk asphalt base course
Paving- wearing course	1,425	10		1,583	SY	$10.17	$16,109.63	use 1.5" thk asphalt wearing course
Elevated Boardwalk				1,000	SF	$125.00	$125,000.00	
10ft Wood Retaining Wall	130			130	LF	$300.00	$39,000.00	
Culvert	30		2	20.0	LF	$300.00	$12,000.00	assume 2ea x 30" dia x 40ft L
Endwall				4	EA	$5,000.00	$20,000.00	
Land Acquisition							$47,338.00	at Robert's Oxygen
TOTAL DIRECT							**$318,976.40**	
OVERHEAD				25%			$79,744.10	
PROFIT				8%			$25,518.11	
CONTINGENCY				5%			$21,211.93	
PROJECT COST							**$445,450.54**	
						Unit Price	**$312.60**	**per linear foot**

Trail Length =	1,425	LF
Trail Width =	10	FT
Shoulder =	2	FT ea side
LOD =	25	FT wide

15.1 Cost Estimate: Alignment #2 - Ridge Road

Crabbs Branch Way to Ridge Road and Brown Street	L (ft)	W (ft)	Thk (ft)	QTY	Unit	Unit Cost	Total Cost	Remarks
MOB							$5,000.00	Assume
Tree Clearing	350	25		0.20	AC	$15,000.00	$3,013.09	Use medium trees
Clearing & Grubbing	1,380	25	na	0.79	AC	$5,025.00	$3,979.86	assume 25ft width- ROW
Rough Grading	1,380	25	na	34,500	SF	$4,150.00	$4,150.00	
Aggregate Base	1,380	14		2,147	SY	$9.71	$20,841.99	use 6" thk 3/4" stone base course
Paving- binder course	1,380	10		1,533	SY	$14.90	$22,840.53	use 2.5" thk asphalt base course
Paving- wearing course	1,380	10		1,533	SY	$10.17	$15,600.90	use 1.5" thk asphalt wearing course
10ft Elevated Boardwalk				1,000	SF	$125.00	$125,000.00	
Wood Retaining Wall	130			130	LF	$300.00	$39,000.00	
Culvert	20		2	20	LF	$300.00	$12,000.00	assume 2ea x 30" dia20ft L
Endwall				4	EA	$5,000.00	$20,000.00	
Land Acquisition							$27,563.00	
TOTAL DIRECT							**$298,989.36**	
OVERHEAD				25%			$74,747.34	
PROFIT				8%			$23,919.15	
CONTINGENCY				5%			$19,882.79	
PROJECT COST							**$417,538.64**	
						Unit Price	**$302.56**	**per linear foot**

Trail Length =	1,380	LF
Trail Width =	10	FT
Shoulder =	2	FT ea side
LOD =	24	FT wide

15.1 Cost Estimate: Alignment #3 - Brown Street

Crabbs Branch Way to Brown Street	L (ft)	W (ft)	Thk (ft)		Unit	Unit Cost	Total Cost	Remarks
MOB							$5,000.00	Assume
Tree Clearing	135	25		0.08	AC	$7,175.00	$555.91	Use medium trees
Clearing & Grubbing	750	25	na	0.43	AC	$5,025.00	$2,162.96	assume 25ft width- ROW
Rough Grading	750	25	na	18,750	SF	$2,768.05	$2,768.05	
Aggregate Base	750	14		1,167	SY	$9.71	$11,327.17	use 6" thk 3/4" stone base course
Paving- binder course	750	10		833	SY	$14.90	$12,413.33	use 2.5" thk asphalt base course
Paving- wearing course	750	10		833	SY	$10.17	$8,478.75	use 1.5" thk asphalt wearing course
10ft Elevated Boardwalk				1,000	SF	$125.00	$125,000.00	
Wood Retaining Wall	130			130	LF	$300.00	$39,000.00	
Culvert	20		2	20	LF	$300.00	$12,000.00	assume 2ea x 30" dia20ft L
Endwall				4	EA	$5,000.00	$20,000.00	
Land Acquisition							$12,500.00	
TOTAL DIRECT							**$251,206.18**	
OVERHEAD				25%			$62,801.54	
PROFIT				8%			$20,096.49	
CONTINGENCY				5%			$16,705.21	
PROJECT COST							**$350,809.43**	
						Unit Price	**$467.75**	**per linear foot**

Trail Length =	750	LF
Trail Width =	10	FT
Shoulder =	2	FT ea side
LOD =	24	FT wide

15.1 Cost Estimate - Picea View Connector

Picea View Connector	L (ft)	W (ft)	Thk (ft)		Unit	Unit Cost	Total Cost	Remarks
MOB							$2,000.00	Assume
Tree Clearing	0	25		0.00	AC	$0.00	$0.00	none
Clearing & Grubbing	100	15	na	0.03	AC	$5,025.00	$173.04	assume 15ft width- ROW
Rough Grading	0	0	na	0	SF	$0.00	$0.00	
Aggregate Base	100	14		156	SY	$9.71	$1,510.29	use 6" thk 3/4" stone base course
Paving- binder course	100	10		111	SY	$14.90	$1,655.11	use 2.5" thk asphalt base course
Paving- wearing course	100	10		111	SY	$10.17	$1,130.50	use 1.5" thk asphalt wearing course
Demo curb	16			16	LF	$10.00	$160.00	
HC Ramp (1ea x 10ft L x 5ft W)	10			10	LF	$960.00	$9,600.00	use exist ramp on south side of Picea View
Handicap marking				1	LOT	$1,000.00	$500.00	
Land Acquisition							$2,567.00	
TOTAL DIRECT							**$19,295.94**	
OVERHEAD				25%			$4,823.98	
PROFIT				8%			$1,543.67	
CONTINGENCY				5%			$1,283.18	
PROJECT COST							**$26,946.78**	
						Unit Price	**$215.57**	**per linear foot**

Trail Length =	125	LF
Trail Width =	10	FT
Shoulder =	2	FT ea side
LOD =	24	FT wide

15.1 Cost Estimate: Crabbs Branch Way Extension

Crabbs Branch Way Extension with Trails	L (ft)	W (ft)	Thk (ft)	TOTAL	Unit	Unit Cost	Total Cost	Remarks
MOB							$20,000.00	Assume
Tree Clearing	350	75		0.60	AC	$15,000.00	$9,039.26	Use medium trees
Clearing & Grubbing	1,650	75	na	2.84	AC	$5,025.00	$14,275.57	assume 75ft wide LOD
Excavation Fill	1,650	75	4	10,000	CY	$40.00	$400,000.00	assume balanced cut-fill
Excavation Cut	1,650	75	4	10,000	CY	$20.00	$200,000.00	
Road:								
Aggregate Base	1,650	21		3,850	SY	$17.96	$69,126.75	use 12" thk 3/4" stone base course
Paving- binder course	1,650	21		3,850	SY	$23.28	$89,608.75	use 4" thk asphalt base course
Paving- wearing course	1,650	21		3,850	SY	$13.50	$51,973.08	use 2" thk asphalt wearing course
Trail:								
Aggregate Base	1,650	12		2,200	SY	$9.71	$21,359.80	use 6" thk 3/4" stone base course
Paving- binder course	1,650	12		2,200	SY	$14.90	$32,771.20	use 2.5" thk asphalt base course
Paving- wearing course	1,650	10		1,833	SY	$10.17	$18,653.25	use 1.5" thk asphalt wearing course
Sidewalk:								
6-inch thick concrete	1,650	6		1,100	SY	$9.11	$10,021.55	
4-inch gravel base	1,650	6		1,100	SY	$1.48	$1,623.93	
Ditch:								
Rough Grading							included	
Filter Fabric	1,650	18		3,300	SY	$5.32	$17,556.00	
Rip-Rap	1,650	18	1.5	135	TN	$133.00	$17,955.00	
Buffer:								
Topsoil	1,650	12	0.5	367	CY	$98.42	$36,087.33	
Hydroseeding	1,650	12		20	MSF	$66.50	$1,316.70	
6ft &10ft Elevated Boardwalk				1	LS	$123,690.00	$123,690.00	
Wood Retaining Wall	260			260	LF	$300.00	$78,000.00	
Culvert	75		6	75.0	LF	$300.00	$135,000.00	assume 3 x-ings x 2ea x 30" dia x 75ft L
Endwall				12	EA	$5,000.00	$60,000.00	
Guard Rail	1000			1,000	LF	$150.00	$150,000.00	assume 50% road length
Land Acquisition							$538,300.00	
TOTAL DIRECT							**$2,096,358.16**	
OVERHEAD				25%			$524,089.54	
PROFIT				8%			$167,708.65	
CONTINGENCY				5%			$139,407.82	
PROJECT COST							**$2,927,564.17**	
						Unit Price	**$1,774.28**	**per linear foot**
							$8,587,521.58	**per mile**

Road/Trail Length =	1,800	LF
Road Width (2ea x 10.5ft) =	21	FT
Buffer (2ea x 6ft) =	12	FT
Sidetrail =	10	FT
Sidewalk =	6	FT
Maint. Buffer (2ea x 3ft) =	6	FT
TOTAL =	55	FT

Appendix 15.2 Soil Types

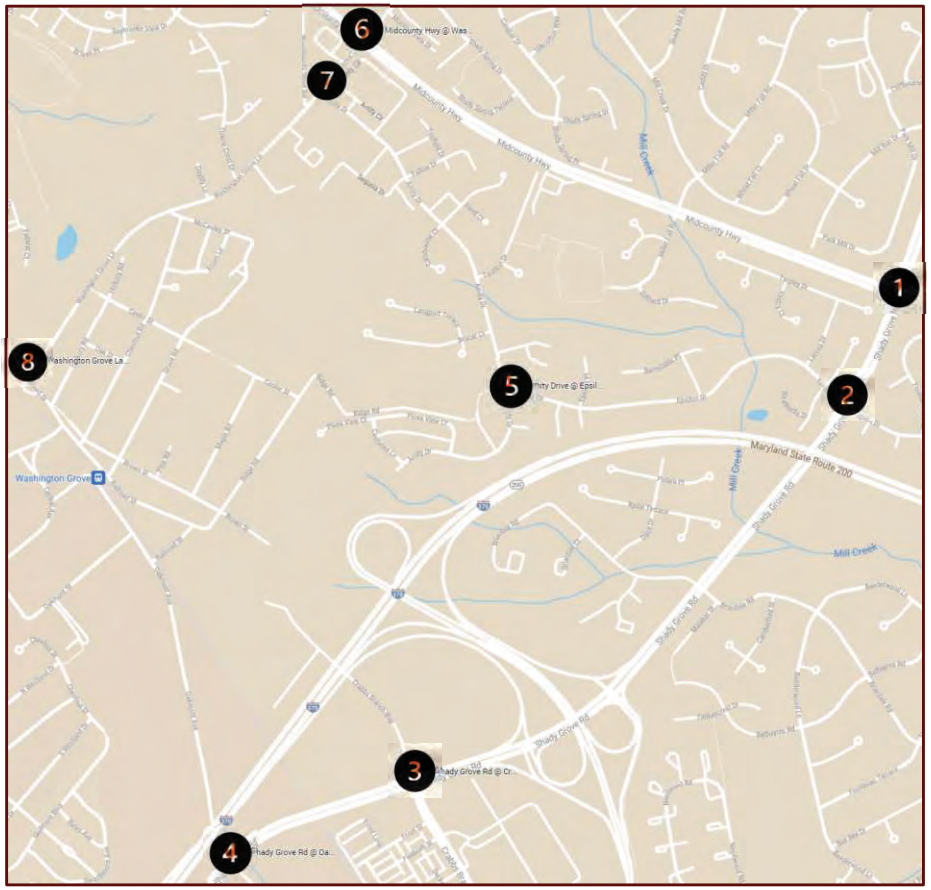
Soil Type	Percent Slope	Description
Gaila silt loam (1B)	3 to 8 percent slopes	Soils of the Gaila series are very deep and well drained. They formed in residuum that weathered from quartz muscovite schist of the northern portion of the Piedmont Plateau. Saturated hydraulic conductivity is moderately high. Slopes range from 0 to 55 percent.[i]
Gaila silt loam (1C)	8 to 15 percent slopes	
Glenelg silt loam (2B)	3 to 8 percent slopes	The Glenelg series consists of very deep, well drained soils formed in residuum weathered from micaceous schist on uplands of the Blue Ridge and the Northern Piedmont. Slopes range from 0 to 55 percent. Saturated hydraulic conductivity is moderately high in the subsoil and moderately high too high in the substratum.
Baile silt loam (6A)	0 to 3 percent slopes	The Baile series consists of very deep, poorly drained, moderately low to moderately high saturated hydraulic conductivity, soils on upland depressions and footslopes. They form in local alluvium over residuum from acid crystalline rocks, chiefly mica schist and granitized schist and gneiss. Slope ranges from 0 to 8 percent.
Neshaminy silt loam (27B)	3 to 8 percent slopes	The Neshaminy series consists of deep and very deep, well drained soils formed in materials weathered from diabase and other dark colored basic rocks. Saturated hydraulic conductivity is moderately high. Slopes range from 0 to 70 percent.
Chrome and Conowingo soils (35B)	3 to 8 percent slopes	The Chrome series consists of moderately deep, well drained soils. They formed in residuum weathered mostly from serpentine. They are on convex upland slopes of 0 to 45 percent. Saturated hydraulic conductivity is moderately high to high. The Conowingo series consists of deep, moderately well to somewhat poorly drained soils formed in materials weathered from basic rocks high in magnesium, usually serpentine. Saturated Hydraulic Conductivity: A and C horizons have moderately high and high and B horizon has moderately low and moderately high. These nearly level to sloping soils are in well dissected uplands of the northern Piedmont Plateau. Slopes range from 0 to 15 percent.

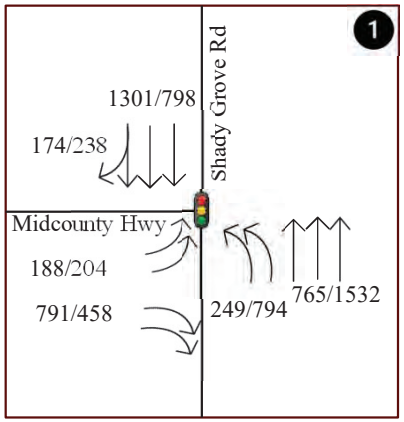
Travilah silt loam (37B)	3 to 8 percent slopes	The Travilah series consists of moderately deep, somewhat poorly drained soils with moderately slow permeability. They formed in residuum that weathered from serpentine in the Piedmont Plateau. Slopes range from 0 to 15 percent.
Wheaton-Urban land complex (66UB)	0 to 8 percent slopes	The Wheaton series consists of very deep, well drained soils with moderate permeability. They formed in residuum that has been graded from the original weathering of schist and gneiss in the Piedmont Plateau. Slopes range from 0 to 15 percent.
Urban land (400)	NA	Urban soils are found in watersheds that provide drinking water, food, waste utilization, and natural resources to communities. Urban soils also are located within cities in park areas, recreation areas, community gardens, green belts, lawns, septic absorption fields, sediment basins and other uses.

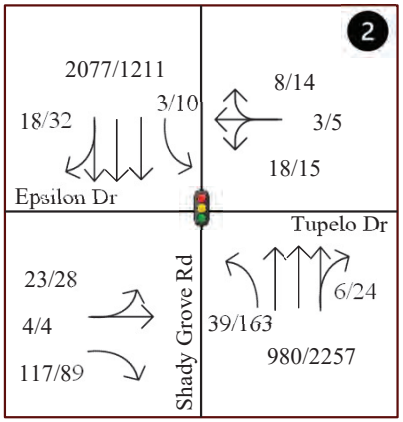
Appendix 15.3

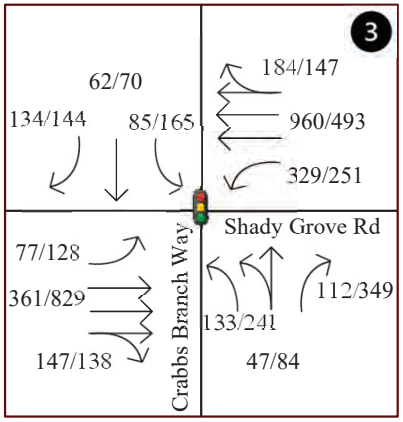
Exhibit 1: Site Plan

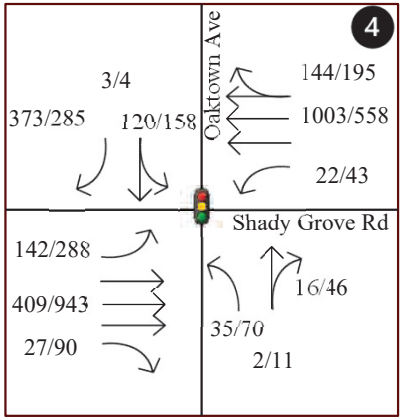
Exhibit 2: Weekday AM/PM Peak Hour Volumes & Lane Configuration - Existing Conditions

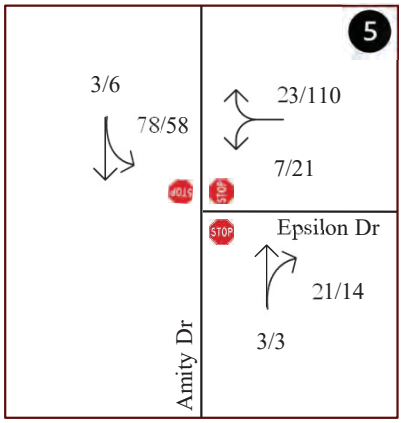


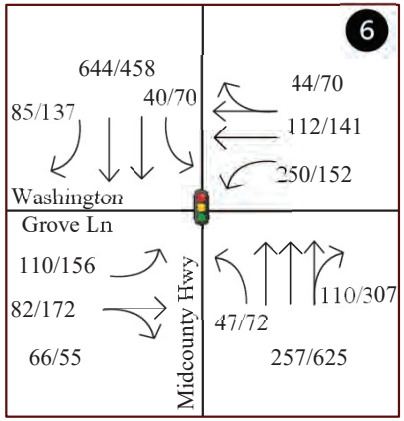


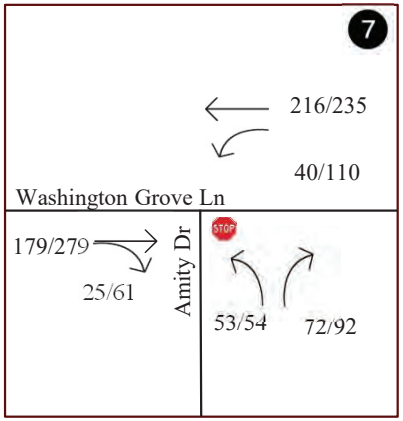












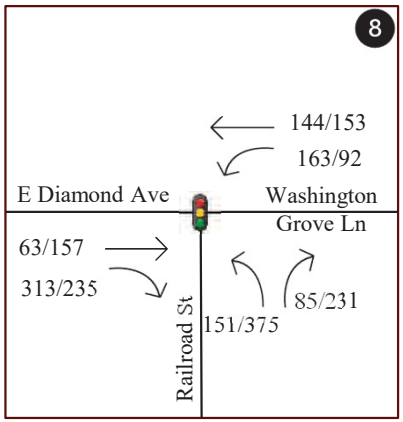


Exhibit 3: Intersection Level of Service Standards and Thresholds

Signazlized intersection Level of Service and Thresholds

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10–20
C	> 20–35
D	> 35–55
E	> 55–80
F	> 80

Unsignazlized intersection Level of Service and Thresholds

Level of Service	Average Control Delay (s/veh)
A	0–10
B	> 10–15
C	> 15–25
D	> 25–35
E	> 35–50
F	> 50

Source: Highway Capacity Manual 2000

Appendix 15.6 *Exhibit 4: Weekday AM and PM Peak Hour Level of Service, Delay and Queue lengths - Existing Conditions*

EXISTING CONDITIONS								
Intersection Information			AM Peak			PM Peak		
Traffic Control	Approach	Movement	LOS	Delay (sec)	95th Queue (ft)	LOS	Delay (sec)	95th Queue (ft)
1. Midcounty Hwy & Shady Grove Rd								
Signalized	Eastbound (Midcounty Hwy)	EBL	D	41.8	113	E	55.5	137
		EBR	D	37.2	446	B	19.5	155
		EB Approach	**D**	**38.1**		**C**	**31.5**	
	Northbound (Shady Grove Rd)	NBL	F	84.9	#236	D	50.8	439
		NBT	B	11.8	151	A	7.7	250
		NB Approach	**C**	**30.7**		**C**	**23.1**	
	Southbound (Shady Grove Rd)	SBTR	C	29.8	498	D	37.9	434
		SB Approach	**C**	**29.8**		**D**	**37.9**	
Overall LOS (Delay)			**C (32.4)**			**C (28.4)**		
2. Shady Grove Rd & Tupelo Dr								
Signalized	Eastbound (Epsilon Dr)	EBLT	E	62.0	37	E	62.7	43
		EBR	F	91.1	189	E	74.2	146
		EB Approach	**F**	**85.1**		**E**	**71.0**	
	Westbound (Tupelo Dr)	WBLTR	E	62.4	17	E	62.4	27
		WB Approach	**E**	**62.4**		**E**	**62.4**	
	Northbound (Shady Grove Rd)	NBL	E	73.1	78	E	74.2	234
		NBTR	A	5.8	165	B	10.3	563
		NB Approach	**A**	**9.1**		**B**	**15.4**	
	Southbound (Shady Grove Rd)	SBL	F	90.3	11	E	77.5	32
		SBTR	B	12.9	600	B	15.9	360
		SB Approach	**B**	**13.2**		**B**	**16.4**	
Overall LOS (Delay)			**B (16.3)**			**B (18.5)**		
3. Shady Grove Rd & Crabbs Branch Way								
Signalized	Eastbound (Shady Grove Rd)	EBL	D	35.2	75	C	30.5	100
		EBTR	B	19.1	137	D	42.5	212
		EB Approach	**C**	**21.6**		**D**	**41.1**	
	Westbound (Shady Grove Rd)	WBL	B	15.2	250	D	53.2	#460
		WBTR	C	24.2	393	D	37.7	265
		WB Approach	**C**	**22.5**		**D**	**42.2**	
	Northbound (Crabbs Branch Way)	NBL	E	70.8	154	E	72.0	240
		NBLT	E	69.0	166	E	71.8	278
		NBR	D	45.3	72	D	38.3	234
		NB Approach	**E**	**59.0**		**E**	**55.5**	
	Southbound (Crabbs Branch Way)	SBL	E	70.7	142	E	71.4	240
		SBT	E	64.5	104	E	56.9	109
		SBR	E	57.9	176	D	40.0	91
		SB Approach	**E**	**63.6**		**E**	**57.1**	
Overall LOS (Delay)			**C (31.0)**			**D (46.7)**		
4. Shady Grove Rd & Oakmont Ave								
Signalized	Eastbound (Shady Grove Rd)	EBL	C	30.1	120	D	51.8	290
		EBT	C	21.2	114	C	22.7	264
		EBR	B	14.1	0	B	12.0	25
		EB Approach	**C**	**23.0**		**C**	**28.9**	
	Westbound (Shady Grove Rd)	WBL	B	14.1	m10	C	24.1	33
		WBTR	C	23.5	128	D	38.9	376
		WB Approach	**C**	**23.4**		**D**	**38.2**	
	Northbound (Oakmont Ave)	NBL	E	72.8	71	E	68.8	125
		NBTR	E	65.5	11	E	62.2	63
		NB Approach	**E**	**70.3**		**E**	**65.6**	
	Southbound (Oakmont Ave)	SBLT	D	51.3	172	E	68.1	146
		SBR	D	44.1	337	D	36.1	170
		SB Approach	**D**	**46.1**		**D**	**48.2**	
Overall LOS (Delay)			**C (29.4)**			**D (36.9)**		
5. Amity Drive & Epsilon Drive								
Unsignalized	Westbound (Epsilon Drive)	WBLR	A	7.1	3	A	7.5	15
		WB Approach	**A**	**7.1**		**A**	**7.5**	
	Northbound (Amity Drive)	NBTR	A	6.9	3	A	7.0	3
		NB Approach	**A**	**6.9**		**A**	**7.0**	
	Southbound (Amity Drive)	SBLT	A	7.8	10	A	8.0	10
		SB Approach	**A**	**7.8**		**A**	**8.0**	
Overall LOS (Delay)			**A (7.4)**			**A (7.6)**		
6. Midcounty Hwy & Washington Grove Ln								
Signalized	Eastbound (Midcounty Hwy)	EBL	B	19.6	44	C	20.6	74
		EBT	C	28.7	343	C	26.9	248
		EBR	C	23.4	20	C	24.2	30
		EB Approach	**C**	**27.4**		**C**	**25.5**	
	Westbound (Midcounty Hwy)	WBL	C	20.4	53	B	19.2	73
		WBTR	C	24.7	113	C	29.3	329
		WB Approach	**C**	**24.2**		**C**	**28.4**	
	Northbound (Washington Grove Ln)	NBL	D	47.6	111	D	41.5	149
		NBTR	E	75.1	177	E	73.0	316
		NB Approach	**E**	**65.3**		**E**	**60.3**	
	Southbound (Washington Grove Ln)	SBL	D	42.2	246	D	43.1	147
		SBTR	D	46.3	80	D	52.4	107
		SB Approach	**D**	**44.1**		**D**	**48.6**	
Overall LOS (Delay)			**D (36.5)**			**D (36.3)**		
7. Amity Drive & Washington Grove Lane								
Unsignalized	Eastbound (Washington Grove Lane)	EBTR		0.0			0.0	
		EB Approach		**0.0**			**0.0**	
	Westbound (Washington Grove Lane)	WBL	A	8.1	5	A	8.7	13
		WBT						
		WB Approach		**2.1**			**3.0**	
	Northbound (Amity Dr)	NBL	B	12.5	20	C	19.1	55
		NBR			10			15
		NB Approach	**B**	**12.5**		**C**	**19.1**	
Overall LOS (Delay)			**A (3.7)**			**A (4.5)**		
8. Washington Grove La & Railroad St								
Signalized	Eastbound (E Diamond Ave)	EBT	D	38.9	85	D	35.1	165
		EBR	A	0.4	0	A	0.3	0
		EB Approach	**A**	**7.2**		**B**	**14.3**	
	Westbound (Washington Grove Lane)	WBL	C	21.8	132	C	24.9	80
		WBT	C	20.2	118	C	21.9	124
		WB Approach	**C**	**21.0**		**C**	**23.0**	
	Northbound (Railroad St)	NBL	C	21.7	121	C	25.4	316
		NBR	A	0.1	0	A	0.2	0
		NB Approach	**B**	**14.9**		**B**	**15.7**	
Overall LOS (Delay)			**B (13.9)**			**B (16.8)**		

95th percentile volume exceeds capacity, queue may be longer
m Volume for the 95th percentile queue is metered by upstream signal

Appendix 15.7 *Exhibit 5: MDSHA Historic Traffic Data for Area Roadways*

SHADY GROVE RD-.20 MI S OF MIDCOUNTY HWY	YEAR	AADT	K-FACTOR
	2021	36980	8.17
	2020	41502	8.24
	2019	49701	8.24
	2018	49700	8.24
	2017	50982	8.52
	2016	49781	8.52
	2015	48850	8.52
	2014	48772	8.37
	2013	48921	8.37
	2012	48820	8.37

WASHINGTON GROVE LA - BETWEEN AMITY DR & MIDCOUNTY HWY	YEAR	AADT	K-FACTOR
	2021	8593	9.17
	2020	7512	9.17
	2019	8991	9.17
	2018	8990	9.17
	2017	9155	8.4
	2016	8934	8.4
	2015	8763	8.4
	2014	8542	8.4
	2013	8561	8.4
	2012	8540	8.4

CRABBS BRANCH WAY - .05 MILE NORTH OF SHADY	YEAR	AADT	K-FACTOR
	2021	7854	8.01
	2020	6863	8.01
	2019	8212	8.01
	2018	8211	8.01
	2017	8280	8.01

RAILROAD ST - BETWEEN E DIAMOND AVE & HICKORY RD	YEAR	AADT	K-FACTOR
	2021	12303	9.42
	2020	10752	9.42
	2019	12871	9.42
	2018	12870	9.42
	2017	13035	8.62
	2016	12724	8.62
	2015	12483	8.62
	2014	12162	8.62
	2013	12201	8.62
	2012	12180	8.62

CRABBS BRANCH WAY - .10 MI SOUTH OF SHADY GROVE RD	YEAR	AADT	K-FACTOR
	2021	16463	8.93
	2020	14392	8.93
	2019	17231	8.93
	2018	17230	8.93
	2017	17935	7.89
	2016	17514	7.89
	2015	17183	7.89
	2014	16742	7.89
	2013	16791	7.89
	2012	16760	7.89

E DIAMOND AVE - .10 MI WEST OF RAILROAD ST	YEAR	AADT	K-FACTOR
	2021	12383	9.1
	2020	10822	9.1
	2019	12961	9.1
	2018	12960	9.1
	2017	12675	8.5
	2016	12374	8.5
	2015	12143	8.5
	2014	11832	8.5
	2013	11861	8.5
	2012	11840	8.5

SHADY GROVE RD-.10 MI N OF MD355	YEAR	AADT	K-FACTOR
	2021	26440	7.61
	2020	23692	7.3
	2019	28371	7.3
	2018	28370	7.3
	2017	34382	7.99
	2016	33571	7.99
	2015	32940	7.99
	2014	35002	7.68
	2013	35101	7.68
	2012	35030	7.68

MIDCOUNTY HWY-.10 MI S OF WASHINGTON GROVE LA	YEAR	AADT	K-FACTOR
	2021	17460	8.95
	2020	21012	9.63
	2019	25161	9.63
	2018	25160	9.63
	2017	24952	8.89
	2016	24361	8.89
	2015	23910	8.89
	2014	23692	8.93
	2013	23761	8.93
	2012	23710	8.93

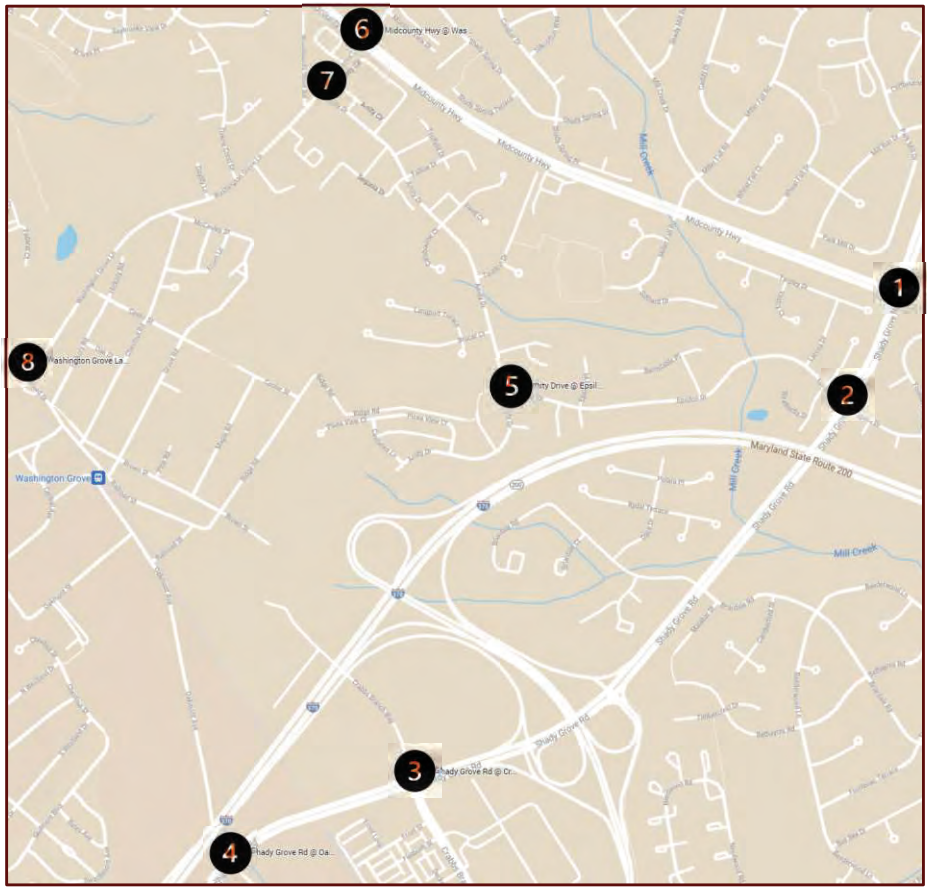
COUNT YEAR

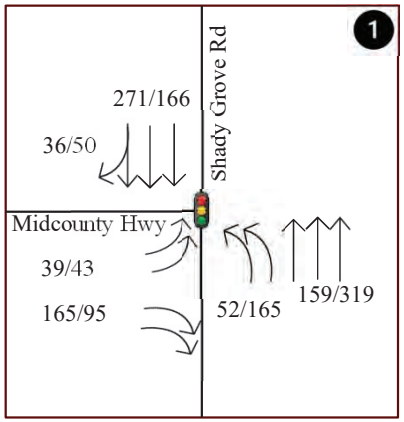
INTERSECTIONS		K-Factor			
		East Leg	West Leg	North Leg	South Leg
#1	Midcounty Hwy & Shady Grove Rd		0.10	0.10	0.09
#2	Shady Grove Rd & Tupelo Dr	0.10	0.10	0.09	0.12
#3	Shady Grove Rd & Crabbs Branch Way	0.08	0.08	0.11	0.08
#4	Shady Grove Rd & Oakmont Ave	0.08	0.09	0.09	0.09
#5	Amity Drive & Epsilon Drive	0.10		0.10	0.10
#6	Midcounty Hwy & Washington Grove Ln	0.09	0.10	0.09	0.08
#7	Amity Drive & Washington Grove Lane	0.10	0.09		0.10
#8	Washington Grove La & Railroad St	0.09	0.09		0.09

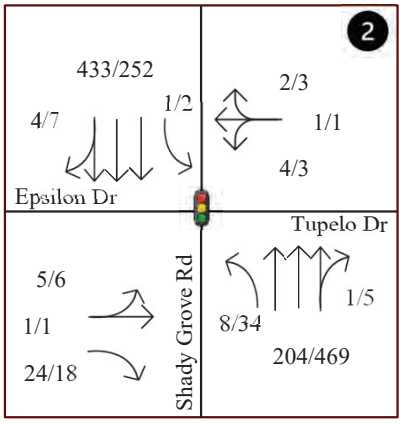
INTERSECTIONS		2021 ADT			
		East Leg	West Leg	North Leg	South Leg
#1	Midcounty Hwy & Shady Grove Rd		17,591	28,792	41,502
#2	Shady Grove Rd & Tupelo Dr	738	3,290	41,502	32,183
#3	Shady Grove Rd & Crabbs Branch Way	26,407	23,322	6,863	14,392
#4	Shady Grove Rd & Oakmont Ave	22,967	23,692	9,989	2,803
#5	Amity Drive & Epsilon Drive	2,081		1,814	451
#6	Midcounty Hwy & Washington Grove Ln	9,702	7,512	16,128	21,012
#7	Amity Drive & Washington Grove Lane	7,512	6,691		3,249
#8	Washington Grove La & Railroad St	7,161	10,822		10,752

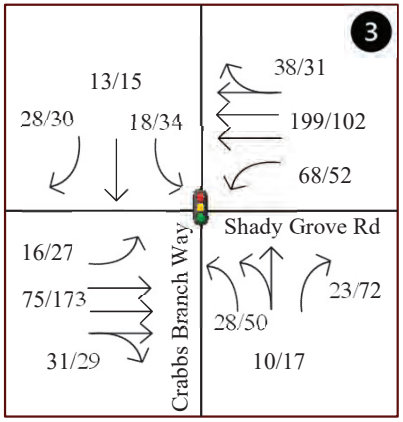
INTERSECTIONS		2040 ADT			
		East Leg	West Leg	North Leg	South Leg
#1	Midcounty Hwy & Shady Grove Rd		21,252	34,784	50,139
#2	Shady Grove Rd & Tupelo Dr	892	3,975	50,139	38,881
#3	Shady Grove Rd & Crabbs Branch Way	31,903	28,176	8,291	17,387
#4	Shady Grove Rd & Oakmont Ave	27,747	28,623	12,068	3,386
#5	Amity Drive & Epsilon Drive	2,514		2,192	545
#6	Midcounty Hwy & Washington Grove Ln	11,721	9,075	19,484	25,385
#7	Amity Drive & Washington Grove Lane	9,075	8,083		3,925
#8	Washington Grove La & Railroad St	8,651	13,074		12,990

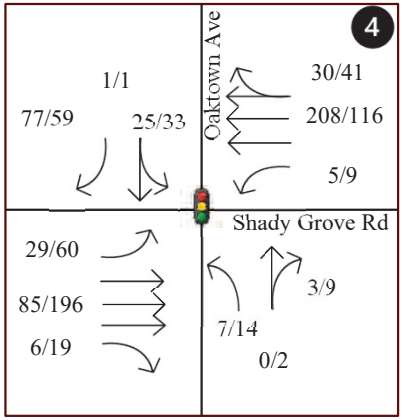
Exhibit 7: Weekday AM/PM Peak Hour Volumes & Lane Configuration – Traffic Growth

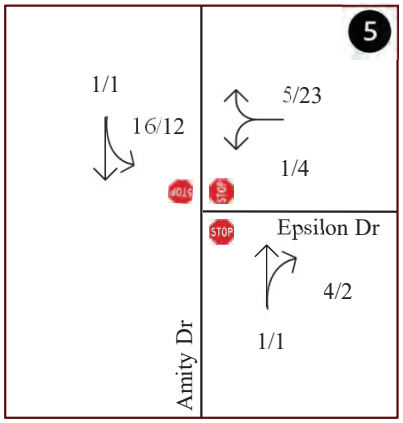


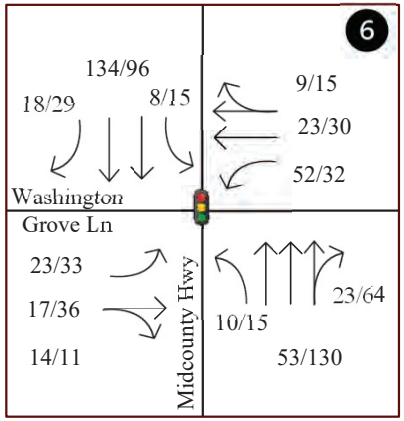


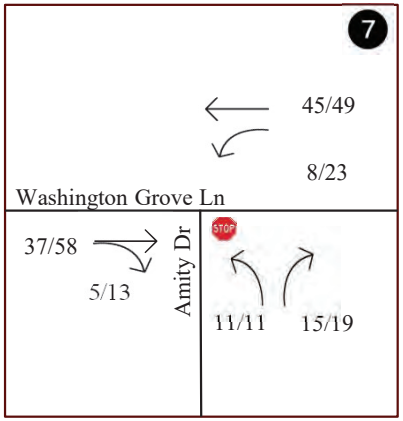


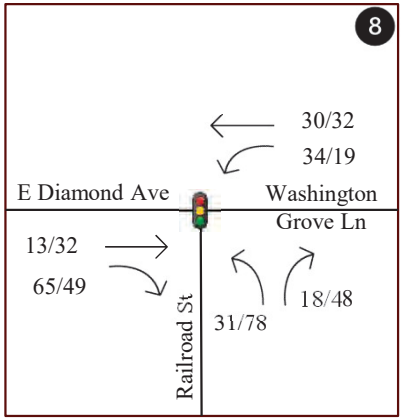




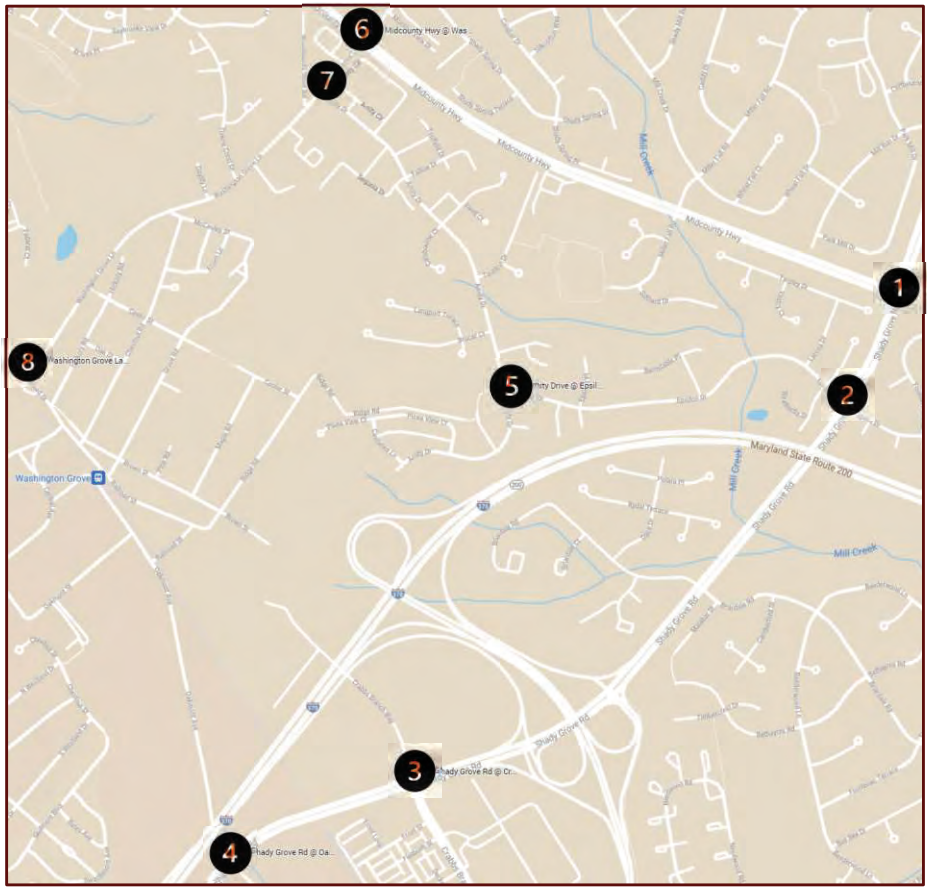


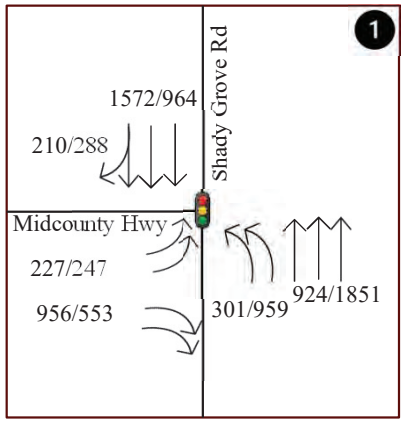


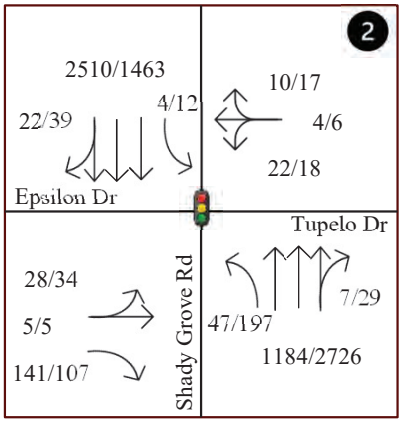


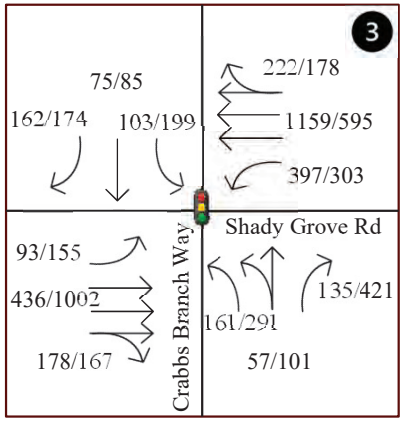


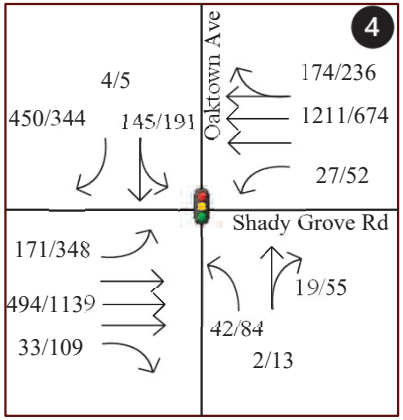
Appendix 15.10 *Exhibit 8: Weekday AM/PM Peak Hour Volumes & Lane Configuration - 2040 No-Build Conditions*

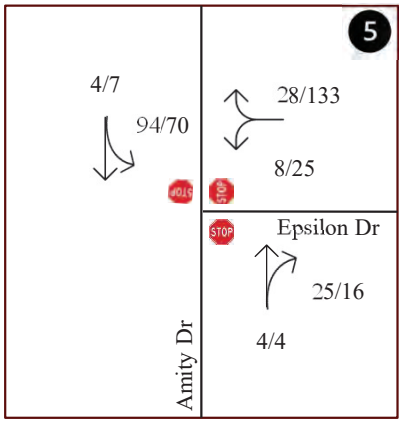


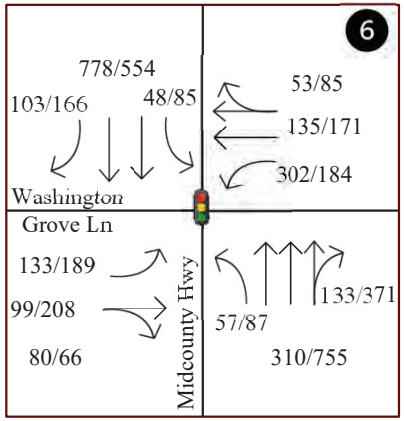


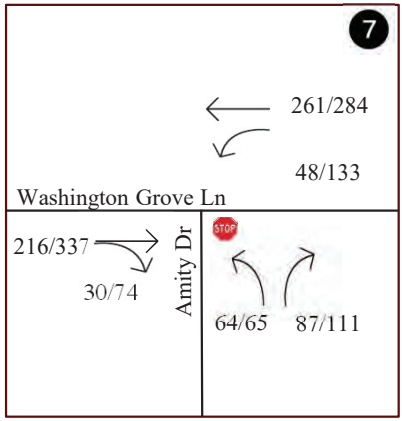












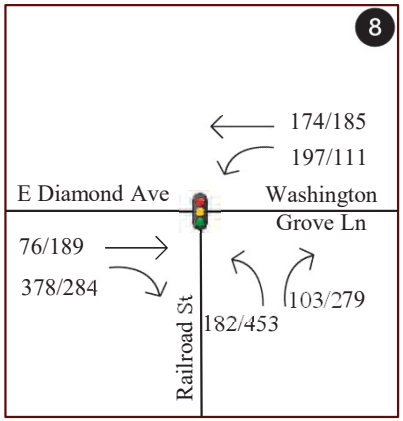


Exhibit 9: Weekday AM and PM Peak Hour Level of Service, Delay and Queue lengths – 2040 No-Build Conditions

2040 NO-BUILD CONDITIONS								
Intersection Information			AM Peak			PM Peak		
Traffic Control	Approach	Movement	LOS	Delay (sec)	95th Queue (ft)	LOS	Delay (sec)	95th Queue (ft)
1. Midcounty Hwy & Shady Grove Rd								
Signalized	Eastbound (Midcounty Hwy)	EBL	D	40.0	132	D	53.5	162
		EBR	D	43.7	606	B	15.6	168
		EB Approach	**D**	**43.0**		**C**	**27.3**	
	Northbound (Shady Grove Rd)	NBL	F	161.3	#296	D	47.7	507
		NBT	B	13.8	187	A	9.8	335
		NB Approach	**D**	**50.7**		**C**	**23.0**	
	Southbound (Shady Grove Rd)	SBTR	C	34.8	627	D	52.1	#645
		SB Approach	**C**	**34.8**		**D**	**52.1**	
Overall LOS (Delay)			**D (41.8)**			**C (31.3)**		
2. Shady Grove Rd & Tupelo Dr								
Signalized	Eastbound (Epsilon Dr)	EBLT	E	60.7	66	E	62.4	76
		EBR	F	90.2	220	E	74.2	174
		EB Approach	**F**	**84.7**		**E**	**71.0**	
	Westbound (Tupelo Dr)	WBLTR	E	60.7	60	E	61.5	63
		WB Approach	**E**	**60.7**		**E**	**61.5**	
	Northbound (Shady Grove Rd)	NBL	E	73.1	94	E	74.0	283
		NBTR	A	6.6	211	B	13.2	834
		NB Approach	**A**	**9.3**		**B**	**17.4**	
	Southbound (Shady Grove Rd)	SBL	F	81.8	17	E	78.1	37
		SBTR	B	17.6	906	B	17.4	454
		SB Approach	**B**	**17.7**		**B**	**17.9**	
Overall LOS (Delay)			**B (18.6)**			**B (19.7)**		
3. Shady Grove Rd & Crabbs Branch Way								
Signalized	Eastbound (Shady Grove Rd)	EBL	D	39.5	108	C	32.9	m127
		EBTR	C	26.8	160	E	59.8	#544
		EB Approach	**C**	**28.5**		**E**	**56.7**	
	Westbound (Shady Grove Rd)	WBL	C	20.3	330	F	85.2	#577
		WBTR	C	26.6	539	D	40.8	319
		WB Approach	**C**	**25.3**		**D**	**53.3**	
	Northbound (Crabbs Branch Way)	NBL	E	71.2	182	E	72.1	298
		NBLT	E	69.3	183	E	71.9	302
		NBR	C	34.8	66	D	44.8	#313
		NB Approach	**E**	**56.7**		**E**	**57.9**	
	Southbound (Crabbs Branch Way)	SBL	E	70.8	166	E	72.5	288
		SBT	E	62.8	126	E	55.7	131
		SBR	E	60.5	205	D	40.0	108
		SB Approach	**E**	**64.1**		**E**	**57.0**	
Overall LOS (Delay)			**C (33.7)**			**E (56.0)**		
4. Shady Grove Rd & Oakmont Ave								
Signalized	Eastbound (Shady Grove Rd)	EBL	E	55.3	#223	D	42.2	#380
		EBT	C	21.5	137	C	24.1	331
		EBR	B	14.2	2	B	11.9	40
		EB Approach	**C**	**29.4**		**C**	**27.3**	
	Westbound (Shady Grove Rd)	WBL	B	15.9	m13	C	21.1	m35
		WBTR	C	27.4	183	C	33.5	184
		WB Approach	**C**	**27.2**		**C**	**32.9**	
	Northbound (Oakmont Ave)	NBL	E	72.7	86	E	70.1	146
		NBTR	E	65.5	32	E	62.2	63
		NB Approach	**E**	**70.3**		**E**	**66.5**	
	Southbound (Oakmont Ave)	SBLT	D	51.7	225	E	70.4	#322
		SBR	D	52.1	479	D	38.7	266
		SB Approach	**D**	**52.0**		**D**	**50.2**	
Overall LOS (Delay)			**C (34.1)**			**C (34.6)**		
5. Amity Drive & Epsilon Drive								
Unsignalized	Westbound (Epsilon Drive)	WBLR	A	7.0	3	A	7.5	15
		WB Approach	**A**	**7.0**		**A**	**7.5**	
	Northbound (Amity Drive)	NBTR	A	6.8	3	A	6.9	3
		NB Approach	**A**	**6.8**		**A**	**6.9**	
	Southbound (Amity Drive)	SBLT	A	7.8	10	A	8.0	10
		SB Approach	**A**	**7.8**		**A**	**8.0**	
Overall LOS (Delay)			**A (7.5)**			**A (7.6)**		
6. Midcounty Hwy & Washington Grove Ln								
Signalized	Eastbound (Midcounty Hwy)	EBL	B	19.9	52	C	23.0	88
		EBT	C	30.7	418	C	29.0	306
		EBR	C	23.6	34	C	25.1	54
		EB Approach	**C**	**29.3**		**C**	**27.6**	
	Westbound (Midcounty Hwy)	WBL	C	21.2	61	C	20.5	91
		WBTR	C	24.9	131	C	32.1	417
		WB Approach	**C**	**24.5**		**C**	**31.3**	
	Northbound (Washington Grove Ln)	NBL	D	48.7	136	D	41.1	175
		NBTR	E	74.7	241	E	73.8	364
		NB Approach	**E**	**63.6**		**E**	**60.5**	
	Southbound (Washington Grove Ln)	SBL	D	48.5	311	D	42.5	172
		SBTR	D	47.4	104	D	51.3	133
		SB Approach	**D**	**48.1**		**D**	**47.6**	
Overall LOS (Delay)			**D (37.3)**			**D (37.4)**		
7. Amity Drive & Washington Grove Lane								
Unsignalized	Eastbound (Washington Grove Lane)	EBTR		0.0			0.0	
		EB Approach		**0.0**			**0.0**	
	Westbound (Washington Grove Lane)	WBL	A	8.0	3	A	8.7	10
		WBT						
		WB Approach		**1.3**			**2.8**	
	Northbound (Amity Dr)	NBL	B	12.3	18	C	17.4	43
		NBR			10			18
		NB Approach	**B**	**12.3**		**C**	**17.4**	
Overall LOS (Delay)			**A (3.2)**			**A (4.2)**		
8. Washington Grove La & Railroad St								
Signalized	Eastbound (E Diamond Ave)	EBT	D	39.4	99	D	35.6	197
		EBR	A	0.5	0	B	0.3	0
		EB Approach	**A**	**7.1**		**B**	**14.4**	
	Westbound (Washington Grove Lane)	WBL	C	22.9	159	C	25.7	97
		WBT	C	20.6	138	C	22.0	150
		WB Approach	**C**	**21.8**		**C**	**23.4**	
	Northbound (Railroad St)	NBL	C	21.5	149	C	28.5	404
		NBR	A	0.1	0	A	0.3	0
		NB Approach	**B**	**13.6**		**B**	**17.7**	
Overall LOS (Delay)			**B (13.7)**			**B (17.8)**		

95th percentile volume exceeds capacity, queue may be longer
m Volume for the 95th percentile queue is metered by upstream signal

Exhibit 10: Residential Trip Computation

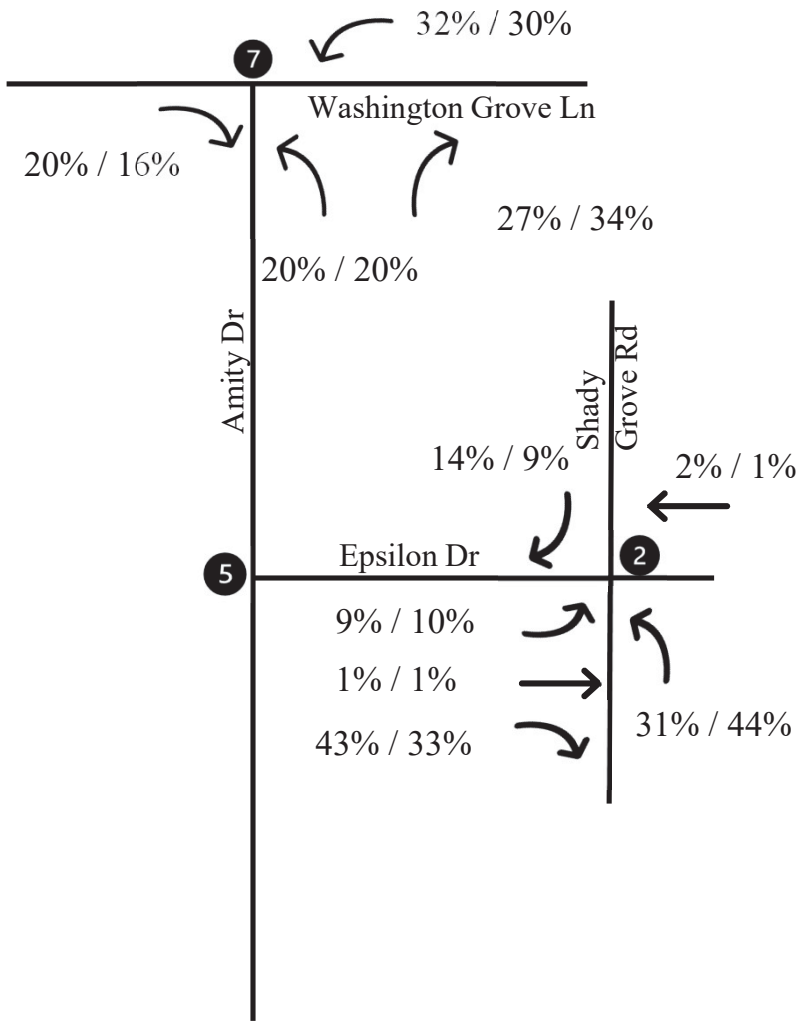
Existing Conditions			
Peak Hour Trips	**IN**	**OUT**	**TOTAL**
AM	126 (32%)	269 (68%)	395
PM	371 (58%)	267 (42%)	638
Total Residential Units		882	
Peak Hr Trips/Unit		AM	0.45
		PM	0.72

2040 Build Conditions			
Peak Hour Trips	**IN**	**OUT**	**TOTAL**
AM	151 (32%)	325 (68%)	476
PM	449 (58%)	322 (42%)	771
Total Residential Units		882	
Peak Hr Trips/Unit		AM	0.54
		PM	0.87

Exhibit 11: Weekday AM/PM Peak Hour Trip Distribution to/From Amity Dr & Epsilon Dr

Appendix 15.13

EXISTING CONDITIONS



2040 BUILD CONDITIONS

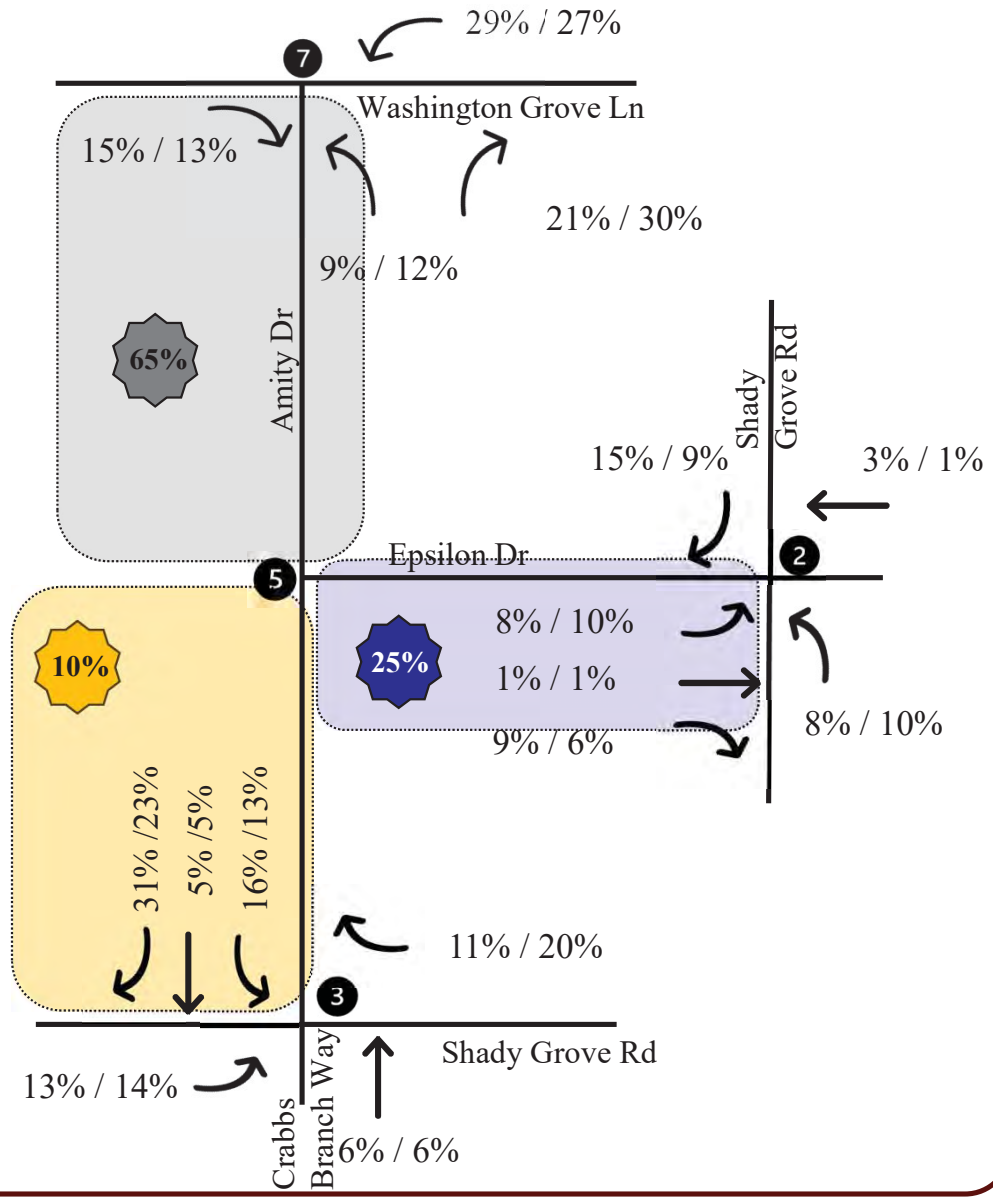
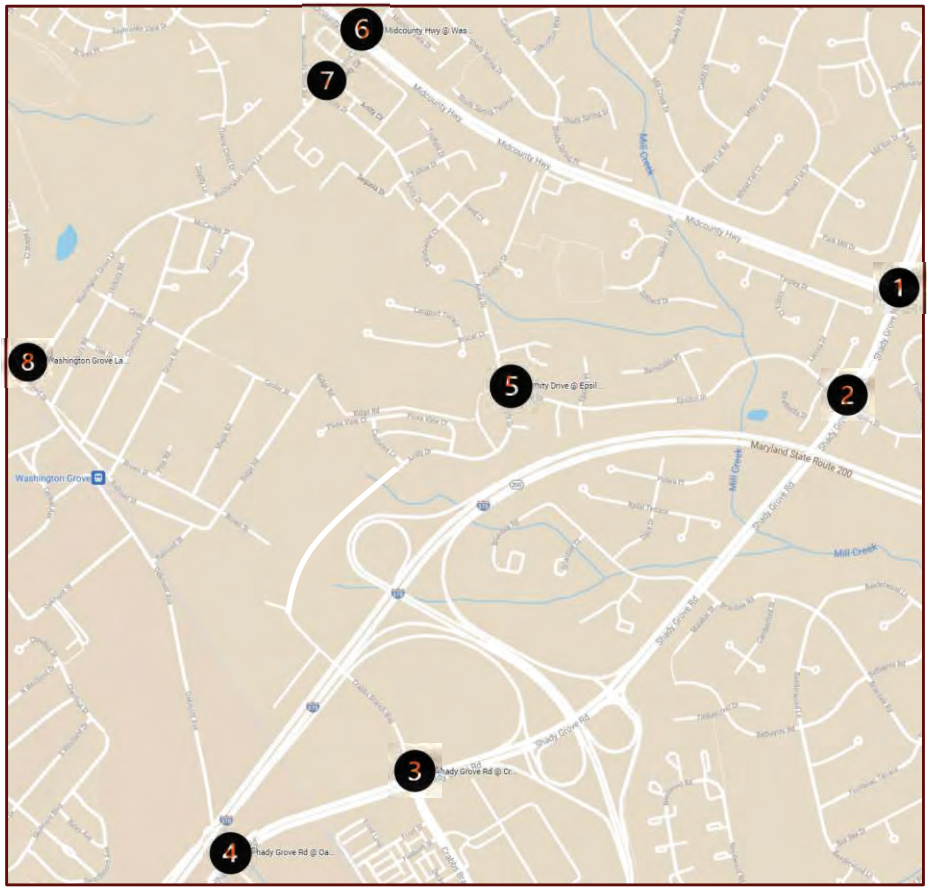
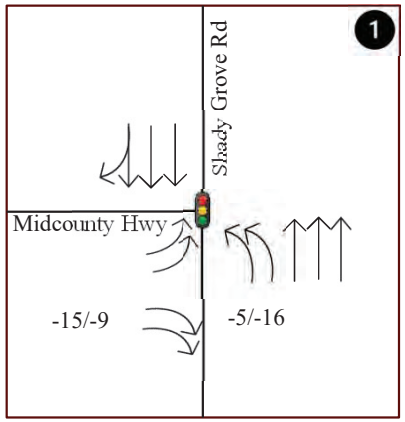
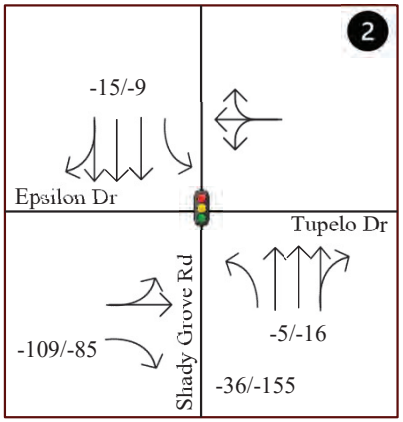
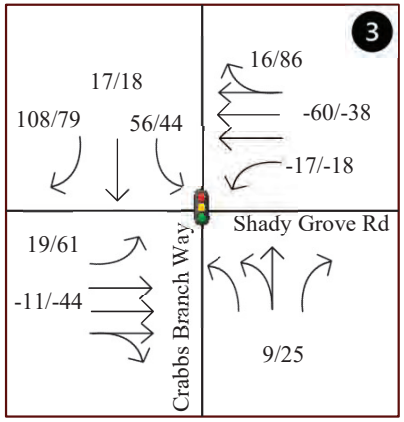


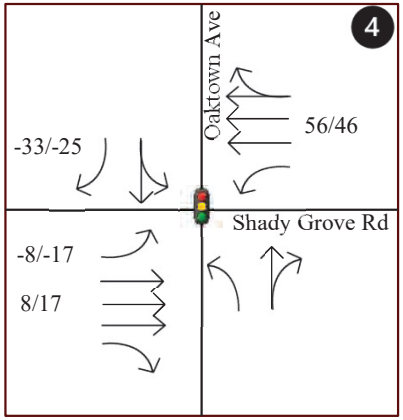
Exhibit 12: Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 Build Conditions (Rerouted Trips)

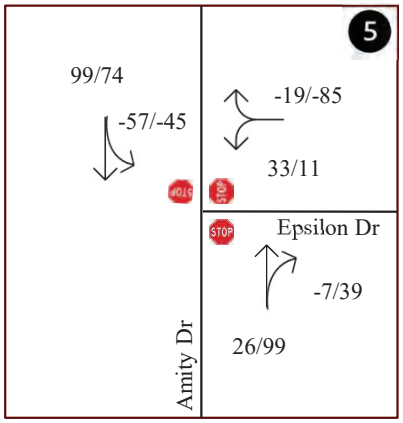


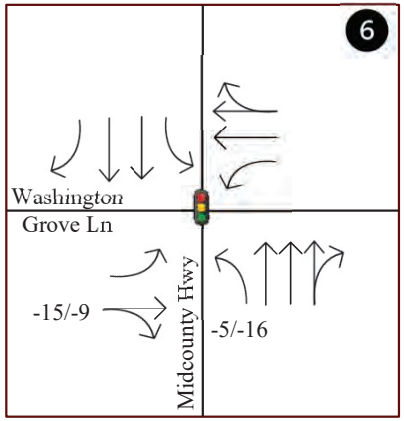


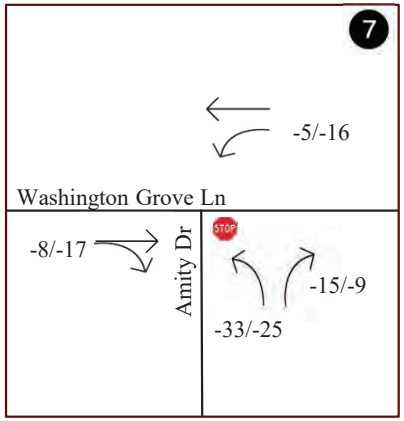












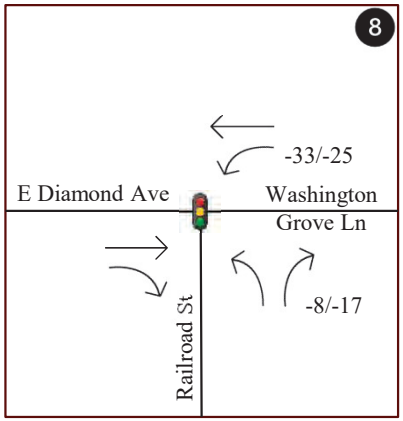
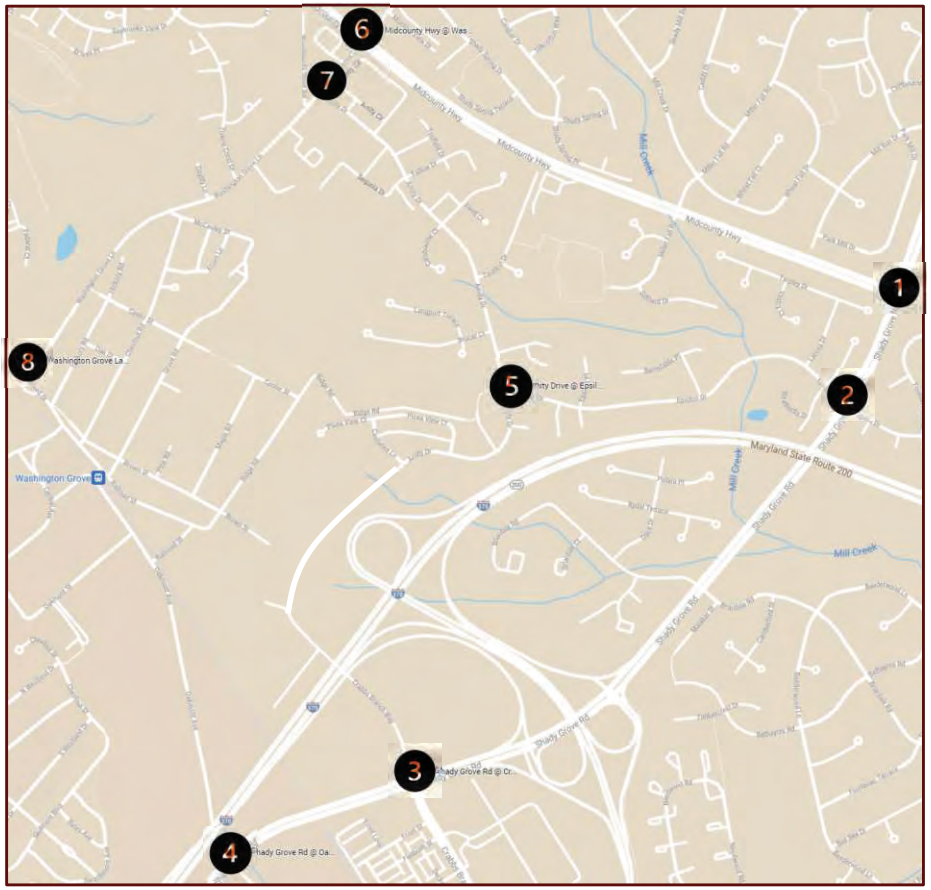
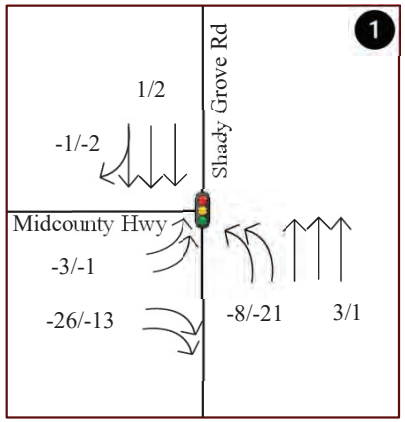
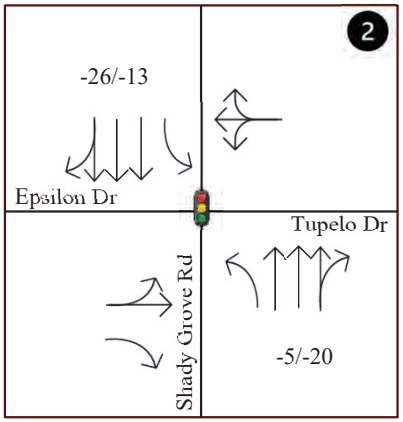
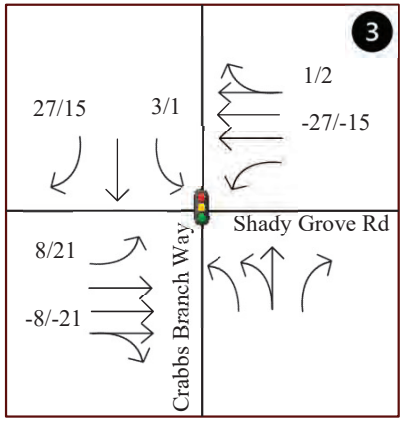


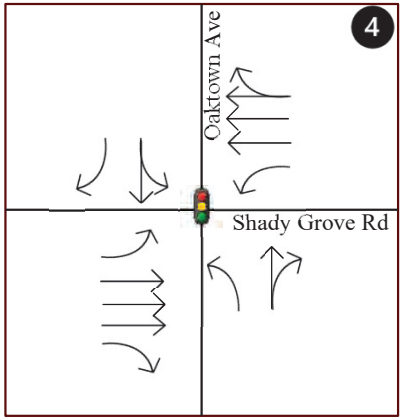
Exhibit 13: Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 Build Conditions (Estimated Cut-Through Traffic Volumes on Amity Dr)

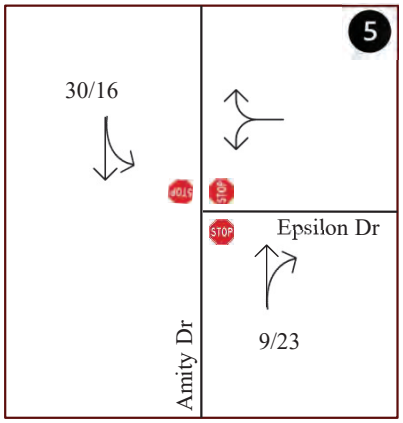


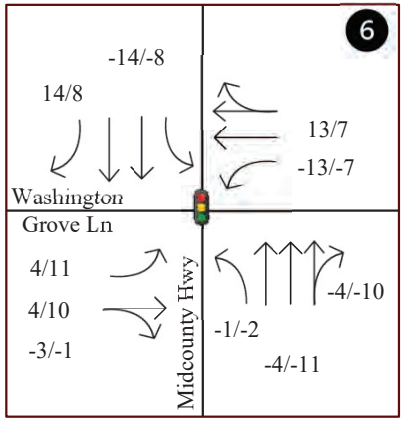


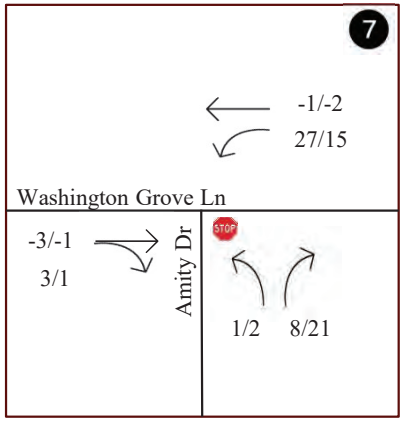


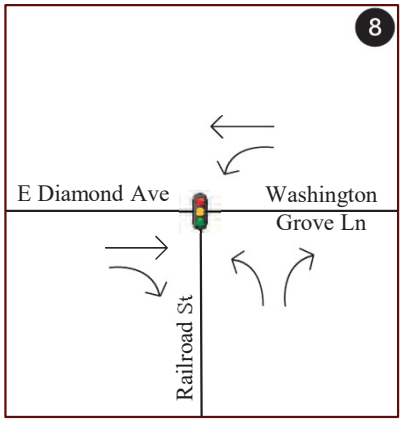




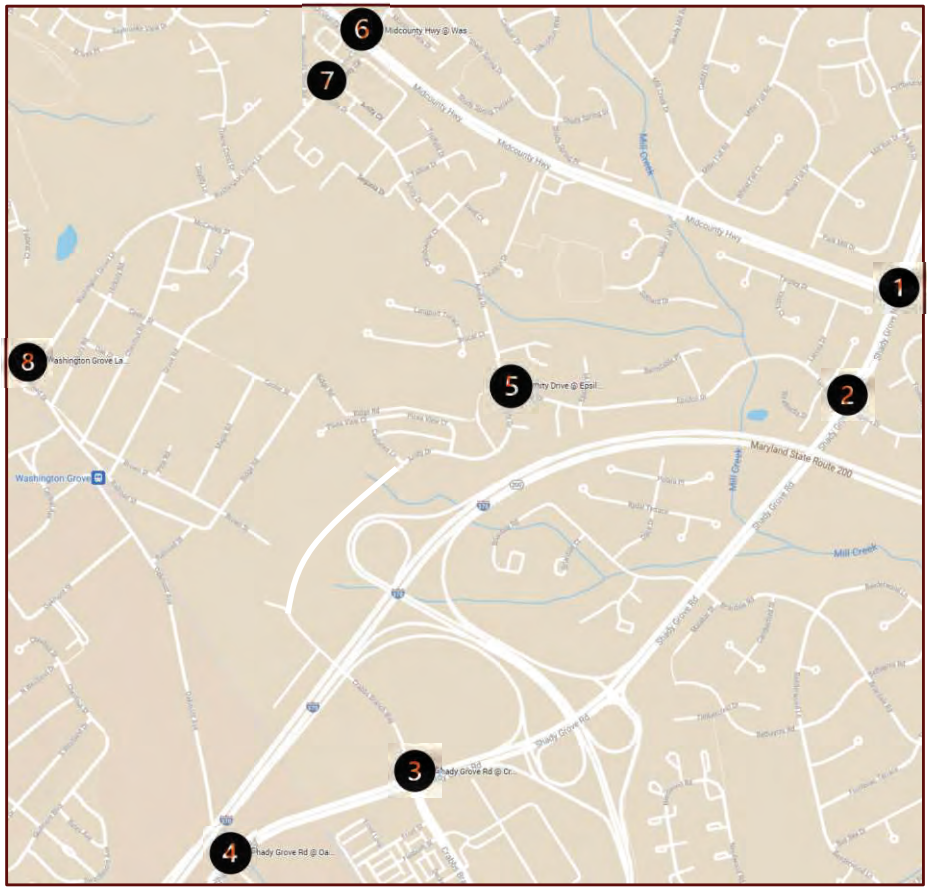


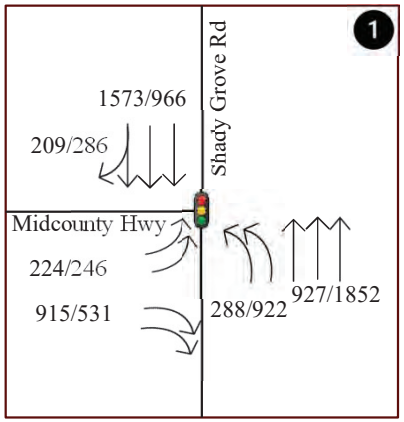


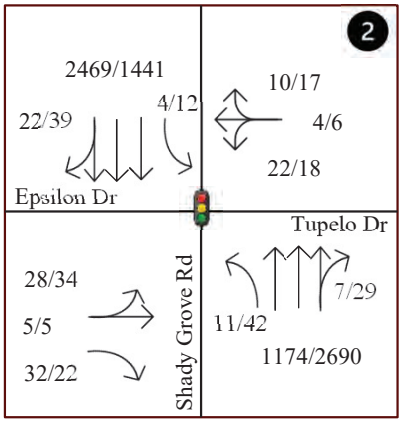


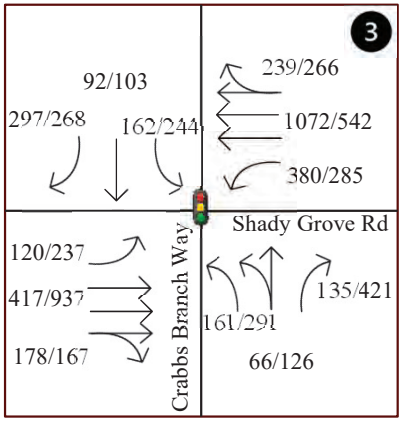


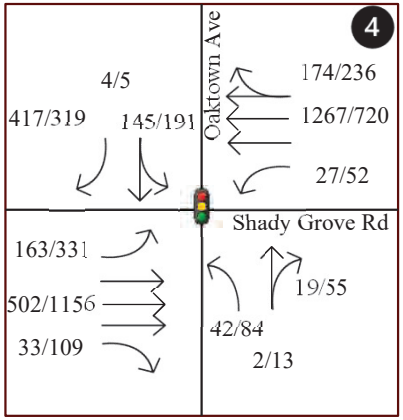
Appendix 15.16 ***Exhibit 14: 2040 Future Weekday AM/PM Peak Hour Volumes & Lane Configuration – 2040 Build Conditions (Crabbs Branch Way Extension)***

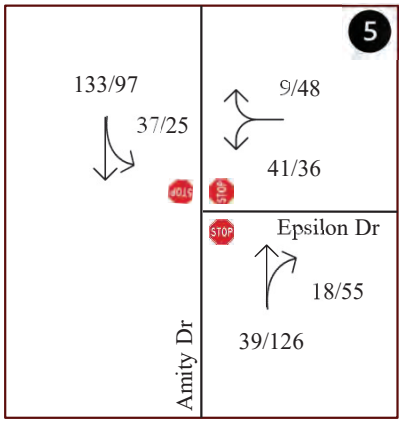


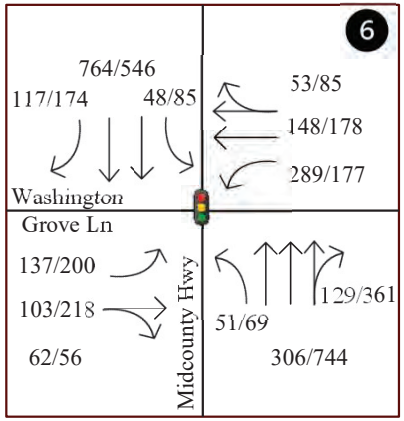


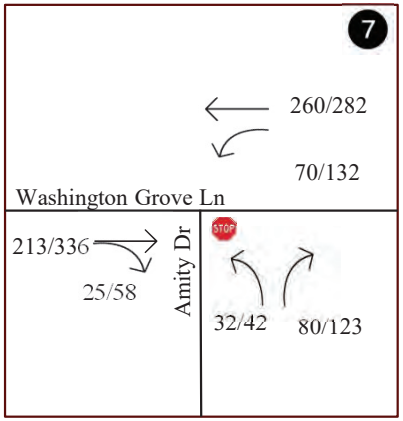


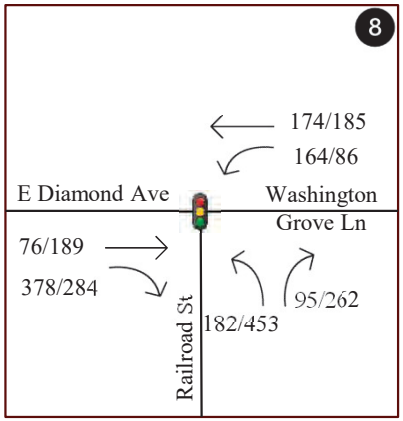












Appendix 15.17 ***Exhibit 15: Weekday AM and PM Peak Hour Level of Service, Delay and Queue lengths – 2040 Build Conditions (with Crabbs Branch Way Extension)***

2040 BUILD CONDITIONS WITH CRABBS BRANCH WAY EXTENSION								
Intersection Information			AM Peak			PM Peak		
Traffic Control	Approach	Movement	LOS	Delay (sec)	95th Queue (ft)	LOS	Delay (sec)	95th Queue (ft)
1. Midcounty Hwy & Shady Grove Rd								
Signalized	Eastbound (Midcounty Hwy)	EBL	D	40.4	130	D	53.9	161
		EBR	D	41.5	567	B	16.5	167
		EB Approach	**D**	**41.1**		**C**	**28.3**	
	Northbound (Shady Grove Rd)	NBL	F	130.5	#279	D	48.3	492
		NBT	B	13.6	188	A	9.5	335
		NB Approach	**D**	**41.7**		**C**	**22.7**	
	Southbound (Shady Grove Rd)	SBTR	C	34.8	627	D	49.6	#639
		SB Approach	**C**	**34.8**		**D**	**49.6**	
Overall LOS (Delay)			**D (38.6)**			**C (30.8)**		
2. Shady Grove Rd & Tupelo Dr								
Signalized	Eastbound (Epsilon Dr)	EBLT	E	71.0	72	E	72.1	81
		EBR	E	70.7	72	E	69.0	53
		EB Approach	**E**	**70.9**		**E**	**71.0**	
	Westbound (Tupelo Dr)	WBLTR	E	73.2	66	E	70.2	67
		WB Approach	**E**	**73.2**		**E**	**70.2**	
	Northbound (Shady Grove Rd)	NBL	E	77.5	35	E	72.6	87
		NBTR	A	3.7	151	A	8.5	656
		NB Approach	**A**	**9.3**		**A**	**9.6**	
	Southbound (Shady Grove Rd)	SBL	F	81.8	17	E	78.1	37
		SBTR	A	7.7	575	A	6.6	268
		SB Approach	**A**	**7.8**		**A**	**7.2**	
Overall LOS (Delay)			**A (8.5)**			**B (10.2)**		
3. Shady Grove Rd & Crabbs Branch Way								
Signalized	Eastbound (Shady Grove Rd)	EBL	D	44.3	127	D	48.3	#220
		EBTR	C	28.1	154	D	49.9	#494
		EB Approach	**C**	**30.9**		**D**	**49.7**	
	Westbound (Shady Grove Rd)	WBL	C	25.1	350	F	100.6	#534
		WBTR	C	33.0	#605	D	45.1	337
		WB Approach	**C**	**31.3**		**E**	**59.6**	
	Northbound (Crabbs Branch Way)	NBL	E	71.3	187	E	73.4	317
		NBLT	E	69.0	190	E	73.9	323
		NBR	D	37.5	71	D	49.5	#313
		NB Approach	**E**	**58.0**		**E**	**61.5**	
	Southbound (Crabbs Branch Way)	SBL	E	71.6	238	E	77.3	#374
		SBT	E	57.0	139	D	53.9	155
		SBR	E	78.0	347	D	41.8	170
		SB Approach	**E**	**72.6**		**E**	**57.9**	
Overall LOS (Delay)			**D (41.1)**			**E (56.3)**		
4. Shady Grove Rd & Oakmont Ave								
Signalized	Eastbound (Shady Grove Rd)	EBL	E	57.5	#218	D	42.6	#362
		EBT	C	21.5	139	C	24.3	337
		EBR	B	14.2	2	B	11.9	40
		EB Approach	**C**	**29.6**		**C**	**27.3**	
	Westbound (Shady Grove Rd)	WBL	B	18.2	m14	C	23.8	m35
		WBTR	C	28.8	282	D	37.5	256
		WB Approach	**C**	**28.6**		**D**	**36.8**	
	Northbound (Oakmont Ave)	NBL	E	72.7	86	E	70.1	146
		NBTR	E	65.5	32	E	62.2	63
		NB Approach	**E**	**70.3**		**E**	**66.5**	
	Southbound (Oakmont Ave)	SBLT	D	51.7	225	E	70.4	#322
		SBR	D	47.9	414	D	39.1	247
		SB Approach	**D**	**48.9**		**D**	**50.4**	
Overall LOS (Delay)			**C (33.9)**			**D (35.8)**		
5. Amity Drive & Epsilon Drive								
Unsignalized	Westbound (Epsilon Drive)	WBLR	A	8.5	5	A	7.9	10
		WB Approach	**A**	**8.5**		**A**	**7.9**	
	Northbound (Amity Drive)	NBTR	A	8.1	8	A	8.2	20
		NB Approach	**A**	**8.1**		**A**	**8.2**	
	Southbound (Amity Drive)	SBLT	B	12.3	58	A	8.2	15
		SB Approach	**B**	**12.3**		**A**	**8.2**	
Overall LOS (Delay)			**A (11.3)**			**A (8.1)**		
6. Midcounty Hwy & Washington Grove Ln								
Signalized	Eastbound (Midcounty Hwy)	EBL	B	18.9	51	C	22.2	88
		EBT	C	29.1	400	C	28.2	300
		EBR	C	22.7	46	C	24.6	55
		EB Approach	**C**	**27.7**		**C**	**26.7**	
	Westbound (Midcounty Hwy)	WBL	C	20.0	54	C	20.1	75
		WBTR	C	23.8	126	C	31.5	407
		WB Approach	**C**	**23.4**		**C**	**30.8**	
	Northbound (Washington Grove Ln)	NBL	D	49.5	141	D	40.9	186
		NBTR	E	74.7	228	E	72.5	363
		NB Approach	**E**	**63.3**		**E**	**59.2**	
	Southbound (Washington Grove Ln)	SBL	D	47.3	301	D	43.6	167
		SBTR	D	49.5	116	D	52.8	141
		SB Approach	**D**	**48.2**		**D**	**49.1**	
Overall LOS (Delay)			**D (36.3)**			**D (37.1)**		
7. Amity Drive & Washington Grove Lane								
Unsignalized	Eastbound (Washington Grove Lane)	EBTR		0.0			0.0	
		EB Approach		**0.0**			**0.0**	
	Westbound (Washington Grove Lane)	WBL	A	8.1	5	A	8.6	10
		WBT						
		WB Approach		**1.8**			**2.7**	
	Northbound (Amity Dr)	NBL	B	11.6	10	B	14.8	23
		NBR			10			20
		NB Approach	**B**	**11.6**		**B**	**14.8**	
Overall LOS (Delay)			**A (2.8)**			**A (3.7)**		
8. Washington Grove La & Railroad St								
Signalized	Eastbound (E Diamond Ave)	EBT	D	39.4	99	D	35.6	197
		EBR	A	0.5	0	B	0.3	0
		EB Approach	**A**	**7.1**		**B**	**14.4**	
	Westbound (Washington Grove Lane)	WBL	C	21.8	133	C	24.7	77
		WBT	C	20.6	138	C	22.0	150
		WB Approach	**C**	**21.2**		**C**	**22.9**	
	Northbound (Railroad St)	NBL	C	21.5	149	C	28.5	404
		NBR	A	0.1	0	A	0.3	0
		NB Approach	**B**	**14.0**		**B**	**18.1**	
Overall LOS (Delay)			**B (13.4)**			**B (17.8)**		

95th percentile volume exceeds capacity, queue may be longer

m Volume for the 95th percentile queue is metered by upstream signal

Exhibit 16: Key Comparative Differences - 2040 No-Build and Build Conditions

Intersection	Delay/LOS/95th Percentile Queue		2040 No-Build Conditions	2040 Build Conditions - with Crabbs Branch Way Extension
Shady Grove Rd & Crabbs Branch Way	Delay	AM	33.7 seconds	41.1 seconds
		PM	56 seconds	56.3 seconds
	LOS	AM	C	D
		PM	E	E
	95th Percentile Queue - SB Right Turns	AM	205 feet	347 feet
		PM	108 feet	170 feet
Segment			**2040 No-Build Conditions**	**2040 Build Conditions - with Crabbs Branch Way Extension**
Crabbs Branch Way Extension	Peak Hour Volume*	AM	N/A	264 vehciles
		PM	N/A	351 vehicles
	ADT*		N/A	3,600 vpd
Amity Dr south of Epsilon Dr			540 vpd	3,200 vpd
Crabbs Branch Way north of Shady Grove Rd			8,300 vpd	11,500 vpd

* Estimates only

Appendix 15.19

APPENDIX A: TRAFFIC COUNT DATA

MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

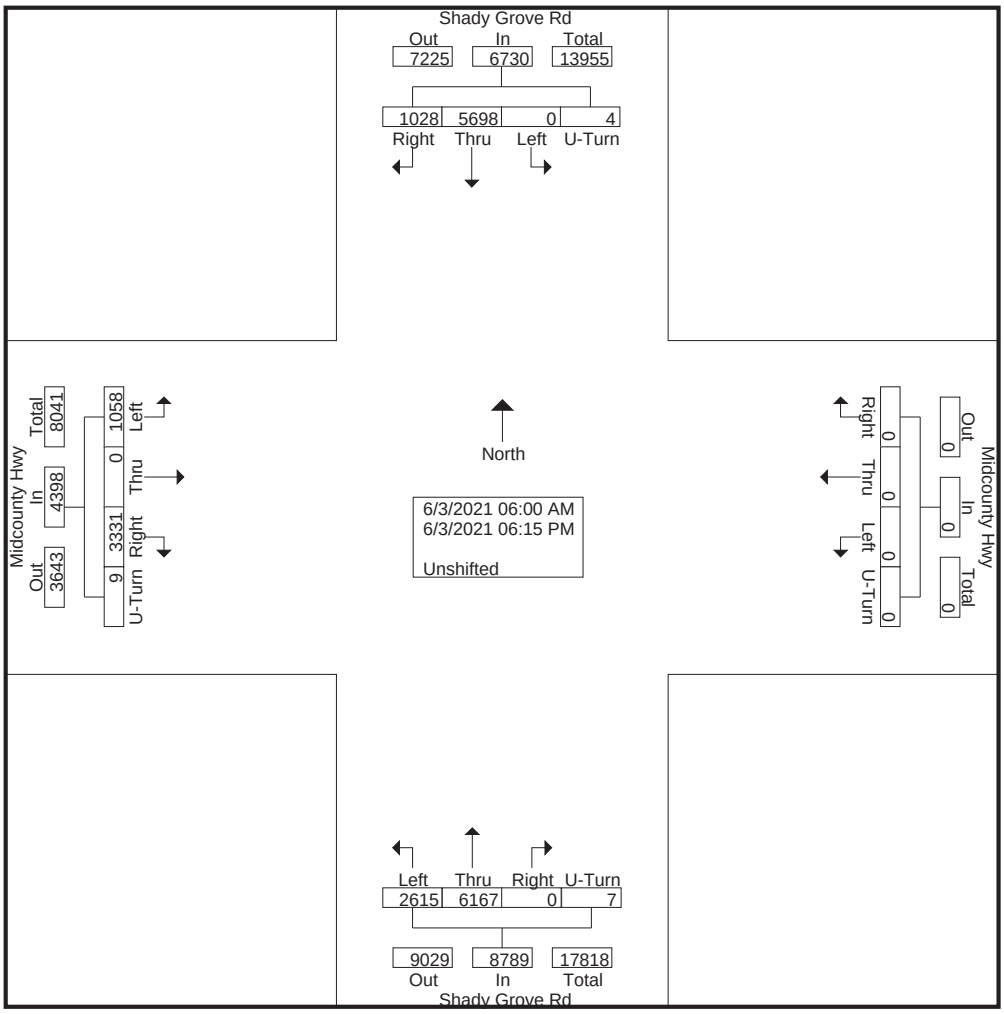
File Name : 1. Midcounty Hwy @ Shady Grove Rd
Site Code : J 998-1
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Shady Grove Rd From North					Midcounty Hwy From East					Shady Grove Rd From South					Midcounty Hwy From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	0	183	9	0	192	0	0	0	0	0	22	87	0	0	109	28	0	89	0	117	418
06:15 AM	0	231	11	0	242	0	0	0	0	0	21	115	0	0	136	35	0	146	0	181	559
06:30 AM	0	221	14	0	235	0	0	0	0	0	19	118	0	0	137	54	0	161	0	215	587
06:45 AM	0	248	14	0	262	0	0	0	0	0	47	163	0	0	210	34	0	157	0	191	663
Total	0	883	48	0	931	0	0	0	0	0	109	483	0	0	592	151	0	553	0	704	2227
07:00 AM	0	308	17	0	325	0	0	0	0	0	34	118	0	0	152	36	0	173	0	209	686
07:15 AM	0	326	39	0	365	0	0	0	0	0	42	136	0	0	178	39	0	169	0	208	751
07:30 AM	0	321	44	0	365	0	0	0	0	0	43	181	0	0	224	38	0	201	0	239	828
07:45 AM	0	332	62	0	394	0	0	0	0	0	59	202	0	0	261	44	0	209	0	253	908
Total	0	1287	162	0	1449	0	0	0	0	0	178	637	0	0	815	157	0	752	0	909	3173
08:00 AM	0	313	31	0	344	0	0	0	0	0	48	170	0	0	218	46	0	196	1	243	805
08:15 AM	0	346	36	0	382	0	0	0	0	0	71	203	0	1	275	52	0	197	0	249	906
08:30 AM	0	310	45	0	355	0	0	0	0	0	70	190	0	0	260	45	0	189	0	234	849
08:45 AM	0	286	58	1	345	0	0	0	0	0	64	186	0	0	250	40	0	195	2	237	832
Total	0	1255	170	1	1426	0	0	0	0	0	253	749	0	1	1003	183	0	777	3	963	3392
03:30 PM	0	210	52	0	262	0	0	0	0	0	126	332	0	0	458	44	0	131	0	175	895
03:45 PM	0	225	59	0	284	0	0	0	0	0	159	369	0	0	528	50	0	96	1	147	959
Total	0	435	111	0	546	0	0	0	0	0	285	701	0	0	986	94	0	227	1	322	1854
04:00 PM	0	203	52	0	255	0	0	0	0	0	157	343	0	0	500	52	0	127	0	179	934
04:15 PM	0	185	59	0	244	0	0	0	0	0	171	378	0	0	549	49	0	119	0	168	961
04:30 PM	0	208	49	0	257	0	0	0	0	0	170	375	0	0	545	56	0	102	2	160	962
04:45 PM	0	185	63	0	248	0	0	0	0	0	204	402	0	0	606	63	0	99	1	163	1017
Total	0	781	223	0	1004	0	0	0	0	0	702	1498	0	0	2200	220	0	447	3	670	3874
05:00 PM	0	201	48	0	249	0	0	0	0	0	165	393	0	2	560	51	0	120	0	171	980
05:15 PM	0	193	69	1	263	0	0	0	0	0	225	391	0	1	617	43	0	126	0	169	1049
05:30 PM	0	216	58	2	276	0	0	0	0	0	196	346	0	1	543	46	0	113	0	159	978
05:45 PM	0	146	49	0	195	0	0	0	0	0	162	313	0	1	476	53	0	83	1	137	808
Total	0	756	224	3	983	0	0	0	0	0	748	1443	0	5	2196	193	0	442	1	636	3815
06:00 PM	0	146	53	0	199	0	0	0	0	0	184	318	0	1	503	24	0	70	0	94	796
06:15 PM	0	155	37	0	192	0	0	0	0	0	156	338	0	0	494	36	0	63	1	100	786
Grand Total	0	5698	1028	4	6730	0	0	0	0	0	2615	6167	0	7	8789	1058	0	3331	9	4398	19917
Apprch %	0	84.7	15.3	0.1		0	0	0	0		29.8	70.2	0	0.1		24.1	0	75.7	0.2		
Total %	0	28.6	5.2	0	33.8	0	0	0	0	0	13.1	31	0	0	44.1	5.3	0	16.7	0	22.1	

MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 1. Midcounty Hwy @ Shady Grove Rd
Site Code : J 998-1
Start Date : 6/3/2021
Page No : 2



MCV Associates, Inc.
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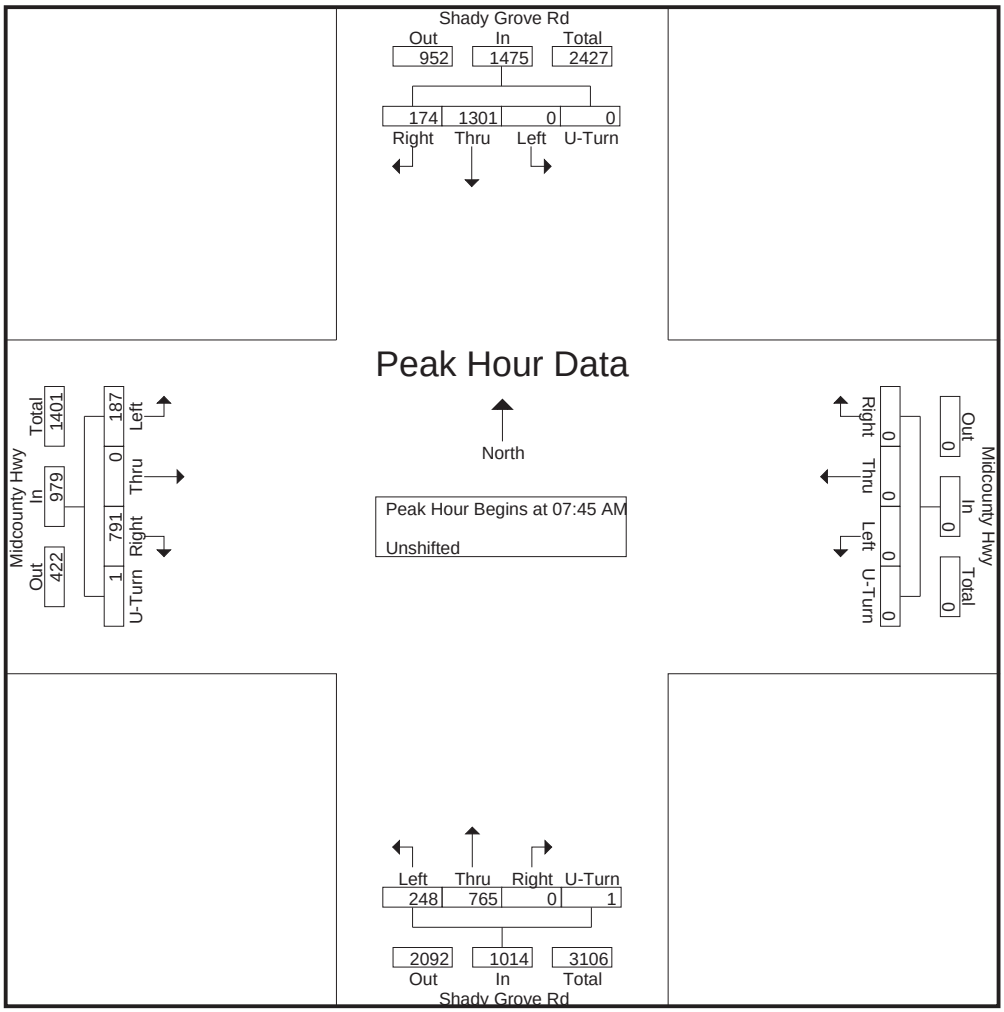
Phone: 703 914-4850

File Name : 1. Midcounty Hwy @ Shady Grove Rd
Site Code : J 998-1
Start Date : 6/3/2021
Page No : 3

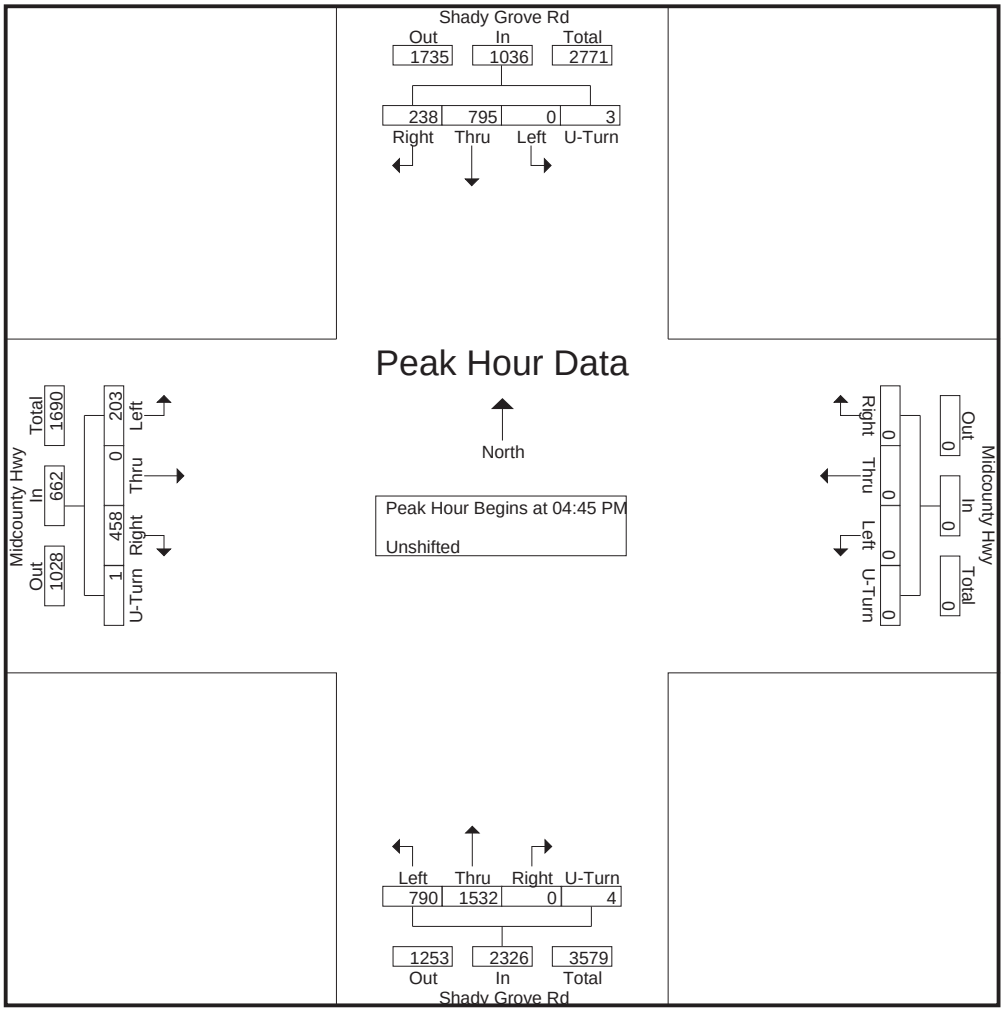
	Shady Grove Rd From North					Midcounty Hwy From East					Shady Grove Rd From South					Midcounty Hwy From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	332	**62**	0	**394**	0	0	0	0	0	59	202	0	0	261	44	0	**209**	0	**253**	**908**
08:00 AM	0	313	31	0	344	0	0	0	0	0	48	170	0	0	218	46	0	196	**1**	243	805
08:15 AM	0	**346**	36	0	382	0	0	0	0	0	**71**	**203**	0	**1**	**275**	**52**	0	197	0	249	906
08:30 AM	0	310	45	0	355	0	0	0	0	0	70	190	0	0	260	45	0	189	0	234	849
Total Volume	0	1301	174	0	1475	0	0	0	0	0	248	765	0	1	1014	187	0	791	1	979	3468
% App. Total	0	88.2	11.8	0		0	0	0	0		24.5	75.4	0	0.1		19.1	0	80.8	0.1		
PHF	.000	.940	.702	.000	.936	.000	.000	.000	.000	.000	.873	.942	.000	.250	.922	.899	.000	.946	.250	.967	.955



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 1. Midcounty Hwy @ Shady Grove Rd
Site Code : J 998-1
Start Date : 6/3/2021
Page No : 4

	Shady Grove Rd From North					Midcounty Hwy From East					Shady Grove Rd From South					Midcounty Hwy From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	185	63	0	248	0	0	0	0	0	204	**402**	0	0	606	**63**	0	99	**1**	163	1017
05:00 PM	0	201	48	0	249	0	0	0	0	0	165	393	0	**2**	560	51	0	120	0	**171**	980
05:15 PM	0	193	**69**	1	263	0	0	0	0	0	**225**	391	0	1	**617**	43	0	**126**	0	169	**1049**
05:30 PM	0	**216**	58	**2**	**276**	0	0	0	0	0	196	346	0	1	543	46	0	113	0	159	978
Total Volume	0	795	238	3	1036	0	0	0	0	0	790	1532	0	4	2326	203	0	458	1	662	4024
% App. Total	0	76.7	23	0.3		0	0	0	0		34	65.9	0	0.2		30.7	0	69.2	0.2		
PHF	.000	.920	.862	.375	.938	.000	.000	.000	.000	.000	.878	.953	.000	.500	.942	.806	.000	.909	.250	.968	.959



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 2. Shady Grove Rd @ Tupelo Dr
Site Code : J 998-2
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Shady Grove Rd From North					Tupelo Drive From East					Shady Grove Rd From South					Epsilon Dr From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	0	273	0	0	273	2	1	0	0	3	3	106	0	0	109	5	0	17	0	22	407
06:15 AM	0	364	2	0	366	1	0	0	0	1	5	132	0	0	137	5	0	24	0	29	533
06:30 AM	0	380	1	0	381	2	0	0	0	2	3	143	0	0	146	5	3	29	0	37	566
06:45 AM	3	410	2	0	415	2	0	1	0	3	6	187	1	0	194	1	0	21	0	22	634
Total	3	1427	5	0	1435	7	1	1	0	9	17	568	1	0	586	16	3	91	0	110	2140
07:00 AM	3	474	3	0	480	4	0	0	0	4	4	141	1	1	147	5	0	24	0	29	660
07:15 AM	0	498	1	0	499	4	0	1	0	5	5	183	0	0	188	4	1	41	0	46	738
07:30 AM	0	510	1	0	511	0	0	1	0	1	3	209	3	0	215	2	0	47	0	49	776
07:45 AM	1	535	4	0	540	4	1	2	0	7	6	248	1	0	255	6	2	35	0	43	845
Total	4	2017	9	0	2030	12	1	4	0	17	18	781	5	1	805	17	3	147	0	167	3019
08:00 AM	1	485	6	1	493	5	0	0	0	5	9	235	0	1	245	7	1	29	0	37	780
08:15 AM	0	565	3	0	568	6	2	0	0	8	10	251	2	0	263	4	0	27	0	31	870
08:30 AM	0	492	5	0	497	3	0	6	0	9	13	246	3	0	262	6	1	26	0	33	801
08:45 AM	1	483	6	0	490	2	1	0	0	3	12	230	1	1	244	9	1	33	0	43	780
Total	2	2025	20	1	2048	16	3	6	0	25	44	962	6	2	1014	26	3	115	0	144	3231
03:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03:30 PM	3	324	9	0	336	4	2	3	0	9	24	447	7	3	481	3	0	17	0	20	846
03:45 PM	3	303	3	0	309	2	0	3	0	5	38	516	7	0	561	8	0	21	0	29	904
Total	6	627	12	1	646	6	2	6	0	14	62	963	14	3	1042	11	0	38	0	49	1751
04:00 PM	0	334	7	0	341	2	0	3	0	5	29	483	7	0	519	4	2	16	0	22	887
04:15 PM	3	286	7	0	296	4	1	1	0	6	46	552	4	1	603	6	1	19	0	26	931
04:30 PM	1	306	6	1	314	1	0	4	0	5	35	527	6	1	569	4	0	24	0	28	916
04:45 PM	1	278	7	0	286	1	3	1	0	5	38	579	5	2	624	8	0	29	0	37	952
Total	5	1204	27	1	1237	8	4	9	0	21	148	2141	22	4	2315	22	3	88	0	113	3686
05:00 PM	2	299	10	1	312	5	1	3	0	9	40	558	6	0	604	8	2	19	0	29	954
05:15 PM	3	295	8	0	306	3	0	4	0	7	52	594	8	0	654	3	1	13	0	17	984
05:30 PM	3	339	7	0	349	6	1	6	0	13	31	526	5	0	562	9	1	28	0	38	962
05:45 PM	2	226	10	1	239	1	1	2	0	4	26	480	6	3	515	3	0	11	0	14	772
Total	10	1159	35	2	1206	15	3	15	0	33	149	2158	25	3	2335	23	4	71	0	98	3672
06:00 PM	2	196	5	0	203	5	4	6	0	15	38	461	11	1	511	4	1	10	0	15	744
06:15 PM	2	210	2	0	214	3	0	3	0	6	42	487	7	0	536	0	0	14	0	14	770
Grand Total	34	8865	115	5	9019	72	18	50	0	140	518	8521	91	14	9144	119	17	574	0	710	19013
Apprch %	0.4	98.3	1.3	0.1		51.4	12.9	35.7	0		5.7	93.2	1	0.2		16.8	2.4	80.8	0		
Total %	0.2	46.6	0.6	0	47.4	0.4	0.1	0.3	0	0.7	2.7	44.8	0.5	0.1	48.1	0.6	0.1	3	0	3.7	

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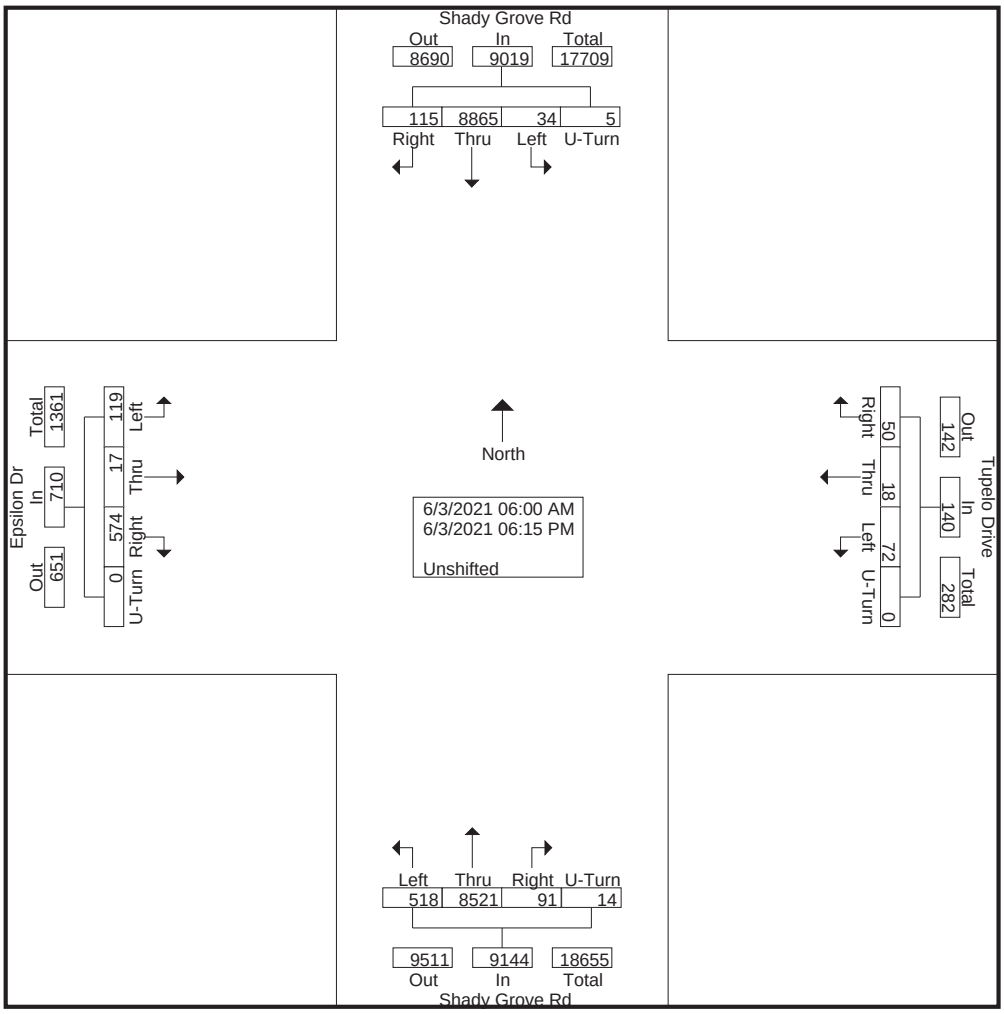
File Name : 2. Shady Grove Rd @ Tupelo Dr
Site Code : J 998-2
Start Date : 6/3/2021
Page No : 2



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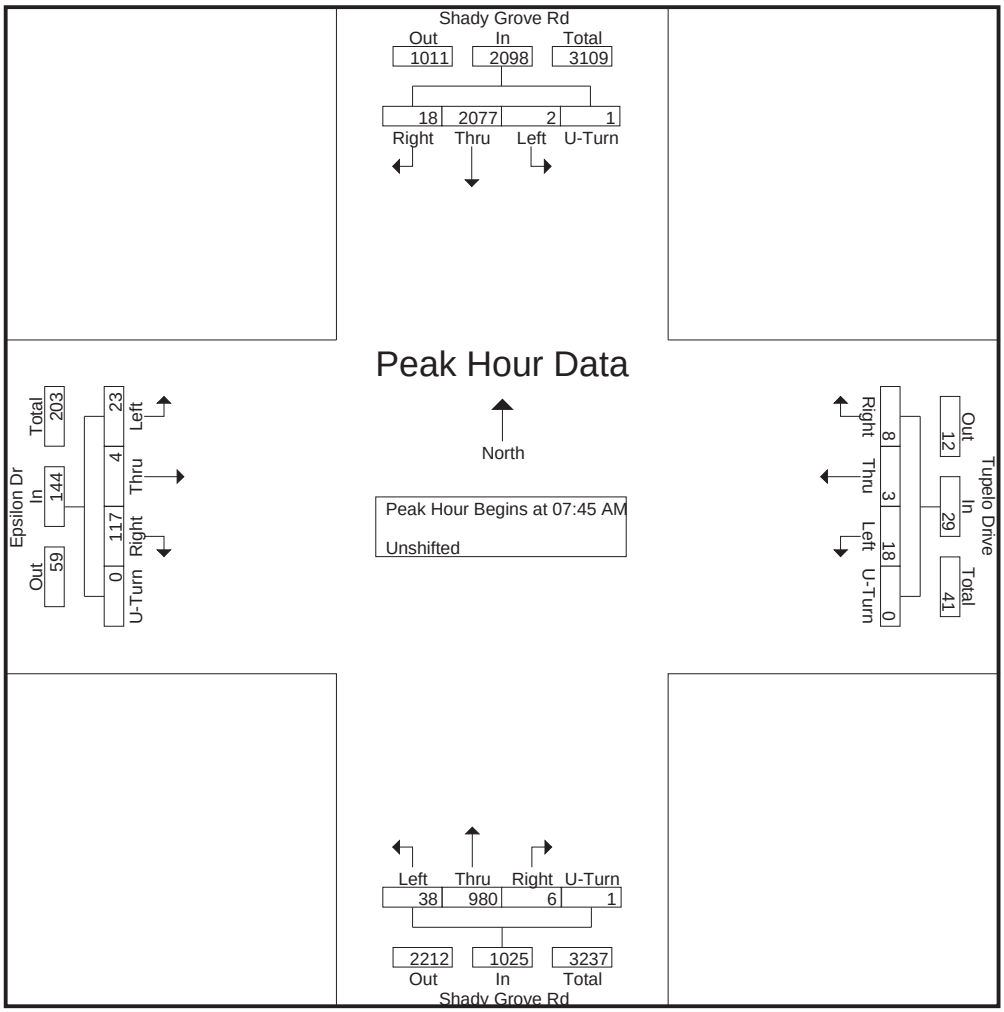
File Name : 2. Shady Grove Rd @ Tupelo Dr
Site Code : J 998-2
Start Date : 6/3/2021
Page No : 3

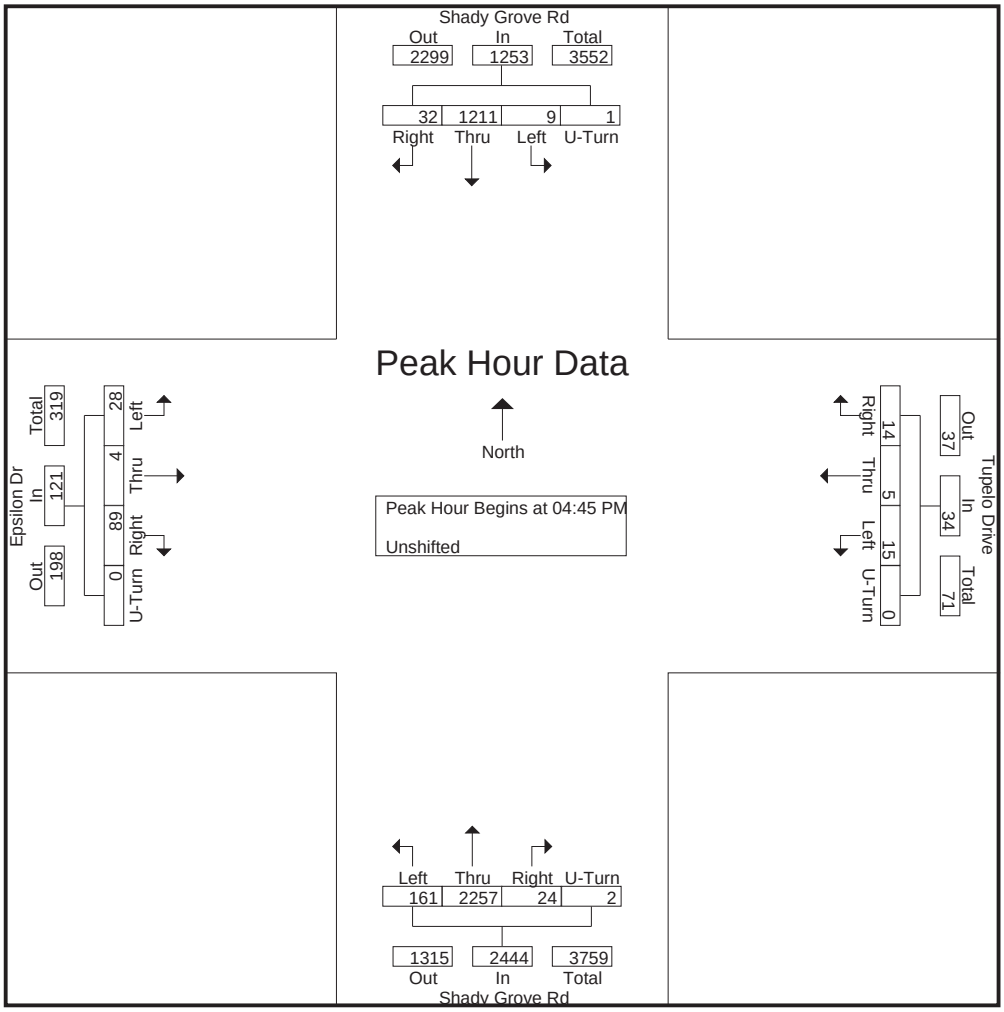
	Shady Grove Rd From North					Tupelo Drive From East					Shady Grove Rd From South					Epsilon Dr From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	**1**	535	4	0	540	4	1	2	0	7	6	248	1	0	255	6	**2**	**35**	0	**43**	845
08:00 AM	1	485	**6**	**1**	493	5	0	0	0	5	9	235	0	**1**	245	**7**	1	29	0	37	780
08:15 AM	0	**565**	3	0	**568**	**6**	**2**	0	0	8	10	**251**	2	0	**263**	4	0	27	0	31	**870**
08:30 AM	0	492	5	0	497	3	0	**6**	0	**9**	**13**	246	**3**	0	262	6	1	26	0	33	801
Total Volume	2	2077	18	1	2098	18	3	8	0	29	38	980	6	1	1025	23	4	117	0	144	3296
% App. Total	0.1	99	0.9	0		62.1	10.3	27.6	0		3.7	95.6	0.6	0.1		16	2.8	81.2	0		
PHF	.500	.919	.750	.250	.923	.750	.375	.333	.000	.806	.731	.976	.500	.250	.974	.821	.500	.836	.000	.837	.947



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 2. Shady Grove Rd @ Tupelo Dr
Site Code : J 998-2
Start Date : 6/3/2021
Page No : 4

	Shady Grove Rd From North					Tupelo Drive From East					Shady Grove Rd From South					Epsilon Dr From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	1	278	7	0	286	1	**3**	1	0	5	38	579	5	**2**	624	8	0	**29**	0	37	952
05:00 PM	2	299	**10**	**1**	312	5	1	3	0	9	40	558	6	0	604	8	**2**	19	0	29	954
05:15 PM	**3**	295	8	0	306	3	0	4	0	7	**52**	**594**	**8**	0	**654**	3	1	13	0	17	**984**
05:30 PM	3	**339**	7	0	**349**	**6**	1	**6**	0	**13**	31	526	5	0	562	**9**	1	28	0	**38**	962
Total Volume	9	1211	32	1	1253	15	5	14	0	34	161	2257	24	2	2444	28	4	89	0	121	3852
% App. Total	0.7	96.6	2.6	0.1		44.1	14.7	41.2	0		6.6	92.3	1	0.1		23.1	3.3	73.6	0		
PHF	.750	.893	.800	.250	.898	.625	.417	.583	.000	.654	.774	.950	.750	.250	.934	.778	.500	.767	.000	.796	.979



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 3. Shady Grove Rd @ Crabbs Branch Way
Site Code : J 998-3
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Crabbs Branch Way From North					Shady Grove Rd From East					Crabbs Branch Way From South					Shady Grove Road From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	9	4	16	0	29	59	98	44	1	202	7	6	18	0	31	11	37	26	0	74	336
06:15 AM	14	18	25	0	57	72	130	63	1	266	15	12	27	0	54	13	28	35	0	76	453
06:30 AM	10	14	14	0	38	110	134	36	0	280	16	10	49	0	75	18	42	31	0	91	484
06:45 AM	21	12	31	0	64	102	163	48	0	313	32	10	53	0	95	14	43	27	0	84	556
Total	54	48	86	0	188	343	525	191	2	1061	70	38	147	0	255	56	150	119	0	325	1829
07:00 AM	17	19	45	0	81	93	161	38	2	294	39	11	35	0	85	19	45	40	1	105	565
07:15 AM	11	8	44	0	63	88	204	46	0	338	32	10	27	0	69	16	64	29	0	109	579
07:30 AM	23	15	36	0	74	69	199	49	1	318	28	8	20	0	56	18	89	40	1	148	596
07:45 AM	16	11	41	0	68	74	238	46	0	358	36	10	31	0	77	18	75	24	0	117	620
Total	67	53	166	0	286	324	802	179	3	1308	135	39	113	0	287	71	273	133	2	479	2360
08:00 AM	26	15	34	0	75	80	306	53	0	439	33	13	22	0	68	15	96	34	0	145	727
08:15 AM	17	14	29	0	60	82	256	35	0	373	29	13	30	0	72	26	90	38	0	154	659
08:30 AM	25	22	36	0	83	83	196	45	1	325	39	9	18	0	66	18	85	28	0	131	605
08:45 AM	17	11	35	0	63	82	202	51	1	336	32	12	42	0	86	18	90	47	0	155	640
Total	85	62	134	0	281	327	960	184	2	1473	133	47	112	0	292	77	361	147	0	585	2631
03:30 PM	24	9	32	0	65	45	117	39	0	201	49	13	45	0	107	33	197	42	1	273	646
03:45 PM	34	16	41	0	91	68	133	38	0	239	50	13	61	0	124	40	190	38	1	269	723
Total	58	25	73	0	156	113	250	77	0	440	99	26	106	0	231	73	387	80	2	542	1369
04:00 PM	41	17	31	0	89	60	134	37	2	233	48	20	89	2	159	29	210	40	0	279	760
04:15 PM	50	13	42	0	105	71	116	29	1	217	77	20	95	1	193	39	189	28	0	256	771
04:30 PM	33	24	35	0	92	50	131	43	2	226	61	20	96	0	177	31	186	34	1	252	747
04:45 PM	41	16	36	0	93	64	112	38	1	215	52	24	69	0	145	28	244	36	0	308	761
Total	165	70	144	0	379	245	493	147	6	891	238	84	349	3	674	127	829	138	1	1095	3039
05:00 PM	37	16	40	0	93	39	114	47	0	200	43	22	72	2	139	35	216	36	0	287	719
05:15 PM	47	21	34	0	102	43	107	33	3	186	38	25	63	0	126	20	235	31	1	287	701
05:30 PM	48	24	32	0	104	37	133	27	5	202	50	21	60	0	131	23	194	30	0	247	684
05:45 PM	36	12	34	0	82	37	76	31	1	145	31	13	61	0	105	18	201	24	0	243	575
Total	168	73	140	0	381	156	430	138	9	733	162	81	256	2	501	96	846	121	1	1064	2679
06:00 PM	32	13	35	0	80	37	108	19	1	165	37	14	41	0	92	23	177	18	0	218	555
06:15 PM	21	11	30	0	62	37	106	23	1	167	34	10	35	0	79	23	198	21	0	242	550
Grand Total	650	355	808	0	1813	1582	3674	958	24	6238	908	339	1159	5	2411	546	3221	777	6	4550	15012
Apprch %	35.9	19.6	44.6	0		25.4	58.9	15.4	0.4		37.7	14.1	48.1	0.2		12	70.8	17.1	0.1		
Total %	4.3	2.4	5.4	0	12.1	10.5	24.5	6.4	0.2	41.6	6	2.3	7.7	0	16.1	3.6	21.5	5.2	0	30.3	

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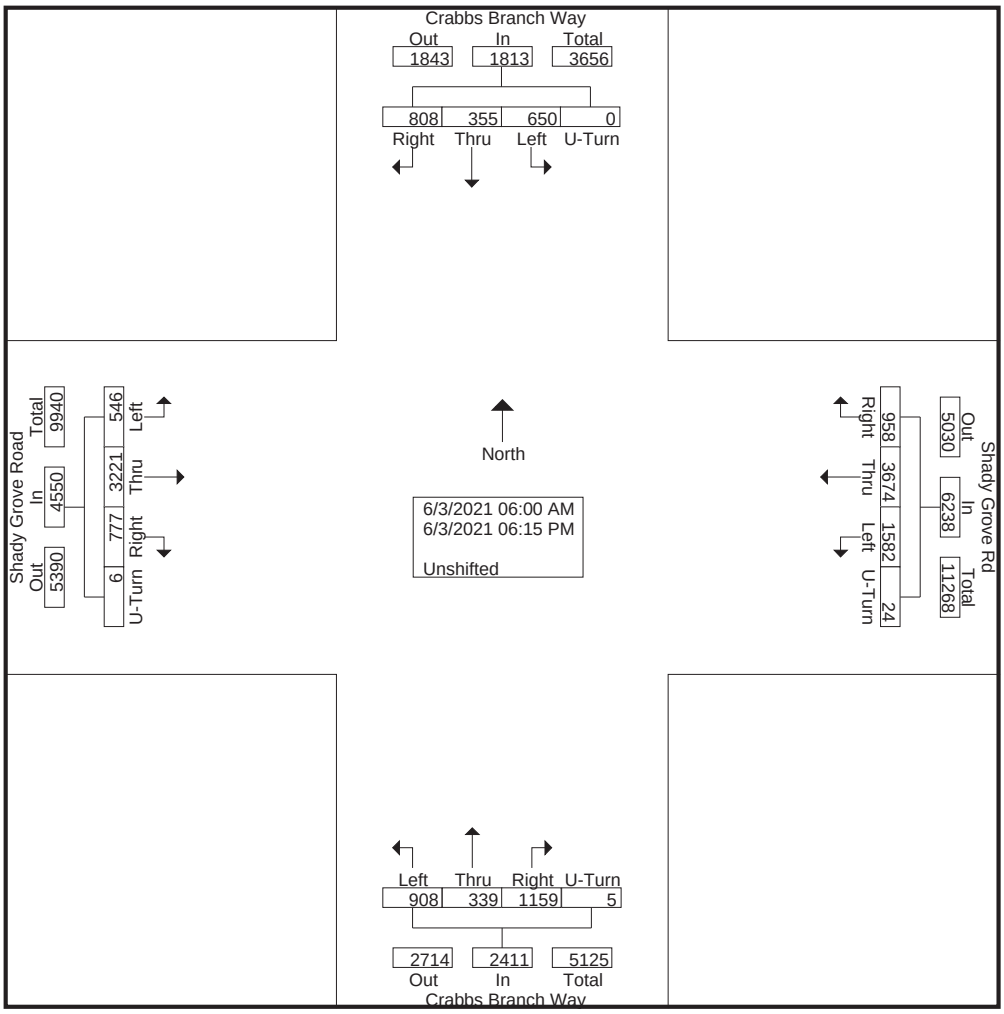
File Name : 3. Shady Grove Rd @ Crabbs Branch Way
Site Code : J 998-3
Start Date : 6/3/2021
Page No : 2



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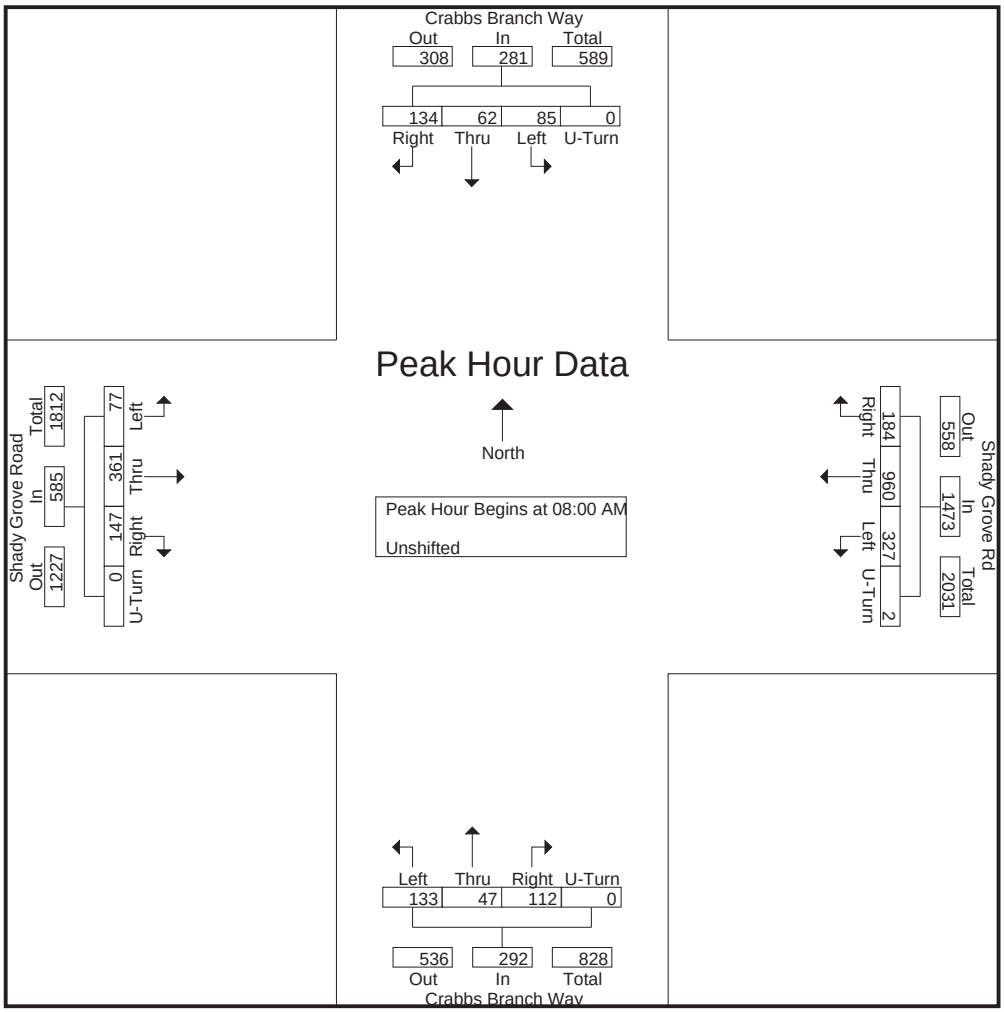
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 3. Shady Grove Rd @ Crabbs Branch Way
Site Code : J 998-3
Start Date : 6/3/2021
Page No : 3

	Crabbs Branch Way From North					Shady Grove Rd From East					Crabbs Branch Way From South					Shady Grove Road From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	**26**	15	34	0	75	80	**306**	**53**	0	**439**	33	**13**	22	0	68	15	**96**	34	0	145	**727**
08:15 AM	17	14	29	0	60	82	256	35	0	373	29	13	30	0	72	**26**	90	38	0	154	659
08:30 AM	25	**22**	**36**	0	**83**	**83**	196	45	**1**	325	**39**	9	18	0	66	18	85	28	0	131	605
08:45 AM	17	11	35	0	63	82	202	51	1	336	32	12	**42**	0	**86**	18	90	**47**	0	**155**	640
Total Volume	85	62	134	0	281	327	960	184	2	1473	133	47	112	0	292	77	361	147	0	585	2631
% App. Total	30.2	22.1	47.7	0		22.2	65.2	12.5	0.1		45.5	16.1	38.4	0		13.2	61.7	25.1	0		
PHF	.817	.705	.931	.000	.846	.985	.784	.868	.500	.839	.853	.904	.667	.000	.849	.740	.940	.782	.000	.944	.905



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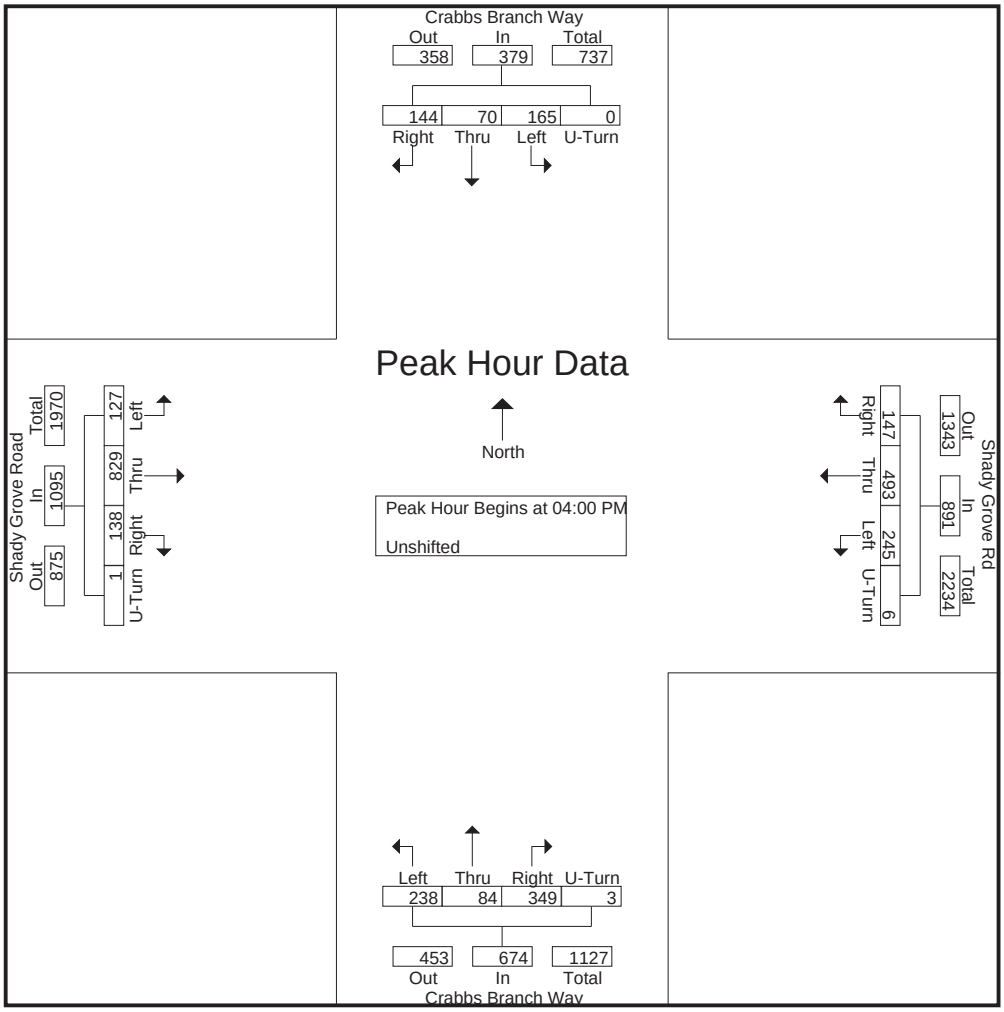
File Name : 3. Shady Grove Rd @ Crabbs Branch Way
Site Code : J 998-3
Start Date : 6/3/2021
Page No : 4

	Crabbs Branch Way From North					Shady Grove Rd From East					Crabbs Branch Way From South					Shady Grove Road From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	41	17	31	0	89	60	**134**	37	**2**	**233**	48	20	89	**2**	159	29	210	**40**	0	279	760
04:15 PM	**50**	13	**42**	0	**105**	**71**	116	29	1	217	**77**	20	95	1	**193**	**39**	189	28	0	256	**771**
04:30 PM	33	**24**	35	0	92	50	131	**43**	2	226	61	20	**96**	0	177	31	186	34	**1**	252	747
04:45 PM	41	16	36	0	93	64	112	38	1	215	52	**24**	69	0	145	28	**244**	36	0	**308**	761
Total Volume	165	70	144	0	379	245	493	147	6	891	238	84	349	3	674	127	829	138	1	1095	3039
% App. Total	43.5	18.5	38	0		27.5	55.3	16.5	0.7		35.3	12.5	51.8	0.4		11.6	75.7	12.6	0.1		
PHF	.825	.729	.857	.000	.902	.863	.920	.855	.750	.956	.773	.875	.909	.375	.873	.814	.849	.863	.250	.889	.985



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4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 4. Shady Grove Rd @ Oakmont Ave
Site Code : J 998-4
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Oakmont Avenue From North					Shady Grove Rd From East					Oakmont Avenue From South					Shady Grove Rd From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	18	0	32	0	50	7	89	14	0	110	3	0	2	0	5	22	48	6	3	79	244
06:15 AM	23	0	39	0	62	5	147	17	0	169	1	0	3	0	4	18	53	4	0	75	310
06:30 AM	16	0	58	0	74	9	155	14	1	179	8	0	2	0	10	25	60	6	0	91	354
06:45 AM	21	0	48	0	69	4	171	38	0	213	10	0	4	0	14	37	65	6	0	108	404
Total	78	0	177	0	255	25	562	83	1	671	22	0	11	0	33	102	226	22	3	353	1312
07:00 AM	36	0	62	0	98	5	192	34	1	232	6	2	7	0	15	33	61	6	0	100	445
07:15 AM	41	1	85	0	127	9	217	30	0	256	14	1	6	0	21	30	74	3	0	107	511
07:30 AM	37	1	88	0	126	5	246	32	0	283	11	1	5	0	17	31	89	5	0	125	551
07:45 AM	28	1	98	0	127	5	248	36	0	289	8	1	3	0	12	43	92	9	0	144	572
Total	142	3	333	0	478	24	903	132	1	1060	39	5	21	0	65	137	316	23	0	476	2079
08:00 AM	29	0	84	0	113	5	233	41	1	280	12	0	3	0	15	35	104	8	1	148	556
08:15 AM	26	1	103	0	130	5	276	35	1	317	4	0	5	0	9	32	124	5	0	161	617
08:30 AM	23	2	67	0	92	7	224	36	2	269	7	0	7	0	14	44	104	8	0	156	531
08:45 AM	31	2	65	0	98	7	232	31	0	270	6	2	2	0	10	43	115	9	0	167	545
Total	109	5	319	0	433	24	965	143	4	1136	29	2	17	0	48	154	447	30	1	632	2249
03:30 PM	31	2	80	0	113	6	130	50	0	186	15	1	18	0	34	52	204	20	0	276	609
03:45 PM	35	1	73	0	109	8	153	58	0	219	12	1	16	0	29	64	216	19	0	299	656
Total	66	3	153	0	222	14	283	108	0	405	27	2	34	0	63	116	420	39	0	575	1265
04:00 PM	43	3	72	0	118	8	162	40	1	211	10	0	18	0	28	58	219	16	0	293	650
04:15 PM	37	2	78	0	117	7	167	51	0	225	6	1	11	0	18	54	210	20	1	285	645
04:30 PM	37	1	74	0	112	13	159	55	1	228	21	3	10	0	34	59	212	22	1	294	668
04:45 PM	43	1	58	0	102	9	133	48	3	193	19	2	9	0	30	57	254	18	1	330	655
Total	160	7	282	0	449	37	621	194	5	857	56	6	48	0	110	228	895	76	3	1202	2618
05:00 PM	49	2	84	0	135	11	133	51	1	196	14	3	17	0	34	76	236	16	1	329	694
05:15 PM	29	0	69	0	98	5	133	41	0	179	16	3	10	0	29	91	241	34	2	368	674
05:30 PM	26	1	60	0	87	9	159	40	1	209	17	1	7	0	25	56	239	8	0	303	624
05:45 PM	21	0	45	0	66	7	105	33	1	146	8	0	9	0	17	69	193	14	1	277	506
Total	125	3	258	0	386	32	530	165	3	730	55	7	43	0	105	292	909	72	4	1277	2498
06:00 PM	17	0	39	0	56	8	125	38	0	171	10	2	9	0	21	69	193	15	2	279	527
06:15 PM	30	4	56	0	90	11	103	44	0	158	17	1	11	0	29	76	202	16	0	294	571
Grand Total	727	25	1617	0	2369	175	4092	907	14	5188	255	25	194	0	474	1174	3608	293	13	5088	13119
Apprch %	30.7	1.1	68.3	0		3.4	78.9	17.5	0.3		53.8	5.3	40.9	0		23.1	70.9	5.8	0.3		
Total %	5.5	0.2	12.3	0	18.1	1.3	31.2	6.9	0.1	39.5	1.9	0.2	1.5	0	3.6	8.9	27.5	2.2	0.1	38.8	

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File Name : 4. Shady Grove Rd @ Oakmont Ave
Site Code : J 998-4
Start Date : 6/3/2021
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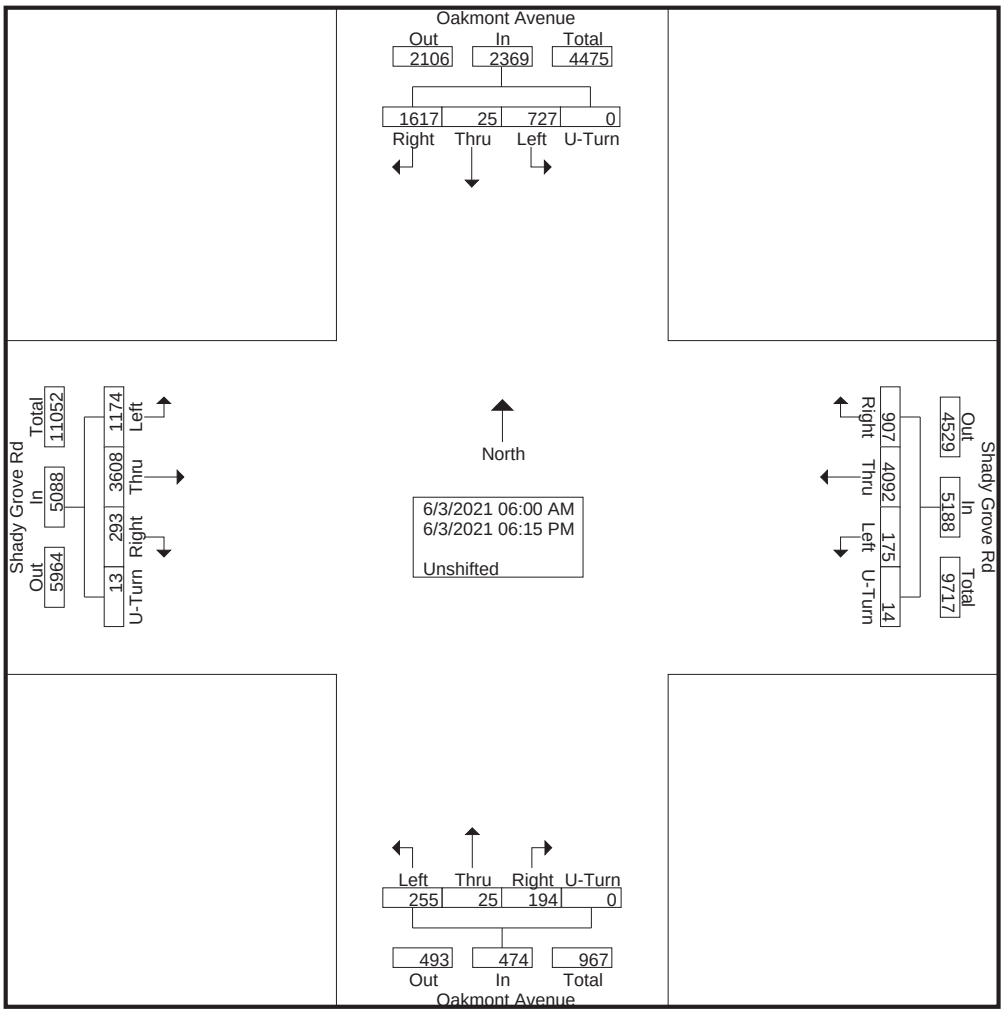

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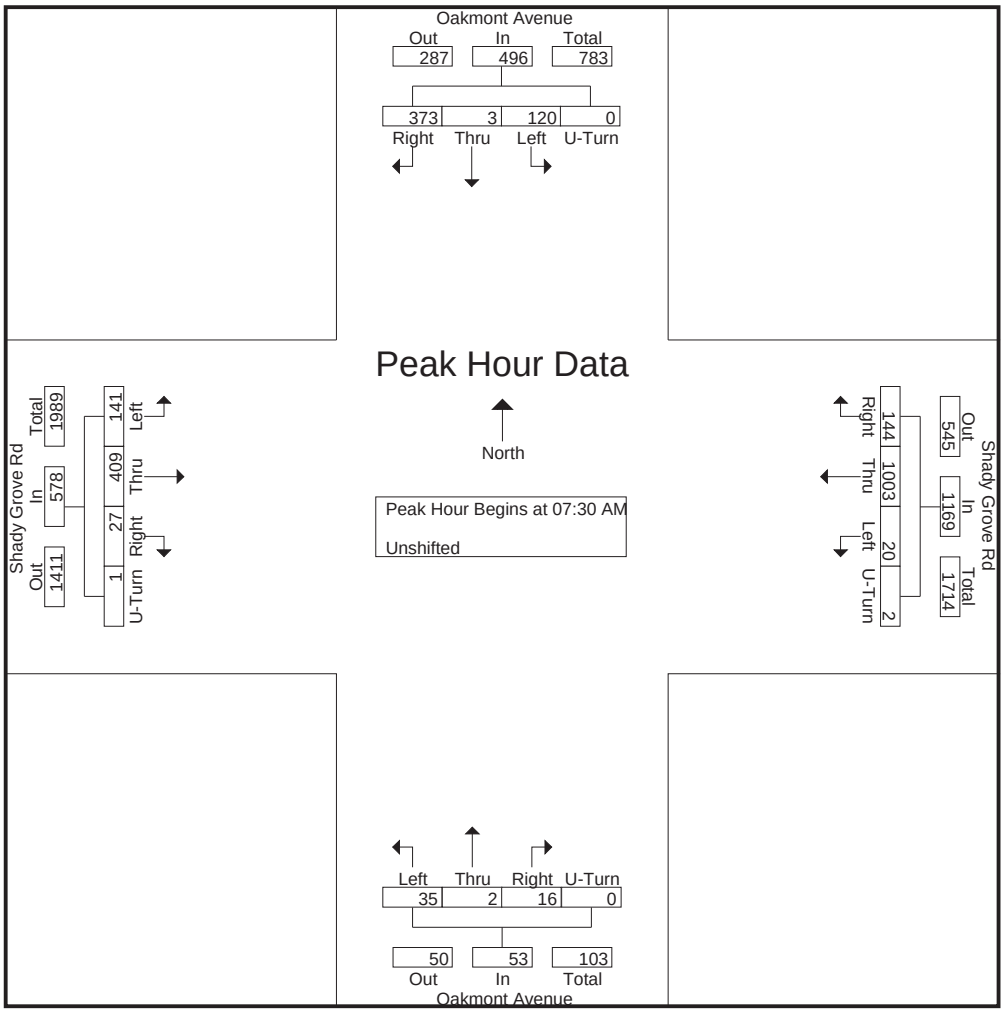
Phone: 703 914-4850

File Name : 4. Shady Grove Rd @ Oakmont Ave
Site Code : J 998-4
Start Date : 6/3/2021
Page No : 3

	Oakmont Avenue From North					Shady Grove Rd From East					Oakmont Avenue From South					Shady Grove Rd From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**37**	**1**	88	0	126	**5**	246	32	0	283	11	**1**	**5**	0	**17**	31	89	5	0	125	551
07:45 AM	28	1	98	0	127	5	248	36	0	289	8	1	3	0	12	**43**	92	**9**	0	144	572
08:00 AM	29	0	84	0	113	5	233	**41**	**1**	280	**12**	0	3	0	15	35	104	8	**1**	148	556
08:15 AM	26	1	**103**	0	**130**	5	**276**	35	1	**317**	4	0	5	0	9	32	**124**	5	0	**161**	**617**
Total Volume	120	3	373	0	496	20	1003	144	2	1169	35	2	16	0	53	141	409	27	1	578	2296
% App. Total	24.2	0.6	75.2	0		1.7	85.8	12.3	0.2		66	3.8	30.2	0		24.4	70.8	4.7	0.2		
PHF	.811	.750	.905	.000	.954	1.00	.909	.878	.500	.922	.729	.500	.800	.000	.779	.820	.825	.750	.250	.898	.930



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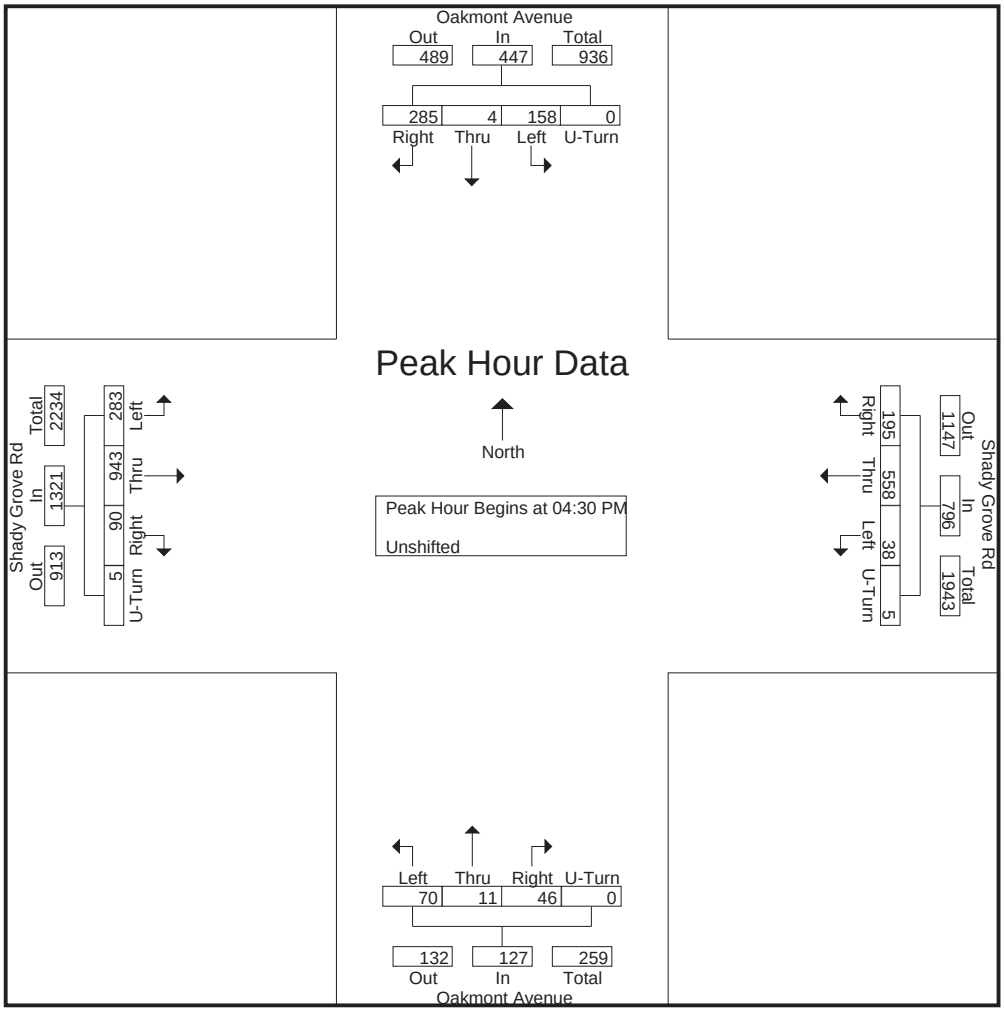
File Name : 4. Shady Grove Rd @ Oakmont Ave
Site Code : J 998-4
Start Date : 6/3/2021
Page No : 4

	Oakmont Avenue From North					Shady Grove Rd From East					Oakmont Avenue From South					Shady Grove Rd From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	37	1	74	0	112	**13**	**159**	**55**	1	**228**	**21**	**3**	10	0	**34**	59	212	22	1	294	668
04:45 PM	43	1	58	0	102	9	133	48	**3**	193	19	2	9	0	30	57	**254**	18	1	330	655
05:00 PM	**49**	**2**	**84**	0	**135**	11	133	51	1	196	14	3	**17**	0	34	76	236	16	1	329	**694**
05:15 PM	29	0	69	0	98	5	133	41	0	179	16	3	10	0	29	**91**	241	**34**	**2**	**368**	674
Total Volume	158	4	285	0	447	38	558	195	5	796	70	11	46	0	127	283	943	90	5	1321	2691
% App. Total	35.3	0.9	63.8	0		4.8	70.1	24.5	0.6		55.1	8.7	36.2	0		21.4	71.4	6.8	0.4		
PHF	.806	.500	.848	.000	.828	.731	.877	.886	.417	.873	.833	.917	.676	.000	.934	.777	.928	.662	.625	.897	.969



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 5. Amity Drive @ Epsion Drive
Site Code : J 998-5
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Amity Drive From North					Epsilon Drive From East					Amity Drive From South					From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	17	0	0	0	17	2	0	2	0	4	0	2	0	0	2	0	0	0	0	0	23
06:15 AM	20	0	0	0	20	0	0	2	0	2	0	1	3	0	4	0	0	0	0	0	26
06:30 AM	22	0	0	0	22	0	0	1	0	1	0	1	5	0	6	0	0	0	0	0	29
06:45 AM	13	2	0	0	15	0	0	8	0	8	0	2	3	0	5	0	0	0	0	0	28
Total	72	2	0	0	74	2	0	13	0	15	0	6	11	0	17	0	0	0	0	0	106
07:00 AM	13	1	0	0	14	0	0	6	0	6	0	1	4	0	5	0	0	0	0	0	25
07:15 AM	17	1	0	0	18	1	0	4	0	5	0	1	5	0	6	0	0	0	0	0	29
07:30 AM	22	2	0	0	24	0	0	5	0	5	0	2	8	0	10	0	0	0	0	0	39
07:45 AM	21	0	0	0	21	3	0	6	0	9	0	0	7	0	7	0	0	0	0	0	37
Total	73	4	0	0	77	4	0	21	0	25	0	4	24	0	28	0	0	0	0	0	130
08:00 AM	18	0	0	0	18	2	0	8	1	11	0	0	1	0	1	0	0	0	0	0	30
08:15 AM	20	0	0	0	20	0	0	4	0	4	0	2	3	0	5	0	0	0	0	0	29
08:30 AM	17	1	0	0	18	3	0	8	0	11	0	3	2	0	5	0	0	0	0	0	34
08:45 AM	22	1	0	0	23	3	0	2	0	5	0	2	8	0	10	0	0	0	0	0	38
Total	77	2	0	0	79	8	0	22	1	31	0	7	14	0	21	0	0	0	0	0	131
03:30 PM	9	2	0	0	11	7	0	15	0	22	0	4	7	0	11	0	0	0	0	0	44
03:45 PM	16	1	0	0	17	4	0	24	0	28	0	2	3	0	5	0	0	0	0	0	50
Total	25	3	0	0	28	11	0	39	0	50	0	6	10	0	16	0	0	0	0	0	94
04:00 PM	15	3	0	0	18	7	0	18	1	26	0	0	1	0	1	0	0	0	0	0	45
04:15 PM	13	2	0	0	15	7	0	24	0	31	0	0	2	0	2	0	0	0	0	0	48
04:30 PM	15	2	0	0	17	0	0	27	0	27	0	1	4	0	5	0	0	0	0	0	49
04:45 PM	18	0	0	0	18	3	0	29	1	33	0	0	5	0	5	0	0	0	0	0	56
Total	61	7	0	0	68	17	0	98	2	117	0	1	12	0	13	0	0	0	0	0	198
05:00 PM	11	4	0	0	15	6	0	27	1	34	0	2	4	0	6	0	0	0	0	0	55
05:15 PM	14	0	0	0	14	10	0	27	0	37	0	0	1	0	1	0	0	0	0	0	52
05:30 PM	14	1	0	0	15	5	0	23	0	28	0	0	6	0	6	0	0	0	0	0	49
05:45 PM	8	4	0	0	12	5	0	25	0	30	0	2	0	0	2	0	0	0	0	0	44
Total	47	9	0	0	56	26	0	102	1	129	0	4	11	0	15	0	0	0	0	0	200
06:00 PM	9	0	0	0	9	2	0	24	0	26	0	0	2	0	2	0	0	0	0	0	37
06:15 PM	10	1	0	0	11	8	0	27	0	35	0	0	1	0	1	0	0	0	0	0	47
Grand Total	374	28	0	0	402	78	0	346	4	428	0	28	85	0	113	0	0	0	0	0	943
Apprch %	93	7	0	0		18.2	0	80.8	0.9		0	24.8	75.2	0		0	0	0	0		
Total %	39.7	3	0	0	42.6	8.3	0	36.7	0.4	45.4	0	3	9	0	12	0	0	0	0	0	

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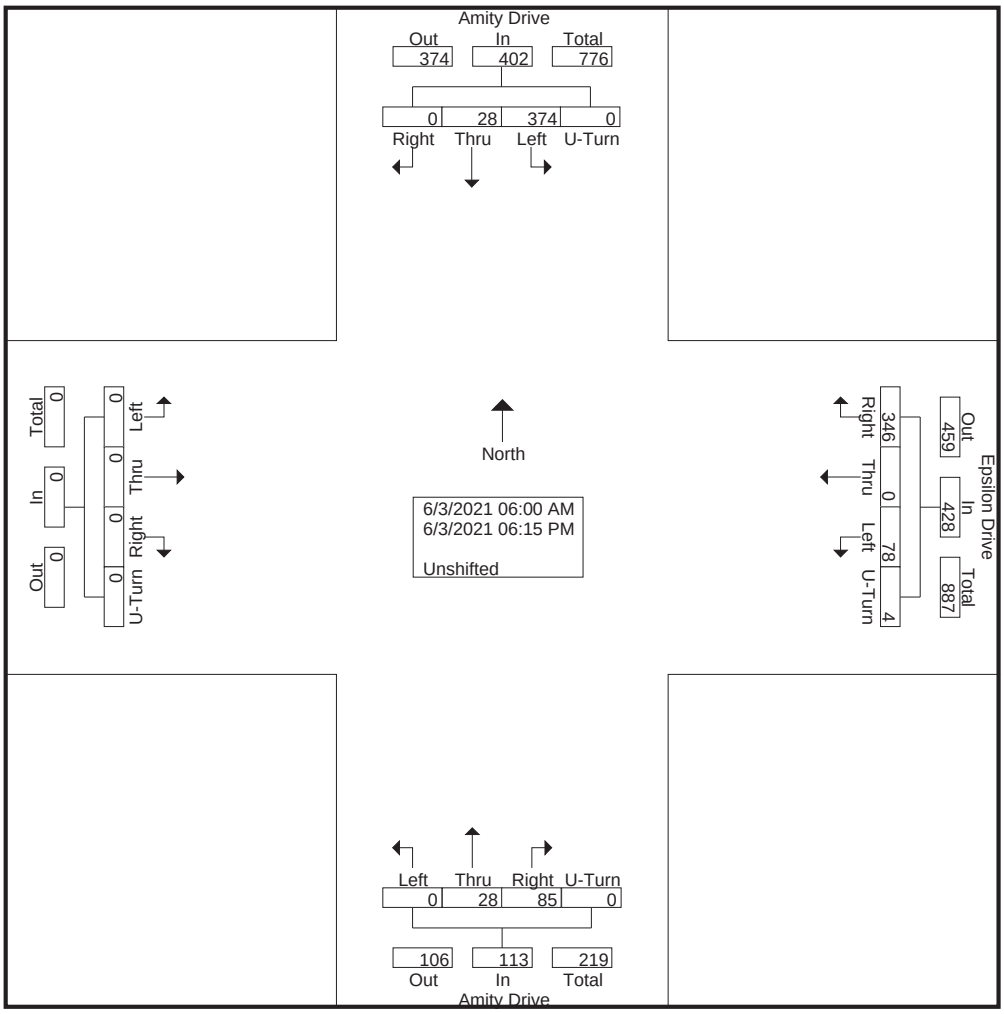
File Name : 5. Amity Drive @ Epsion Drive
Site Code : J 998-5
Start Date : 6/3/2021
Page No : 2



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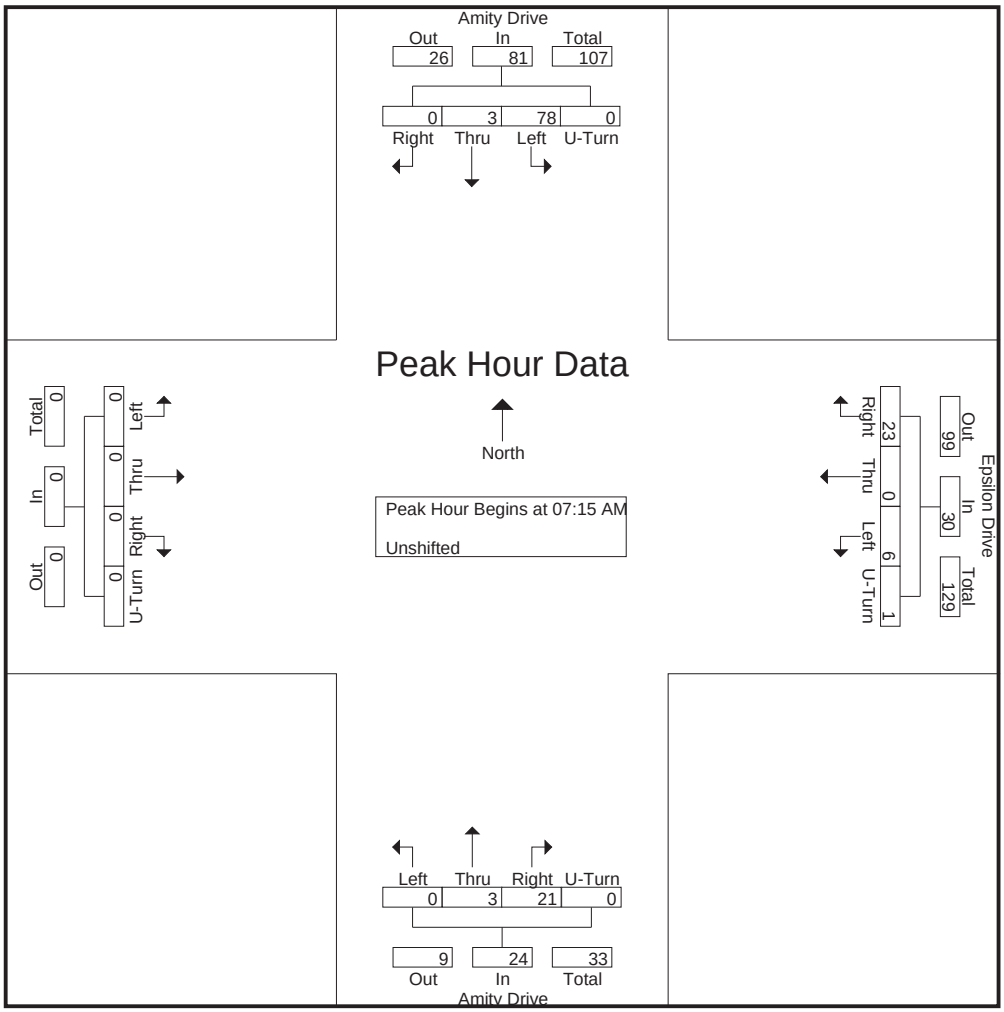
Phone: 703 914-4850

File Name : 5. Amity Drive @ Epsion Drive
Site Code : J 998-5
Start Date : 6/3/2021
Page No : 3

	Amity Drive From North					Epsilon Drive From East					Amity Drive From South					From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	17	1	0	0	18	1	0	4	0	5	0	1	5	0	6	0	0	0	0	0	29
07:30 AM	**22**	**2**	0	0	**24**	0	0	5	0	5	0	**2**	**8**	0	**10**	0	0	0	0	0	**39**
07:45 AM	21	0	0	0	21	**3**	0	6	0	9	0	0	7	0	7	0	0	0	0	0	37
08:00 AM	18	0	0	0	18	2	0	**8**	**1**	**11**	0	0	1	0	1	0	0	0	0	0	30
Total Volume	78	3	0	0	81	6	0	23	1	30	0	3	21	0	24	0	0	0	0	0	135
% App. Total	96.3	3.7	0	0		20	0	76.7	3.3		0	12.5	87.5	0		0	0	0	0		
PHF	.886	.375	.000	.000	.844	.500	.000	.719	.250	.682	.000	.375	.656	.000	.600	.000	.000	.000	.000	.000	.865



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
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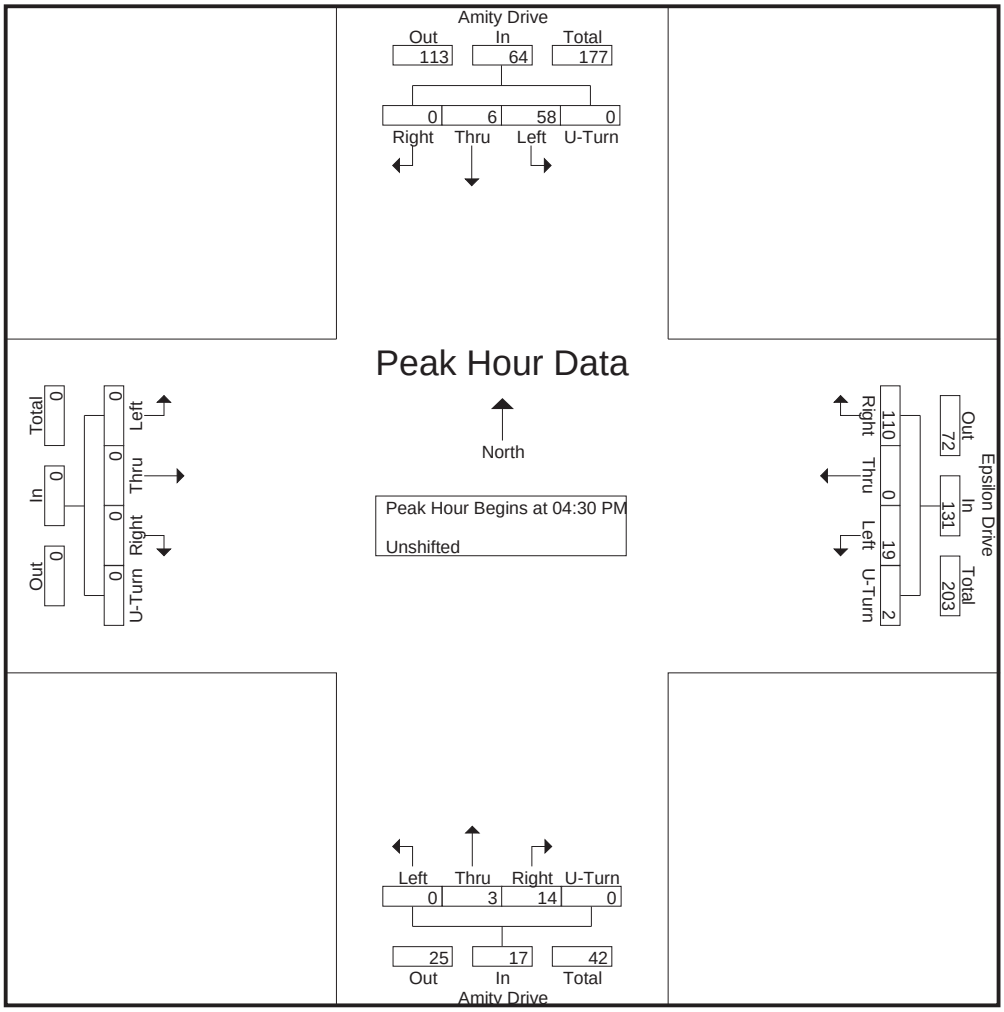
Phone: 703 914-4850

File Name : 5. Amity Drive @ Epsion Drive
Site Code : J 998-5
Start Date : 6/3/2021
Page No : 4

	Amity Drive From North					Epsilon Drive From East					Amity Drive From South					From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	15	2	0	0	17	0	0	27	0	27	0	1	4	0	5	0	0	0	0	0	49
04:45 PM	**18**	0	0	0	**18**	3	0	**29**	**1**	33	0	0	**5**	0	5	0	0	0	0	0	**56**
05:00 PM	11	**4**	0	0	15	6	0	27	1	34	0	**2**	4	0	**6**	0	0	0	0	0	55
05:15 PM	14	0	0	0	14	**10**	0	27	0	**37**	0	0	1	0	1	0	0	0	0	0	52
Total Volume	58	6	0	0	64	19	0	110	2	131	0	3	14	0	17	0	0	0	0	0	212
% App. Total	90.6	9.4	0	0		14.5	0	84	1.5		0	17.6	82.4	0		0	0	0	0		
PHF	.806	.375	.000	.000	.889	.475	.000	.948	.500	.885	.000	.375	.700	.000	.708	.000	.000	.000	.000	.000	.946



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4605-C Pinecrest off Park Dr
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Phone: 703 914-4850

File Name : 6. Midcounty Hwy @ Washington Grove Ln
Site Code : J 998-6
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Washington Grove Lane From North					Midcounty Hwy From East					Washington Grove Lane From South					Midcounty Hwy From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	34	10	8	0	52	0	19	9	0	28	13	8	11	0	32	1	79	9	0	89	201
06:15 AM	53	7	5	0	65	5	23	6	0	34	11	21	10	0	42	3	120	12	0	135	276
06:30 AM	61	14	6	0	81	3	21	8	0	32	17	11	11	0	39	11	126	13	0	150	302
06:45 AM	43	28	6	0	77	13	40	14	0	67	20	15	22	0	57	4	131	21	1	157	358
Total	191	59	25	0	275	21	103	37	0	161	61	55	54	0	170	19	456	55	1	531	1137
07:00 AM	47	17	11	0	75	6	40	9	0	55	16	5	20	0	41	9	136	17	0	162	333
07:15 AM	48	22	11	0	81	8	57	15	0	80	20	11	16	0	47	10	138	26	0	174	382
07:30 AM	66	19	10	0	95	18	48	16	0	82	28	13	18	0	59	6	167	22	0	195	431
07:45 AM	68	22	11	0	101	14	72	26	0	112	29	14	12	0	55	9	163	23	0	195	463
Total	229	80	43	0	352	46	217	66	0	329	93	43	66	0	202	34	604	88	0	726	1609
08:00 AM	64	40	10	0	114	9	60	25	0	94	23	25	15	0	63	7	168	25	0	200	471
08:15 AM	68	22	7	0	97	12	58	27	0	97	28	12	16	0	56	15	153	17	0	185	435
08:30 AM	50	28	16	0	94	12	67	32	0	111	30	31	23	0	84	9	160	20	0	189	478
08:45 AM	66	31	8	0	105	9	83	36	2	130	17	11	13	0	41	16	136	19	0	171	447
Total	248	121	41	0	410	42	268	120	2	432	98	79	67	0	244	47	617	81	0	745	1831
03:30 PM	29	26	19	0	74	14	117	52	0	183	33	32	23	0	88	15	109	39	0	163	508
03:45 PM	48	35	26	0	109	14	130	66	0	210	36	34	16	0	86	11	100	26	1	138	543
Total	77	61	45	0	183	28	247	118	0	393	69	66	39	0	174	26	209	65	1	301	1051
04:00 PM	40	23	15	0	78	19	127	70	0	216	47	31	16	0	94	12	114	31	0	157	545
04:15 PM	33	44	17	0	94	18	148	69	0	235	33	29	10	0	72	8	115	40	0	163	564
04:30 PM	32	38	18	0	88	14	133	72	2	221	47	42	13	0	102	19	116	29	0	164	575
04:45 PM	31	32	16	0	79	16	159	74	0	249	49	52	10	0	111	17	116	31	0	164	603
Total	136	137	66	0	339	67	567	285	2	921	176	154	49	0	379	56	461	131	0	648	2287
05:00 PM	42	26	19	0	87	12	135	75	0	222	40	40	21	0	101	22	111	27	0	160	570
05:15 PM	45	36	19	0	100	24	179	84	0	287	31	42	6	0	79	19	108	35	1	163	629
05:30 PM	34	47	16	0	97	19	152	74	1	246	36	38	18	0	92	10	123	44	1	178	613
05:45 PM	23	28	14	0	65	13	130	56	0	199	29	33	8	0	70	15	99	25	0	139	473
Total	144	137	68	0	349	68	596	289	1	954	136	153	53	0	342	66	441	131	2	640	2285
06:00 PM	22	35	13	0	70	14	141	68	0	223	33	31	6	0	70	18	66	27	0	111	474
06:15 PM	21	29	17	0	67	9	147	72	0	228	36	36	13	0	85	12	62	26	0	100	480
Grand Total	1068	659	318	0	2045	295	2286	1055	5	3641	702	617	347	0	1666	278	2916	604	4	3802	11154
Apprch %	52.2	32.2	15.6	0		8.1	62.8	29	0.1		42.1	37	20.8	0		7.3	76.7	15.9	0.1		
Total %	9.6	5.9	2.9	0	18.3	2.6	20.5	9.5	0	32.6	6.3	5.5	3.1	0	14.9	2.5	26.1	5.4	0	34.1	

MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
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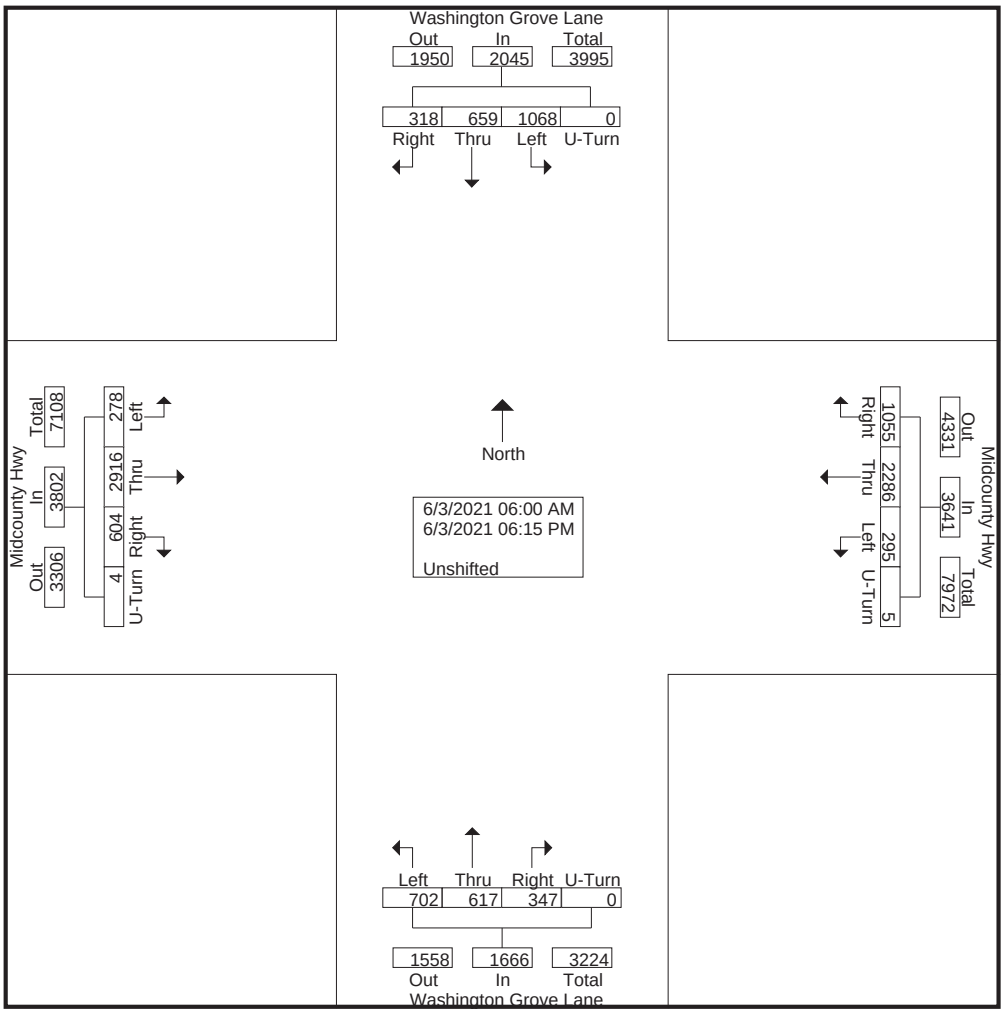
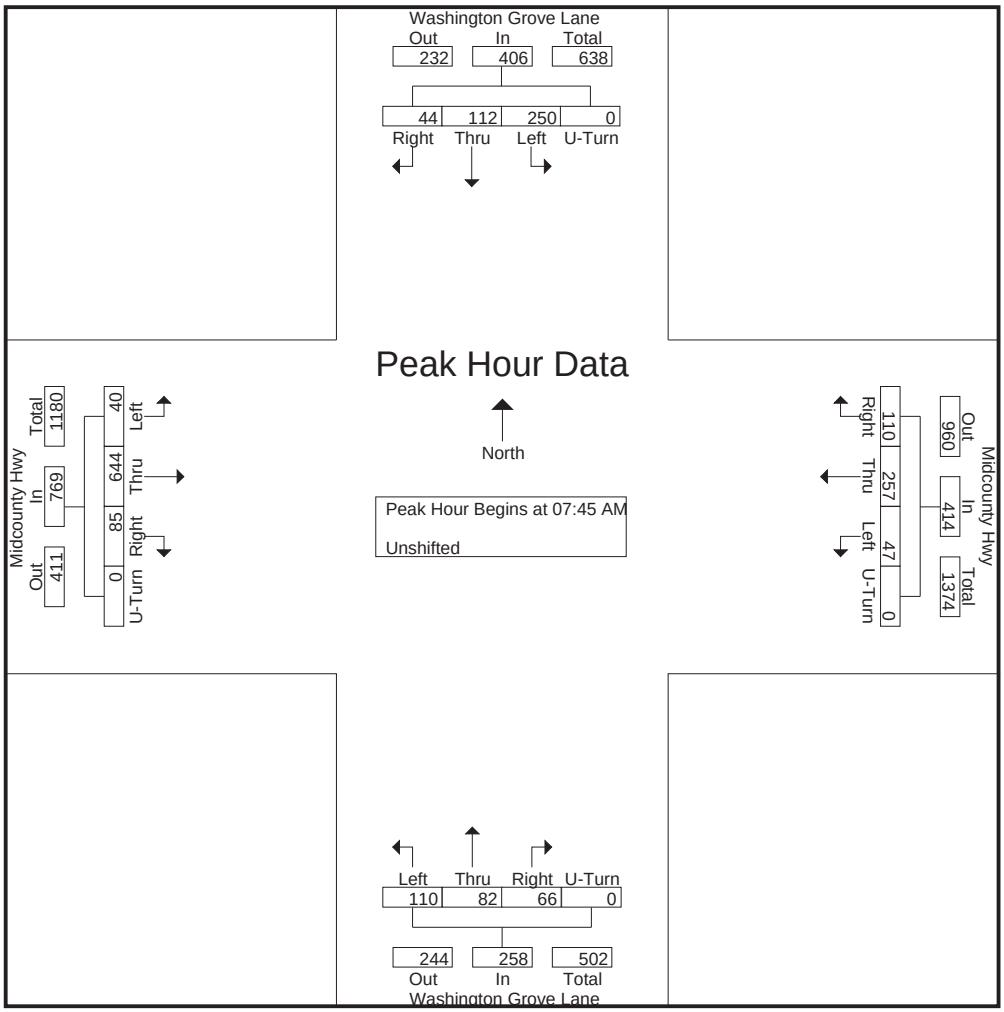
File Name : 6. Midcounty Hwy @ Washington Grove Ln
Site Code : J 998-6
Start Date : 6/3/2021
Page No : 2



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 6. Midcounty Hwy @ Washington Grove Ln
Site Code : J 998-6
Start Date : 6/3/2021
Page No : 3

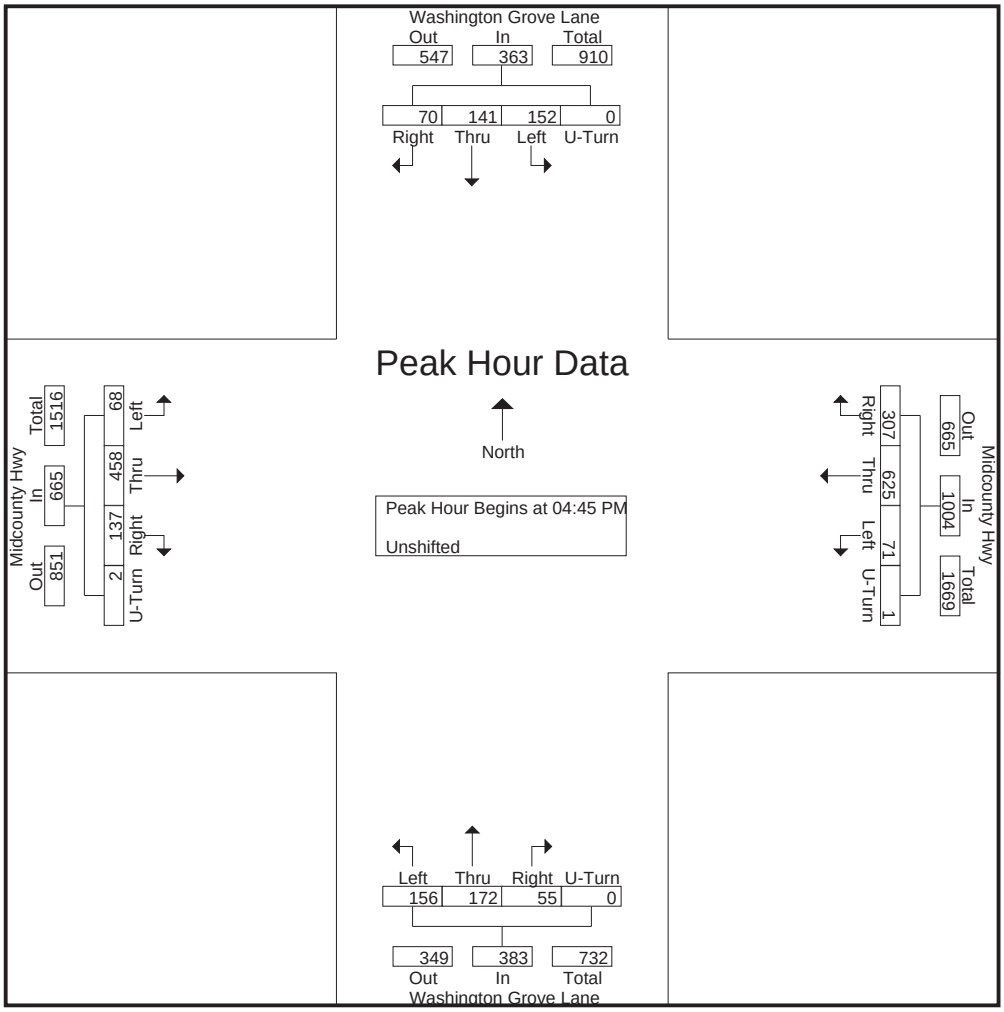
	Washington Grove Lane From North					Midcounty Hwy From East					Washington Grove Lane From South					Midcounty Hwy From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	**68**	22	11	0	101	**14**	**72**	26	0	**112**	29	14	12	0	55	9	163	23	0	195	463
08:00 AM	64	**40**	10	0	**114**	9	60	25	0	94	23	25	15	0	63	7	**168**	**25**	0	**200**	471
08:15 AM	68	22	7	0	97	12	58	27	0	97	28	12	16	0	56	**15**	153	17	0	185	435
08:30 AM	50	28	**16**	0	94	12	67	**32**	0	111	**30**	**31**	**23**	0	**84**	9	160	20	0	189	**478**
Total Volume	250	112	44	0	406	47	257	110	0	414	110	82	66	0	258	40	644	85	0	769	1847
% App. Total	61.6	27.6	10.8	0		11.4	62.1	26.6	0		42.6	31.8	25.6	0		5.2	83.7	11.1	0		
PHF	.919	.700	.688	.000	.890	.839	.892	.859	.000	.924	.917	.661	.717	.000	.768	.667	.958	.850	.000	.961	.966



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 6. Midcounty Hwy @ Washington Grove Ln
Site Code : J 998-6
Start Date : 6/3/2021
Page No : 4

	Washington Grove Lane From North					Midcounty Hwy From East					Washington Grove Lane From South					Midcounty Hwy From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	31	32	16	0	79	16	159	74	0	249	**49**	**52**	10	0	**111**	17	116	31	0	164	603
05:00 PM	42	26	**19**	0	87	12	135	75	0	222	40	40	**21**	0	101	**22**	111	27	0	160	570
05:15 PM	**45**	36	19	0	**100**	**24**	**179**	**84**	0	**287**	31	42	6	0	79	19	108	35	**1**	163	**629**
05:30 PM	34	**47**	16	0	97	19	152	74	**1**	246	36	38	18	0	92	10	**123**	**44**	1	**178**	613
Total Volume	152	141	70	0	363	71	625	307	1	1004	156	172	55	0	383	68	458	137	2	665	2415
% App. Total	41.9	38.8	19.3	0		7.1	62.3	30.6	0.1		40.7	44.9	14.4	0		10.2	68.9	20.6	0.3		
PHF	.844	.750	.921	.000	.908	.740	.873	.914	.250	.875	.796	.827	.655	.000	.863	.773	.931	.778	.500	.934	.960



MCV Associates, Inc.
4605-C Pinecrest off Park Dr
Alexandria, VA - 22312
Phone: 703 914-4850

File Name : 7. Amity Drive @ Washington Grove Lane
Site Code : J 998-7
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Washington Grove Lane From North					Amity Drive From East					Washington Grove Lane From South					From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	2	16	0	0	18	9	0	11	1	21	0	20	2	0	22	0	0	0	0	0	61
06:15 AM	6	18	0	0	24	4	0	18	0	22	0	23	1	0	24	0	0	0	0	0	70
06:30 AM	8	21	0	0	29	6	0	9	0	15	0	32	2	0	34	0	0	0	0	0	78
06:45 AM	9	57	0	0	66	10	0	16	0	26	0	40	6	0	46	0	0	0	0	0	138
Total	25	112	0	0	137	29	0	54	1	84	0	115	11	0	126	0	0	0	0	0	347
07:00 AM	7	32	0	0	39	14	0	16	0	30	0	24	3	0	27	0	0	0	0	0	96
07:15 AM	10	50	0	0	60	9	0	15	0	24	0	33	4	0	37	0	0	0	0	0	121
07:30 AM	6	54	0	0	60	13	0	19	0	32	0	34	7	0	41	0	0	0	0	0	133
07:45 AM	4	57	0	0	61	10	0	16	0	26	0	41	4	0	45	0	0	0	0	0	132
Total	27	193	0	0	220	46	0	66	0	112	0	132	18	0	150	0	0	0	0	0	482
08:00 AM	20	56	0	0	76	18	0	17	0	35	0	44	7	0	51	0	0	0	0	0	162
08:15 AM	6	51	0	0	57	10	0	17	0	27	0	39	5	0	44	0	0	0	0	0	128
08:30 AM	10	52	0	0	62	15	0	22	0	37	0	55	9	0	64	0	0	0	0	0	163
08:45 AM	12	50	0	0	62	10	0	11	0	21	0	35	6	0	41	0	0	0	0	0	124
Total	48	209	0	0	257	53	0	67	0	120	0	173	27	0	200	0	0	0	0	0	577
03:30 PM	21	66	0	0	87	10	0	24	0	34	0	59	13	0	72	0	0	0	0	0	193
03:45 PM	18	60	0	0	78	18	0	15	1	34	0	64	14	0	78	0	0	0	0	0	190
Total	39	126	0	0	165	28	0	39	1	68	0	123	27	0	150	0	0	0	0	0	383
04:00 PM	30	45	0	0	75	6	0	24	0	30	0	73	17	0	90	0	0	0	0	0	195
04:15 PM	27	73	0	0	100	6	0	12	0	18	0	59	8	0	67	0	0	0	0	0	185
04:30 PM	28	56	0	0	84	8	0	23	0	31	0	85	23	0	108	0	0	0	0	0	223
04:45 PM	18	54	0	0	72	20	0	17	0	37	0	90	16	0	106	0	0	0	0	0	215
Total	103	228	0	0	331	40	0	76	0	116	0	307	64	0	371	0	0	0	0	0	818
05:00 PM	23	46	0	0	69	13	0	26	0	39	0	65	16	0	81	0	0	0	0	0	189
05:15 PM	29	59	0	0	88	11	0	24	0	35	0	56	18	0	74	0	0	0	0	0	197
05:30 PM	40	76	0	0	116	10	0	25	0	35	0	68	11	0	79	0	0	0	0	0	230
05:45 PM	23	47	0	0	70	6	0	23	0	29	0	43	19	0	62	0	0	0	0	0	161
Total	115	228	0	0	343	40	0	98	0	138	0	232	64	0	296	0	0	0	0	0	777
06:00 PM	24	46	0	0	70	10	0	15	0	25	0	55	16	0	71	0	0	0	0	0	166
06:15 PM	16	50	0	0	66	13	0	14	0	27	0	72	19	0	91	0	0	0	0	0	184
Grand Total	397	1192	0	0	1589	259	0	429	2	690	0	1209	246	0	1455	0	0	0	0	0	3734
Apprch %	25	75	0	0		37.5	0	62.2	0.3		0	83.1	16.9	0		0	0	0	0		
Total %	10.6	31.9	0	0	42.6	6.9	0	11.5	0.1	18.5	0	32.4	6.6	0	39	0	0	0	0	0	

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File Name : 7. Amity Drive @ Washington Grove Lane
Site Code : J 998-7
Start Date : 6/3/2021
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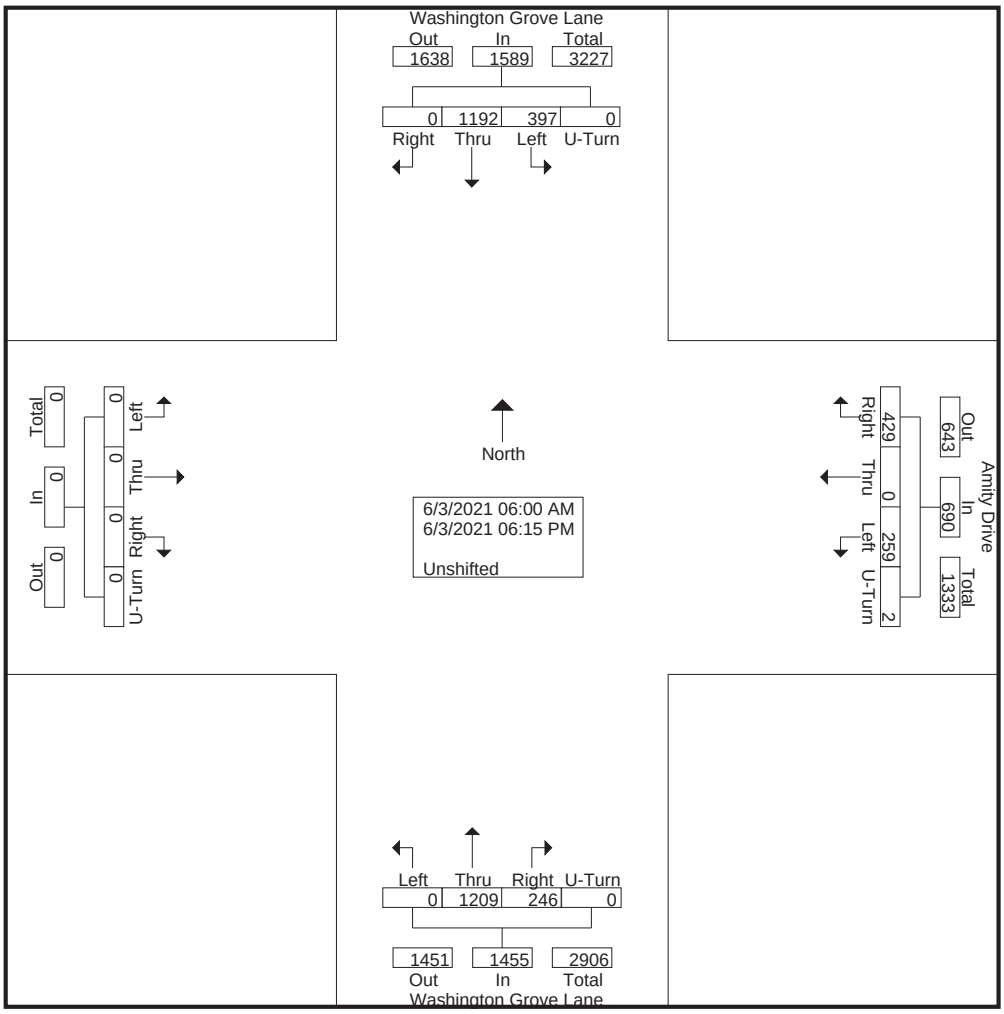

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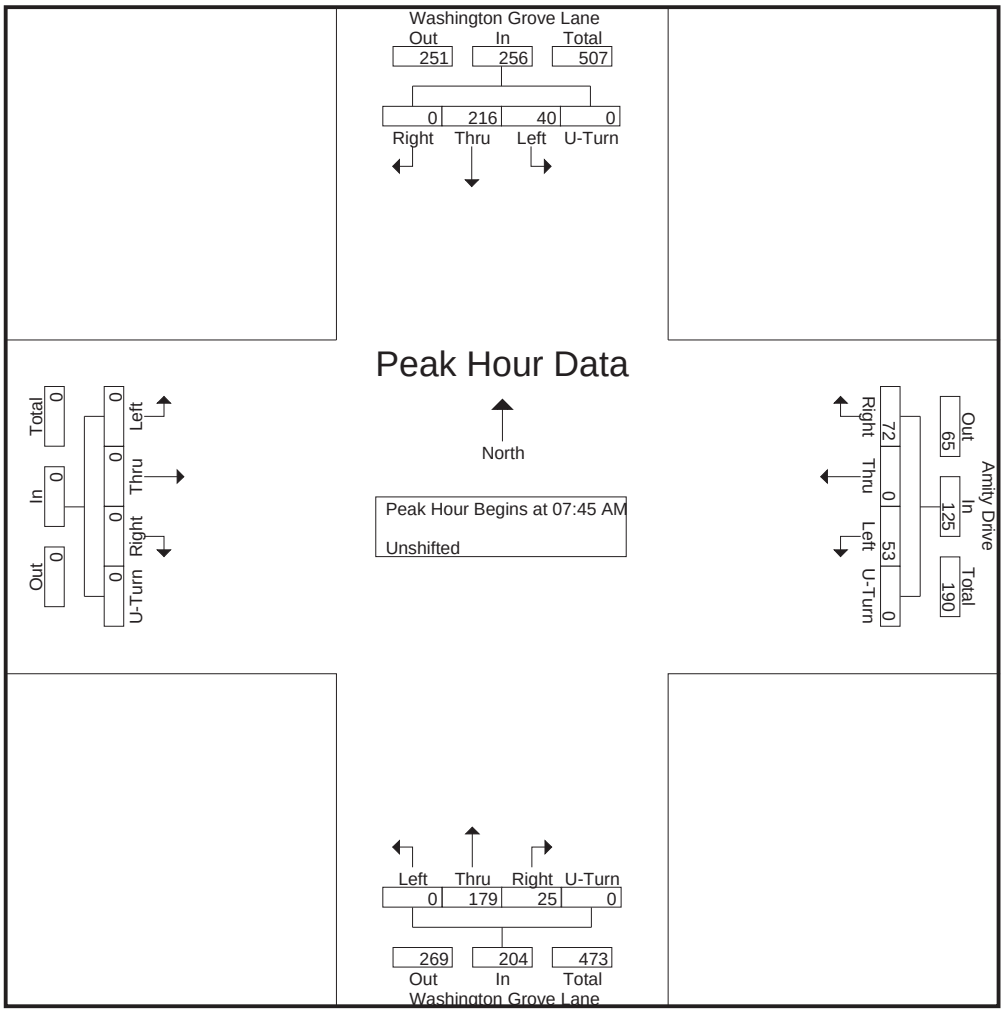
File Name : 7. Amity Drive @ Washington Grove Lane
Site Code : J 998-7
Start Date : 6/3/2021
Page No : 3

	Washington Grove Lane From North					Amity Drive From East					Washington Grove Lane From South					From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	4	**57**	0	0	61	10	0	16	0	26	0	41	4	0	45	0	0	0	0	0	132
08:00 AM	**20**	56	0	0	**76**	**18**	0	17	0	35	0	44	7	0	51	0	0	0	0	0	162
08:15 AM	6	51	0	0	57	10	0	17	0	27	0	39	5	0	44	0	0	0	0	0	128
08:30 AM	10	52	0	0	62	15	0	**22**	0	**37**	0	**55**	**9**	0	**64**	0	0	0	0	0	**163**
Total Volume	40	216	0	0	256	53	0	72	0	125	0	179	25	0	204	0	0	0	0	0	585
% App. Total	15.6	84.4	0	0		42.4	0	57.6	0		0	87.7	12.3	0		0	0	0	0		
PHF	.500	.947	.000	.000	.842	.736	.000	.818	.000	.845	.000	.814	.694	.000	.797	.000	.000	.000	.000	.000	.897



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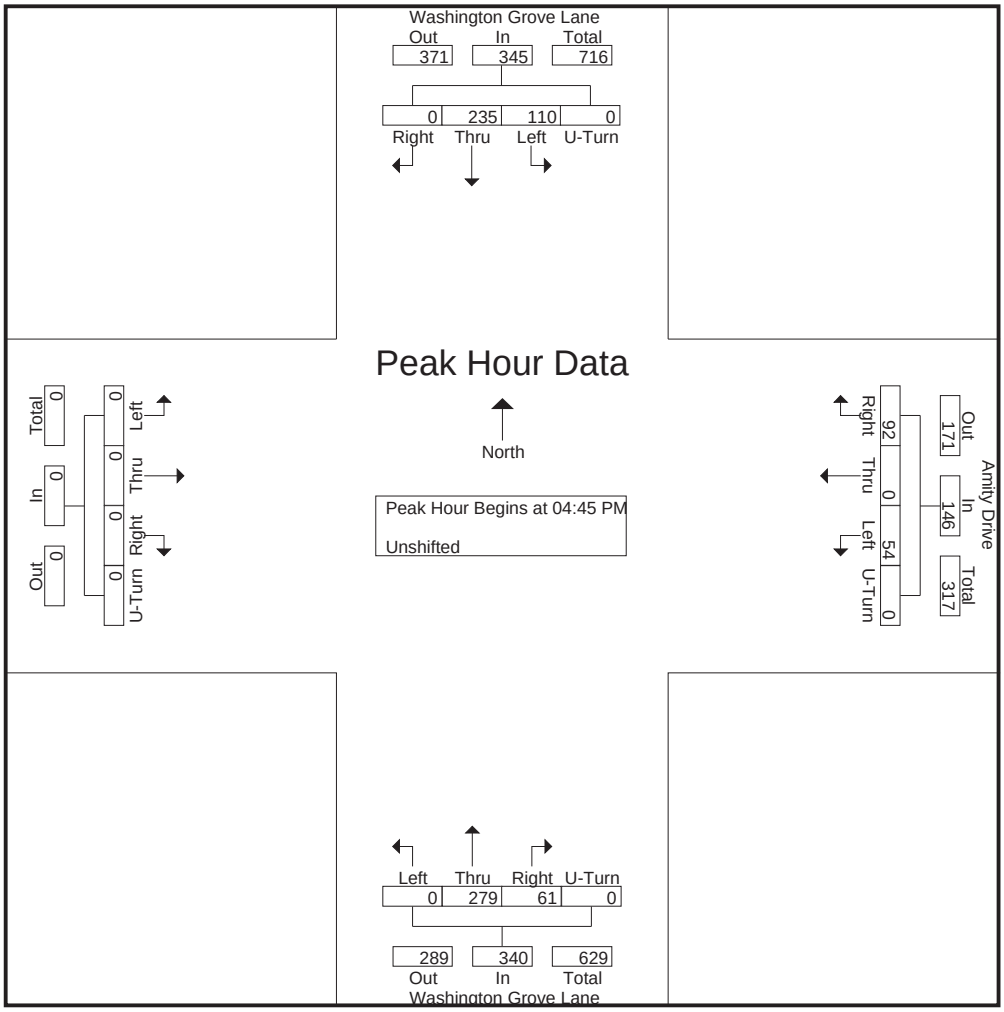
File Name : 7. Amity Drive @ Washington Grove Lane
Site Code : J 998-7
Start Date : 6/3/2021
Page No : 4

	Washington Grove Lane From North					Amity Drive From East					Washington Grove Lane From South					From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	18	54	0	0	72	**20**	0	17	0	37	0	**90**	16	0	**106**	0	0	0	0	0	215
05:00 PM	23	46	0	0	69	13	0	**26**	0	**39**	0	65	16	0	81	0	0	0	0	0	189
05:15 PM	29	59	0	0	88	11	0	24	0	35	0	56	**18**	0	74	0	0	0	0	0	197
05:30 PM	**40**	**76**	0	0	**116**	10	0	25	0	35	0	68	11	0	79	0	0	0	0	0	**230**
Total Volume	110	235	0	0	345	54	0	92	0	146	0	279	61	0	340	0	0	0	0	0	831
% App. Total	31.9	68.1	0	0		37	0	63	0		0	82.1	17.9	0		0	0	0	0		
PHF	.688	.773	.000	.000	.744	.675	.000	.885	.000	.936	.000	.775	.847	.000	.802	.000	.000	.000	.000	.000	.903



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File Name : 8. Washington Grove La @ Rail Road
Site Code : J 998-8
Start Date : 6/3/2021
Page No : 1

Groups Printed- Unshifted

	Washington Grove Lane From North					Rail Road From East					From South					Diamond Ave From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
06:00 AM	10	0	16	0	26	0	14	14	0	28	0	0	0	0	0	8	47	0	0	55	109
06:15 AM	24	0	8	0	32	0	11	10	0	21	0	0	0	0	0	6	44	0	0	50	103
06:30 AM	26	0	13	0	39	0	13	18	0	31	0	0	0	0	0	12	55	0	0	67	137
06:45 AM	44	0	20	0	64	0	20	22	0	42	0	0	0	0	0	10	67	0	0	77	183
Total	104	0	57	0	161	0	58	64	0	122	0	0	0	0	0	36	213	0	0	249	532
07:00 AM	35	0	24	0	59	0	19	8	0	27	0	0	0	0	0	8	62	0	0	70	156
07:15 AM	41	0	23	0	64	0	23	15	0	38	0	0	0	0	0	14	92	0	0	106	208
07:30 AM	44	0	33	0	77	0	32	19	0	51	0	0	0	0	0	18	75	0	0	93	221
07:45 AM	38	0	40	0	78	0	52	20	0	72	0	0	0	0	0	14	83	0	0	97	247
Total	158	0	120	0	278	0	126	62	0	188	0	0	0	0	0	54	312	0	0	366	832
08:00 AM	41	0	37	0	78	0	28	24	0	52	0	0	0	0	0	15	81	0	0	96	226
08:15 AM	40	0	34	0	74	0	39	22	0	61	0	0	0	0	0	16	74	0	0	90	225
08:30 AM	43	0	24	0	67	0	38	28	0	66	0	0	0	0	0	19	63	0	0	82	215
08:45 AM	32	0	28	0	60	0	45	17	0	62	0	0	0	0	0	18	64	0	0	82	204
Total	156	0	123	0	279	0	150	91	0	241	0	0	0	0	0	68	282	0	0	350	870
03:30 PM	29	0	33	0	62	0	71	35	0	106	0	0	0	0	0	37	62	0	0	99	267
03:45 PM	38	0	38	0	76	0	87	50	0	137	0	0	0	0	0	22	52	0	0	74	287
Total	67	0	71	0	138	0	158	85	0	243	0	0	0	0	0	59	114	0	0	173	554
04:00 PM	22	0	32	0	54	0	78	60	0	138	0	0	0	0	0	36	60	0	0	96	288
04:15 PM	43	0	35	0	78	0	81	36	0	117	0	0	0	0	0	35	49	0	0	84	279
04:30 PM	20	0	29	0	49	0	89	64	0	153	0	0	0	0	0	40	71	0	0	111	313
04:45 PM	22	0	49	0	71	0	91	58	0	149	0	0	0	0	0	48	64	0	0	112	332
Total	107	0	145	0	252	0	339	218	0	557	0	0	0	0	0	159	244	0	0	403	1212
05:00 PM	21	0	34	0	55	0	102	56	0	158	0	0	0	0	0	32	49	0	0	81	294
05:15 PM	29	0	41	0	70	0	93	53	0	146	0	0	0	0	0	37	51	0	0	88	304
05:30 PM	34	0	32	0	66	0	104	44	0	148	0	0	0	0	0	34	40	0	0	74	288
05:45 PM	22	0	28	0	50	0	72	36	0	108	0	0	0	0	0	39	36	0	0	75	233
Total	106	0	135	0	241	0	371	189	0	560	0	0	0	0	0	142	176	0	0	318	1119
06:00 PM	16	0	23	0	39	0	97	48	0	145	0	0	0	0	0	26	29	0	0	55	239
06:15 PM	17	0	39	0	56	0	84	50	0	134	0	0	0	0	0	43	38	0	0	81	271
Grand Total	731	0	713	0	1444	0	1383	807	0	2190	0	0	0	0	0	587	1408	0	0	1995	5629
Apprch %	50.6	0	49.4	0		0	63.2	36.8	0		0	0	0	0		29.4	70.6	0	0		
Total %	13	0	12.7	0	25.7	0	24.6	14.3	0	38.9	0	0	0	0	0	10.4	25	0	0	35.4	

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File Name : 8. Washington Grove La @ Rail Road
Site Code : J 998-8
Start Date : 6/3/2021
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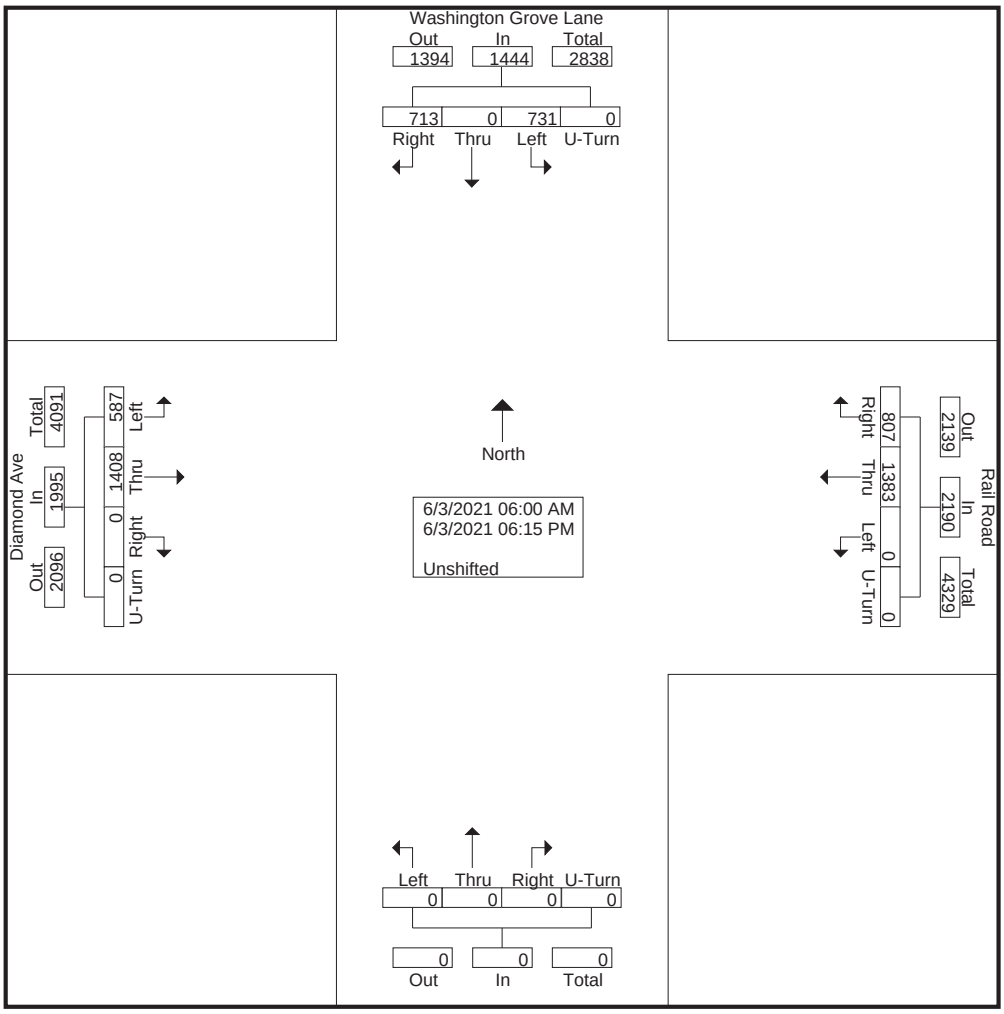

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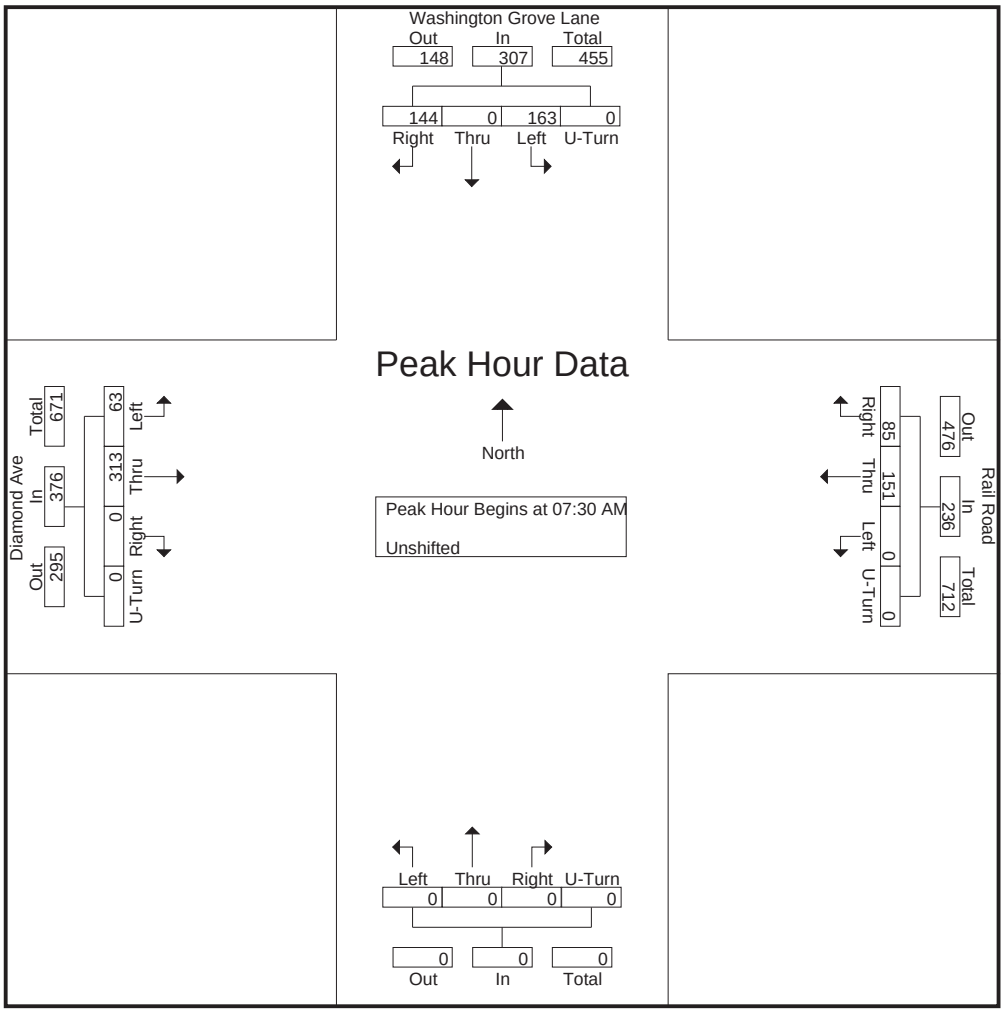
File Name : 8. Washington Grove La @ Rail Road
Site Code : J 998-8
Start Date : 6/3/2021
Page No : 3

	Washington Grove Lane From North					Rail Road From East					From South					Diamond Ave From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**44**	0	33	0	77	0	32	19	0	51	0	0	0	0	0	**18**	75	0	0	93	221
07:45 AM	38	0	**40**	0	**78**	0	**52**	20	0	**72**	0	0	0	0	0	14	**83**	0	0	**97**	**247**
08:00 AM	41	0	37	0	78	0	28	**24**	0	52	0	0	0	0	0	15	81	0	0	96	226
08:15 AM	40	0	34	0	74	0	39	22	0	61	0	0	0	0	0	16	74	0	0	90	225
Total Volume	163	0	144	0	307	0	151	85	0	236	0	0	0	0	0	63	313	0	0	376	919
% App. Total	53.1	0	46.9	0		0	64	36	0		0	0	0	0		16.8	83.2	0	0		
PHF	.926	.000	.900	.000	.984	.000	.726	.885	.000	.819	.000	.000	.000	.000	.000	.875	.943	.000	.000	.969	.930



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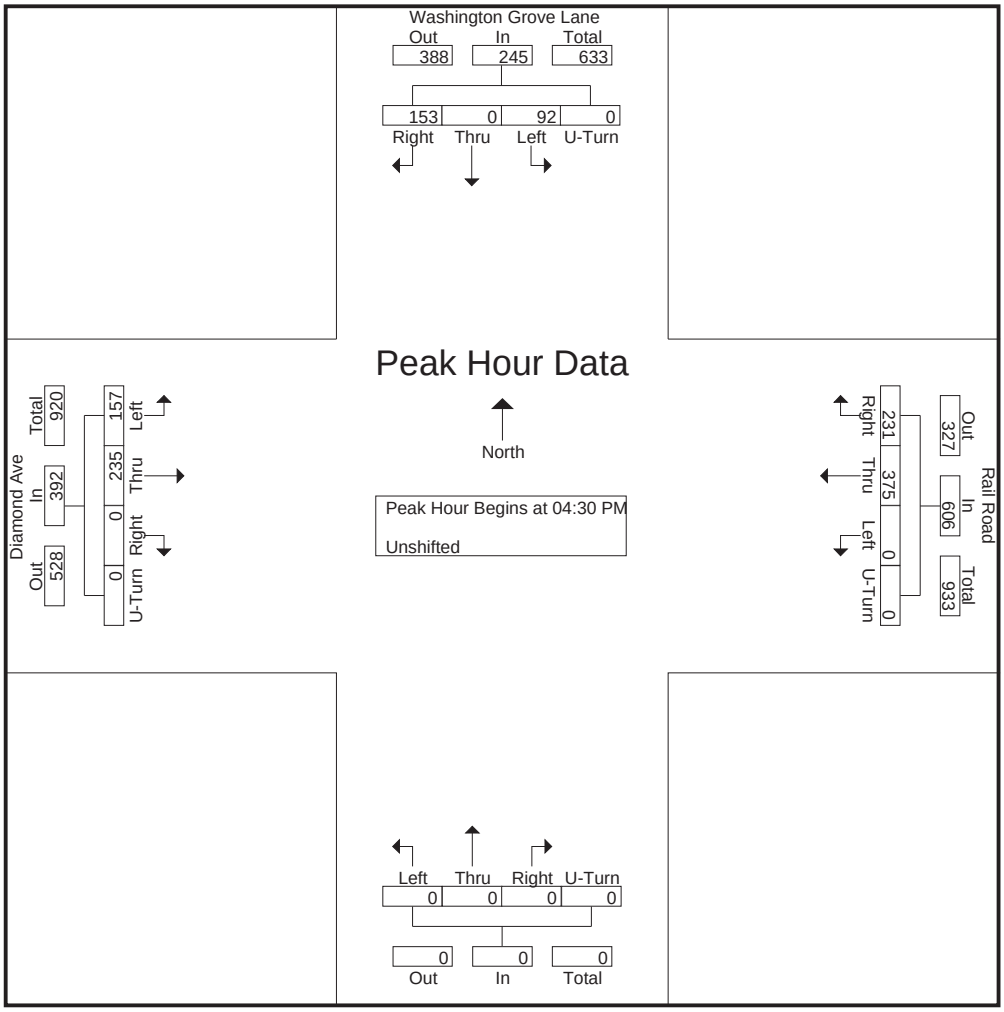
Phone: 703 914-4850

File Name : 8. Washington Grove La @ Rail Road
Site Code : J 998-8
Start Date : 6/3/2021
Page No : 4

	Washington Grove Lane From North					Rail Road From East					From South					Diamond Ave From West					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	20	0	29	0	49	0	89	**64**	0	153	0	0	0	0	0	40	**71**	0	0	111	313
04:45 PM	22	0	**49**	0	**71**	0	91	58	0	149	0	0	0	0	0	**48**	64	0	0	**112**	**332**
05:00 PM	21	0	34	0	55	0	**102**	56	0	**158**	0	0	0	0	0	32	49	0	0	81	294
05:15 PM	**29**	0	41	0	70	0	93	53	0	146	0	0	0	0	0	37	51	0	0	88	304
Total Volume	92	0	153	0	245	0	375	231	0	606	0	0	0	0	0	157	235	0	0	392	1243
% App. Total	37.6	0	62.4	0		0	61.9	38.1	0		0	0	0	0		40.1	59.9	0	0		
PHF	.793	.000	.781	.000	.863	.000	.919	.902	.000	.959	.000	.000	.000	.000	.000	.818	.827	.000	.000	.875	.936



Appendix 15.20

APPENDIX B: EXISTING CONDITIONS (SYNCHRO OUTPUT SHEETS)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	188	791	249	765	1301	174
Future Volume (vph)	188	791	249	765	1301	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-2%			1%	-1%	
Total Lost time (s)	6.0	6.0	4.5	6.0	6.0	
Lane Util. Factor	0.97	0.88	0.97	0.91	0.91	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3368	2760	3167	4779	4656	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3368	2760	3167	4779	4656	
Peak-hour factor, PHF	0.90	0.95	0.88	0.94	0.94	0.70
Adj. Flow (vph)	209	833	283	814	1384	249
RTOR Reduction (vph)	0	26	0	0	0	0
Lane Group Flow (vph)	209	807	283	814	1633	0
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	5%	4%	10%	8%	10%	6%
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 1	1	6	2	
Permitted Phases						
Actuated Green, G (s)	41.8	63.5	15.7	96.2	76.0	
Effective Green, g (s)	41.8	63.5	15.7	96.2	76.0	
Actuated g/C Ratio	0.28	0.42	0.10	0.64	0.51	
Clearance Time (s)	6.0		4.5	6.0	6.0	
Vehicle Extension (s)	4.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	938	1168	331	3064	2359	
v/s Ratio Prot	0.06	c0.29	c0.09	0.17	c0.35	
v/s Ratio Perm						
v/c Ratio	0.22	0.69	0.85	0.27	0.69	
Uniform Delay, d1	41.6	35.3	66.0	11.6	28.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	1.9	18.9	0.2	1.7	
Delay (s)	41.8	37.2	84.9	11.8	29.8	
Level of Service	D	D	F	B	C	
Approach Delay (s)	38.1			30.7	29.8	
Approach LOS	D			C	C	

Intersection Summary			
HCM 2000 Control Delay	32.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	209	833	283	814	1633
v/c Ratio	0.22	0.71	0.85	0.27	0.69
Control Delay	41.6	38.4	88.4	12.2	30.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	41.6	38.4	88.4	12.2	30.3
Queue Length 50th (ft)	78	359	145	127	441
Queue Length 95th (ft)	113	446	#236	151	498
Internal Link Dist (ft)	1412			518	770
Turn Bay Length (ft)	230		460		
Base Capacity (vph)	1010	1165	332	3065	2359
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.21	0.72	0.85	0.27	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	4	117	18	3	8	39	980	6	3	2077	18
Future Volume (vph)	23	4	117	18	3	8	39	980	6	3	2077	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-2%			-1%			1%			-1%	
Total Lost time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.91		1.00	0.91	
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1750	1615		1668		1796	4713		1814	4815	
Flt Permitted		0.77	1.00		0.85		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1404	1615		1442		1796	4713		1814	4815	
Peak-hour factor, PHF	0.82	0.50	0.84	0.75	0.38	0.33	0.73	0.98	0.50	0.38	0.92	0.75
Adj. Flow (vph)	28	8	139	24	8	24	53	1000	12	8	2258	24
RTOR Reduction (vph)	0	0	0	0	21	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	36	139	0	35	0	53	1012	0	8	2281	0
Confl. Peds. (#/hr)									3			
Heavy Vehicles (%)	0%	25%	1%	0%	0%	13%	0%	9%	33%	0%	8%	17%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8								
Actuated Green, G (s)		15.7	15.7		15.7		8.6	113.8		1.5	106.7	
Effective Green, g (s)		15.7	15.7		15.7		8.6	113.8		1.5	106.7	
Actuated g/C Ratio		0.10	0.10		0.10		0.06	0.76		0.01	0.71	
Clearance Time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Vehicle Extension (s)		0.2	0.2		3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		146	169		150		102	3575		18	3425	
v/s Ratio Prot							c0.03	0.21		0.00	c0.47	
v/s Ratio Perm		0.03	c0.09		0.02							
v/c Ratio		0.25	0.82		0.23		0.52	0.28		0.44	0.67	
Uniform Delay, d1		61.7	65.8		61.6		68.7	5.6		73.8	11.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3	25.3		0.8		4.4	0.2		16.5	1.0	
Delay (s)		62.0	91.1		62.4		73.1	5.8		90.3	12.9	
Level of Service		E	F		E		E	A		F	B	
Approach Delay (s)		85.1			62.4			9.1			13.2	
Approach LOS		F			E			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	36	139	56	53	1012	8	2282
v/c Ratio	0.25	0.82	0.33	0.45	0.27	0.11	0.66
Control Delay	63.4	99.5	42.0	78.9	5.3	71.7	14.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.4	99.5	42.0	78.9	5.3	71.7	14.2
Queue Length 50th (ft)	33	135	29	51	75	8	424
Queue Length 95th (ft)	37	189	17	78	165	11	600
Internal Link Dist (ft)	175		190		251		385
Turn Bay Length (ft)				220		200	
Base Capacity (vph)	332	382	359	185	3711	187	3458
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.36	0.16	0.29	0.27	0.04	0.66

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	361	147	329	960	184	133	47	112	85	62	134
Future Volume (vph)	77	361	147	329	960	184	133	47	112	85	62	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			-2%			4%			1%	
Total Lost time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Lane Util. Factor	1.00	0.91		1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1589	4350		1596	4835		1474	1568	1280	1484	1750	1448
Flt Permitted	0.15	1.00		0.37	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	257	4350		618	4835		1474	1568	1280	1484	1750	1448
Peak-hour factor, PHF	0.74	0.94	0.78	0.98	0.78	0.87	0.85	0.90	0.67	0.82	0.70	0.93
Adj. Flow (vph)	104	384	188	336	1231	211	156	52	167	104	89	144
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	104	572	0	336	1442	0	103	105	167	104	89	144
Confl. Peds. (#/hr)	1		1	5		5	1		1	1		1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	13%	8%	20%	14%	5%	8%	14%	6%	23%	21%	8%	10%
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		3	3	1	4	4	5
Permitted Phases	2			6					3			4
Actuated Green, G (s)	74.6	64.9		95.1	79.9		17.7	17.7	42.4	17.7	17.7	27.4
Effective Green, g (s)	74.6	64.9		95.1	79.9		17.7	17.7	42.4	17.7	17.7	27.4
Actuated g/C Ratio	0.50	0.43		0.63	0.53		0.12	0.12	0.28	0.12	0.12	0.18
Clearance Time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Vehicle Extension (s)	3.0	0.2		3.0	0.2		5.0	5.0	3.0	5.0	5.0	3.0
Lane Grp Cap (vph)	213	1882		552	2575		173	185	361	175	206	264
v/s Ratio Prot	0.03	0.13		c0.10	0.30		c0.07	0.07	0.08	c0.07	0.05	0.04
v/s Ratio Perm	0.21			c0.29					0.05			0.06
v/c Ratio	0.49	0.30		0.61	0.56		0.60	0.57	0.46	0.59	0.43	0.55
Uniform Delay, d1	20.5	27.8		13.3	23.3		62.8	62.5	44.4	62.7	61.5	55.6
Progression Factor	1.63	0.67		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.4		1.9	0.9		8.1	6.4	0.9	7.9	3.0	2.3
Delay (s)	35.2	19.1		15.2	24.2		70.8	69.0	45.3	70.7	64.5	57.9
Level of Service	D	B		B	C		E	E	D	E	E	E
Approach Delay (s)		21.6			22.5			59.0			63.6	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	31.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	104	572	336	1442	103	105	167	104	89	144
v/c Ratio	0.48	0.30	0.60	0.56	0.60	0.57	0.45	0.59	0.43	0.54
Control Delay	33.7	21.2	18.4	26.2	76.0	73.9	28.5	75.9	66.8	56.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.7	21.2	18.4	26.2	76.0	73.9	28.5	75.9	66.8	56.4
Queue Length 50th (ft)	43	98	140	332	102	104	95	98	82	123
Queue Length 95th (ft)	75	137	250	393	154	166	72	142	104	176
Internal Link Dist (ft)		1185		1058		325			341	
Turn Bay Length (ft)	330		300		270			185		
Base Capacity (vph)	310	1883	623	2575	299	318	454	306	361	355
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.30	0.54	0.56	0.34	0.33	0.37	0.34	0.25	0.41

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	409	27	22	1003	144	35	2	16	120	3	373
Future Volume (vph)	142	409	27	22	1003	144	35	2	16	120	3	373
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-1%			2%			2%	
Total Lost time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1703	4673	1509	1726	4768		1567	1568			1649	1494
Flt Permitted	0.11	1.00	1.00	0.46	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	202	4673	1509	834	4768		1567	1568			1649	1494
Peak-hour factor, PHF	0.82	0.82	0.75	0.88	0.91	0.88	0.73	0.50	0.80	0.81	0.75	0.91
Adj. Flow (vph)	173	499	36	25	1102	164	48	4	20	148	4	410
RTOR Reduction (vph)	0	0	15	0	14	0	0	19	0	0	0	106
Lane Group Flow (vph)	173	499	21	25	1252	0	48	5	0	0	152	304
Confl. Peds. (#/hr)				1		1						
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	6%	11%	7%	5%	7%	6%	14%	0%	6%	9%	0%	7%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	pm+ov
Protected Phases	1	6	3	5	2		3	3		4	4	1
Permitted Phases	6		6	2								4
Actuated Green, G (s)	85.7	75.0	85.5	65.9	61.7		10.5	10.5			35.3	52.8
Effective Green, g (s)	85.7	75.0	85.5	65.9	61.7		10.5	10.5			35.3	52.8
Actuated g/C Ratio	0.57	0.50	0.57	0.44	0.41		0.07	0.07			0.24	0.35
Clearance Time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Vehicle Extension (s)	3.0	3.0	5.0	3.0	3.0		5.0	5.0			3.0	3.0
Lane Grp Cap (vph)	290	2336	860	391	1961		109	109			388	525
v/s Ratio Prot	c0.07	0.11	0.00	0.00	c0.26		c0.03	0.00			0.09	c0.07
v/s Ratio Perm	0.27		0.01	0.03								0.14
v/c Ratio	0.60	0.21	0.02	0.06	0.64		0.44	0.05			0.39	0.58
Uniform Delay, d1	21.4	21.0	14.1	23.9	35.3		66.9	65.1			48.3	39.5
Progression Factor	1.00	1.00	1.00	0.59	0.63		1.00	1.00			1.00	1.00
Incremental Delay, d2	8.8	0.2	0.0	0.1	1.4		5.8	0.4			3.0	4.6
Delay (s)	30.1	21.2	14.1	14.1	23.5		72.8	65.5			51.3	44.1
Level of Service	C	C	B	B	C		E	E			D	D
Approach Delay (s)		23.0			23.4			70.3			46.1	
Approach LOS		C			C			E			D	

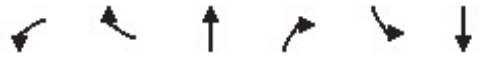
Intersection Summary			
HCM 2000 Control Delay	29.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	173	499	36	25	1266	48	24	152	410
v/c Ratio	0.59	0.20	0.04	0.06	0.63	0.38	0.17	0.39	0.60
Control Delay	27.0	19.9	0.3	8.9	22.5	72.9	29.5	54.4	26.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	19.9	0.3	8.9	22.5	72.9	29.5	54.4	26.5
Queue Length 50th (ft)	77	99	0	6	117	45	4	130	198
Queue Length 95th (ft)	120	114	0	m10	128	71	11	172	337
Internal Link Dist (ft)		591			224		51	121	
Turn Bay Length (ft)	500		75	225					
Base Capacity (vph)	292	2458	1052	479	2016	182	200	388	685
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.20	0.03	0.05	0.63	0.26	0.12	0.39	0.60

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	7	23	3	21	78	3
Future Volume (vph)	7	23	3	21	78	3
Peak Hour Factor	0.58	0.72	0.38	0.66	0.89	0.38
Hourly flow rate (vph)	12	32	8	32	88	8

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	44	40	96
Volume Left (vph)	12	0	88
Volume Right (vph)	32	32	0
Hadj (s)	-0.33	-0.37	0.25
Departure Headway (s)	3.9	3.7	4.3
Degree Utilization, x	0.05	0.04	0.11
Capacity (veh/h)	897	940	829
Control Delay (s)	7.1	6.9	7.8
Approach Delay (s)	7.1	6.9	7.8
Approach LOS	A	A	A

Intersection Summary			
Delay		7.4	
Level of Service		A	
Intersection Capacity Utilization		24.4%	ICU Level of Service A
Analysis Period (min)		15	

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	23	3	21	78	3
Future Vol, veh/h	7	23	3	21	78	3
Peak Hour Factor	0.58	0.72	0.38	0.66	0.89	0.38
Heavy Vehicles, %	0	4	33	0	1	33
Mvmt Flow	12	32	8	32	88	8
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7	7.3	7.8
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	23%	96%
Vol Thru, %	12%	0%	4%
Vol Right, %	88%	77%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	24	30	81
LT Vol	0	7	78
Through Vol	3	0	3
RT Vol	21	23	0
Lane Flow Rate	40	44	96
Geometry Grp	1	1	1
Degree of Util (X)	0.045	0.045	0.112
Departure Headway (Hd)	4.085	3.718	4.216
Convergence, Y/N	Yes	Yes	Yes
Cap	874	951	851
Service Time	2.12	1.789	2.237
HCM Lane V/C Ratio	0.046	0.046	0.113
HCM Control Delay	7.3	7	7.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.1	0.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	40	644	85	47	257	110	110	82	66	250	112	44
Future Volume (vph)	40	644	85	47	257	110	110	82	66	250	112	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			2%			0%			1%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.94		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1744	3487	1530	1553	4510		1719	1642		1694	3188	
Flt Permitted	0.49	1.00	1.00	0.32	1.00		0.61	1.00		0.29	1.00	
Satd. Flow (perm)	902	3487	1530	518	4510		1107	1642		518	3188	
Peak-hour factor, PHF	0.67	0.96	0.85	0.84	0.89	0.86	0.92	0.66	0.72	0.92	0.70	0.69
Adj. Flow (vph)	60	671	100	56	289	128	120	124	92	272	160	64
RTOR Reduction (vph)	0	0	55	0	44	0	0	19	0	0	28	0
Lane Group Flow (vph)	60	671	45	56	373	0	120	197	0	272	196	0
Confl. Peds. (#/hr)				4								
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	3%	3%	5%	15%	7%	10%	5%	9%	6%	6%	9%	5%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2			8			4		
Actuated Green, G (s)	74.8	67.8	67.8	75.0	67.9		35.7	23.1		55.1	36.0	
Effective Green, g (s)	74.8	67.8	67.8	75.0	67.9		35.7	23.1		55.1	36.0	
Actuated g/C Ratio	0.50	0.45	0.45	0.50	0.45		0.24	0.15		0.37	0.24	
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Vehicle Extension (s)	3.0	8.0	8.0	3.0	8.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	489	1576	691	307	2041		314	252		390	765	
v/s Ratio Prot	0.01	c0.19		c0.01	0.08		0.03	c0.12		c0.12	0.06	
v/s Ratio Perm	0.06		0.03	0.08			0.06			0.14		
v/c Ratio	0.12	0.43	0.07	0.18	0.18		0.38	0.78		0.70	0.26	
Uniform Delay, d1	19.5	27.9	23.2	20.1	24.5		46.8	61.0		36.9	46.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.8	0.2	0.3	0.2		0.8	14.1		5.4	0.2	
Delay (s)	19.6	28.7	23.4	20.4	24.7		47.6	75.1		42.2	46.3	
Level of Service	B	C	C	C	C		D	E		D	D	
Approach Delay (s)		27.4			24.2			65.3			44.1	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	36.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.5
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	60	671	100	56	417	120	216	272	224
v/c Ratio	0.12	0.42	0.13	0.17	0.20	0.37	0.79	0.69	0.28
Control Delay	19.8	31.0	3.0	20.6	21.8	34.0	74.4	42.7	38.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.8	31.0	3.0	20.6	21.8	34.0	74.4	42.7	38.1
Queue Length 50th (ft)	28	241	0	26	73	76	185	192	77
Queue Length 95th (ft)	44	343	20	53	113	111	177	246	80
Internal Link Dist (ft)		667			846		233		376
Turn Bay Length (ft)	200		200	245		300		180	
Base Capacity (vph)	530	1599	769	344	2117	504	389	419	839
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.42	0.13	0.16	0.20	0.24	0.56	0.65	0.27

Intersection Summary

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	53	72	179	25	40	216
Future Volume (Veh/h)	53	72	179	25	40	216
Sign Control	Stop		Free			Free
Grade	5%		0%			0%
Peak Hour Factor	0.74	0.82	0.81	0.69	0.50	0.95
Hourly flow rate (vph)	72	88	221	36	80	227
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						601
pX, platoon unblocked						
vC, conflicting volume	626	239			257	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	626	239			257	
tC, single (s)	6.4	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.3	
p0 queue free %	83	89			94	
cM capacity (veh/h)	419	785			1246	

Direction, Lane #	NW 1	NE 1	SW 1	SW 2
Volume Total	160	257	80	227
Volume Left	72	0	80	0
Volume Right	88	36	0	0
cSH	930	1700	1246	1700
Volume to Capacity	0.17	0.15	0.06	0.13
Queue Length 95th (ft)	15	0	5	0
Control Delay (s)	12.5	0.0	8.1	0.0
Lane LOS	B		A	
Approach Delay (s)	12.5	0.0	2.1	
Approach LOS	B			

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	27.6%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	3.9

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	53	72	179	25	40	216
Future Vol, veh/h	53	72	179	25	40	216
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	55	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	0	-	-	0
Peak Hour Factor	74	82	81	69	50	95
Heavy Vehicles, %	2	8	6	0	13	8
Mvmt Flow	72	88	221	36	80	227

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	626	239	0	0	257	0
Stage 1	239	-	-	-	-	-
Stage 2	387	-	-	-	-	-
Critical Hdwy	7.42	6.78	-	-	4.23	-
Critical Hdwy Stg 1	6.42	-	-	-	-	-
Critical Hdwy Stg 2	6.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.372	-	-	2.317	-
Pot Cap-1 Maneuver	376	760	-	-	1246	-
Stage 1	749	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	352	760	-	-	1246	-
Mov Cap-2 Maneuver	352	-	-	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	577	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.7	0	2.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	352	760	1246	-
HCM Lane V/C Ratio	-	-	0.203	0.116	0.064	-
HCM Control Delay (s)	-	-	17.8	10.4	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.8	0.4	0.2	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	63	313	163	144	151	85
Future Volume (vph)	63	313	163	144	151	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12
Grade (%)	0%			1%	-2%	
Total Lost time (s)	5.5	4.0	6.5	5.5	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1801	1473	1694	1800	1642	1510
Flt Permitted	1.00	1.00	0.71	1.00	0.95	1.00
Satd. Flow (perm)	1801	1473	1267	1800	1642	1510
Peak-hour factor, PHF	0.88	0.94	0.93	0.90	0.73	0.89
Adj. Flow (vph)	72	333	175	160	207	96
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	72	333	175	160	207	96
Heavy Vehicles (%)	2%	6%	6%	5%	11%	8%
Turn Type	NA	Free	pm+pt	NA	Prot	Free
Protected Phases	1		2	6	4	
Permitted Phases		Free	6			Free
Actuated Green, G (s)	26.5	120.0	54.5	54.5	54.0	120.0
Effective Green, g (s)	26.5	120.0	54.5	54.5	54.0	120.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.45	1.00
Clearance Time (s)	5.5		6.5	5.5	6.0	
Lane Grp Cap (vph)	397	1473	651	817	738	1510
v/s Ratio Prot	0.04		c0.05	0.09	c0.13	
v/s Ratio Perm		0.23	c0.07			0.06
v/c Ratio	0.18	0.23	0.27	0.20	0.28	0.06
Uniform Delay, d1	37.9	0.0	20.7	19.6	20.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.4	1.0	0.5	0.9	0.1
Delay (s)	38.9	0.4	21.8	20.2	21.7	0.1
Level of Service	D	A	C	C	C	A
Approach Delay (s)	7.2			21.0	14.9	
Approach LOS	A			C	B	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	72	333	175	160	207	96
v/c Ratio	0.18	0.23	0.27	0.20	0.28	0.06
Control Delay	39.4	0.4	22.9	20.5	22.1	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.4	0.4	22.9	20.5	22.1	0.1
Queue Length 50th (ft)	46	0	82	73	99	0
Queue Length 95th (ft)	85	0	132	118	121	0
Internal Link Dist (ft)	299			336	373	
Turn Bay Length (ft)			150			260
Base Capacity (vph)	397	1473	641	817	738	1510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.23	0.27	0.20	0.28	0.06

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	204	458	794	1532	798	238
Future Volume (vph)	204	458	794	1532	798	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-2%			1%	-1%	
Total Lost time (s)	6.0	6.0	4.5	6.0	6.0	
Lane Util. Factor	0.97	0.88	0.97	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3502	2787	3450	4963	4864	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3502	2787	3450	4963	4864	
Peak-hour factor, PHF	0.81	0.91	0.88	0.95	0.92	0.86
Adj. Flow (vph)	252	503	902	1613	867	277
RTOR Reduction (vph)	0	6	0	0	0	0
Lane Group Flow (vph)	252	497	902	1613	1144	0
Heavy Vehicles (%)	1%	3%	1%	4%	4%	1%
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 1	1	6	2	
Permitted Phases						
Actuated Green, G (s)	26.4	81.0	48.6	111.6	58.5	
Effective Green, g (s)	26.4	81.0	48.6	111.6	58.5	
Actuated g/C Ratio	0.18	0.54	0.32	0.74	0.39	
Clearance Time (s)	6.0		4.5	6.0	6.0	
Vehicle Extension (s)	4.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	616	1504	1117	3692	1896	
v/s Ratio Prot	c0.07	0.18	c0.26	0.33	c0.24	
v/s Ratio Perm						
v/c Ratio	0.41	0.33	0.81	0.44	0.60	
Uniform Delay, d1	54.9	19.3	46.4	7.3	36.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	0.2	4.4	0.4	1.4	
Delay (s)	55.5	19.5	50.8	7.7	37.9	
Level of Service	E	B	D	A	D	
Approach Delay (s)	31.5			23.1	37.9	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	252	503	902	1613	1144
v/c Ratio	0.41	0.34	0.81	0.44	0.60
Control Delay	56.4	19.5	52.2	7.9	39.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	56.4	19.5	52.2	7.9	39.8
Queue Length 50th (ft)	113	151	416	197	326
Queue Length 95th (ft)	137	155	439	250	434
Internal Link Dist (ft)	1412			518	770
Turn Bay Length (ft)	230		460		
Base Capacity (vph)	723	1774	1529	3693	1899
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.35	0.28	0.59	0.44	0.60

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	4	89	15	5	14	163	2257	24	10	1211	32
Future Volume (vph)	28	4	89	15	5	14	163	2257	24	10	1211	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-2%			-1%			1%			-1%	
Total Lost time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.91		1.00	0.91	
Frpb, ped/bikes		1.00	1.00		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1844	1615		1709		1796	5003		1814	4993	
Flt Permitted		0.75	1.00		0.85		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1442	1615		1487		1796	5003		1814	4993	
Peak-hour factor, PHF	0.78	0.50	0.77	0.62	0.42	0.58	0.78	0.95	0.75	0.83	0.89	0.80
Adj. Flow (vph)	36	8	116	24	12	24	209	2376	32	12	1361	40
RTOR Reduction (vph)	0	0	0	0	18	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	44	116	0	42	0	209	2407	0	12	1399	0
Confl. Peds. (#/hr)				2		2				1		1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	1%	7%	0%	0%	0%	3%	0%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8								
Actuated Green, G (s)		16.1	16.1		16.1		22.6	111.8		3.1	92.3	
Effective Green, g (s)		16.1	16.1		16.1		22.6	111.8		3.1	92.3	
Actuated g/C Ratio		0.11	0.11		0.11		0.15	0.75		0.02	0.62	
Clearance Time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		154	173		159		270	3728		37	3072	
v/s Ratio Prot							c0.12	c0.48		0.01	0.28	
v/s Ratio Perm		0.03	c0.07		0.03							
v/c Ratio		0.29	0.67		0.27		0.77	0.65		0.32	0.46	
Uniform Delay, d1		61.7	64.4		61.5		61.2	9.4		72.4	15.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0	9.8		0.9		12.9	0.9		5.1	0.5	
Delay (s)		62.7	74.2		62.4		74.2	10.3		77.5	15.9	
Level of Service		E	E		E		E	B		E	B	
Approach Delay (s)		71.0			62.4			15.4			16.4	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	44	116	60	209	2408	12	1401
v/c Ratio	0.29	0.67	0.34	0.77	0.63	0.15	0.46
Control Delay	64.5	82.4	46.6	79.8	10.2	72.6	17.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.5	82.4	46.6	79.8	10.2	72.6	17.1
Queue Length 50th (ft)	40	111	37	199	278	12	255
Queue Length 95th (ft)	43	146	27	234	563	32	360
Internal Link Dist (ft)	175		190		251		385
Turn Bay Length (ft)				220		200	
Base Capacity (vph)	293	328	318	335	3840	332	3076
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.35	0.19	0.62	0.63	0.04	0.46

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	128	829	138	251	493	147	241	84	349	165	70	144
Future Volume (vph)	128	829	138	251	493	147	241	84	349	165	70	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			-2%			4%			1%	
Total Lost time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Lane Util. Factor	1.00	0.91		1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1617	4664		1381	4686		1648	1666	1567	1663	1719	1516
Flt Permitted	0.37	1.00		0.22	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	631	4664		314	4686		1648	1666	1567	1663	1719	1516
Peak-hour factor, PHF	0.82	0.85	0.86	0.87	0.92	0.85	0.78	0.88	0.91	0.82	0.73	0.86
Adj. Flow (vph)	156	975	160	289	536	173	309	95	384	201	96	167
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	156	1135	0	289	709	0	201	203	384	201	96	167
Confl. Peds. (#/hr)	1		1	6		6						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	11%	6%	20%	32%	5%	12%	2%	5%	1%	8%	10%	6%
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		3	3	1	4	4	5
Permitted Phases	2			6					3			4
Actuated Green, G (s)	42.5	41.0		53.1	53.1		24.7	24.7	59.3	24.7	24.7	47.2
Effective Green, g (s)	42.5	41.0		53.1	53.1		24.7	24.7	59.3	24.7	24.7	47.2
Actuated g/C Ratio	0.28	0.27		0.35	0.35		0.16	0.16	0.40	0.16	0.16	0.31
Clearance Time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Vehicle Extension (s)	3.0	0.2		3.0	0.2		5.0	5.0	3.0	5.0	5.0	3.0
Lane Grp Cap (vph)	326	1274		357	1658		271	274	619	273	283	477
v/s Ratio Prot	0.07	c0.24		c0.19	0.15		c0.12	0.12	0.14	c0.12	0.06	0.05
v/s Ratio Perm	0.06			0.10					0.10			0.06
v/c Ratio	0.48	0.89		0.81	0.43		0.74	0.74	0.62	0.74	0.34	0.35
Uniform Delay, d1	46.5	52.4		40.5	36.9		59.6	59.6	36.3	59.6	55.4	39.6
Progression Factor	0.63	0.64		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	9.0		12.7	0.8		12.4	12.2	1.9	11.9	1.5	0.4
Delay (s)	30.5	42.5		53.2	37.7		72.0	71.8	38.3	71.4	56.9	40.0
Level of Service	C	D		D	D		E	E	D	E	E	D
Approach Delay (s)		41.1			42.2			55.5			57.1	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	46.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	156	1135	289	709	201	203	384	201	96	167
v/c Ratio	0.48	0.89	0.81	0.43	0.74	0.74	0.61	0.74	0.34	0.35
Control Delay	36.4	42.8	58.7	39.6	75.6	75.5	23.7	75.0	57.4	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.4	42.8	58.7	39.6	75.6	75.5	23.7	75.0	57.4	22.6
Queue Length 50th (ft)	73	199	229	195	198	201	168	189	84	77
Queue Length 95th (ft)	100	212	#460	265	240	278	234	240	109	91
Internal Link Dist (ft)		1185		1058		325			341	
Turn Bay Length (ft)	330		300		270			185		
Base Capacity (vph)	326	1275	359	1656	335	338	629	343	355	482
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.89	0.81	0.43	0.60	0.60	0.61	0.59	0.27	0.35

Intersection Summary

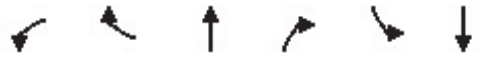
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	288	943	90	43	558	195	70	11	46	158	4	285
Future Volume (vph)	288	943	90	43	558	195	70	11	46	158	4	285
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-1%			2%			2%	
Total Lost time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1752	4940	1583	1778	4648		1686	1593			1745	1567
Flt Permitted	0.13	1.00	1.00	0.27	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	245	4940	1583	506	4648		1686	1593			1745	1567
Peak-hour factor, PHF	0.77	0.93	0.66	0.76	0.88	0.42	0.83	0.92	0.68	0.81	0.50	0.85
Adj. Flow (vph)	374	1014	136	57	634	464	84	12	68	195	8	335
RTOR Reduction (vph)	0	0	30	0	88	0	0	61	0	0	0	115
Lane Group Flow (vph)	374	1014	106	57	1010	0	84	19	0	0	203	220
Confl. Peds. (#/hr)				2		2						
Heavy Vehicles (%)	3%	5%	2%	2%	3%	5%	6%	9%	2%	3%	0%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	pm+ov
Protected Phases	1	6	3	5	2		3	3		4	4	1
Permitted Phases	6		6	2								4
Actuated Green, G (s)	90.0	77.2	92.2	60.3	54.0		15.0	15.0			26.5	56.0
Effective Green, g (s)	90.0	77.2	92.2	60.3	54.0		15.0	15.0			26.5	56.0
Actuated g/C Ratio	0.60	0.51	0.61	0.40	0.36		0.10	0.10			0.18	0.37
Clearance Time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Vehicle Extension (s)	3.0	3.0	5.0	3.0	3.0		5.0	5.0			3.0	3.0
Lane Grp Cap (vph)	443	2542	973	256	1673		168	159			308	585
v/s Ratio Prot	c0.17	0.21	0.01	0.01	0.22		c0.05	0.01			c0.12	0.07
v/s Ratio Perm	c0.34		0.06	0.08								0.07
v/c Ratio	0.84	0.40	0.11	0.22	0.60		0.50	0.12			0.66	0.38
Uniform Delay, d1	34.2	22.2	11.9	27.7	39.2		63.9	61.5			57.5	34.3
Progression Factor	1.00	1.00	1.00	0.85	0.95		1.00	1.00			1.00	1.00
Incremental Delay, d2	17.6	0.5	0.1	0.4	1.5		4.8	0.7			10.6	1.8
Delay (s)	51.8	22.7	12.0	24.1	38.9		68.8	62.2			68.1	36.1
Level of Service	D	C	B	C	D		E	E			E	D
Approach Delay (s)		28.9			38.2			65.6			48.2	
Approach LOS		C			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	374	1014	136	57	1098	84	80	203	335
v/c Ratio	0.85	0.39	0.13	0.21	0.62	0.50	0.36	0.66	0.44
Control Delay	48.9	22.6	4.5	15.1	34.3	73.7	22.1	69.5	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	22.6	4.5	15.1	34.3	73.7	22.1	69.5	15.9
Queue Length 50th (ft)	248	220	19	22	210	78	11	190	102
Queue Length 95th (ft)	290	264	25	33	376	125	63	146	170
Internal Link Dist (ft)		591			224		51	121	
Turn Bay Length (ft)	500		75	225					
Base Capacity (vph)	442	2583	1101	458	1762	196	245	308	755
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.39	0.12	0.12	0.62	0.43	0.33	0.66	0.44

Intersection Summary



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	21	110	3	14	58	6
Future Volume (vph)	21	110	3	14	58	6
Peak Hour Factor	0.53	0.95	0.38	0.70	0.81	0.38
Hourly flow rate (vph)	40	116	8	20	72	16

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	156	28	88
Volume Left (vph)	40	0	72
Volume Right (vph)	116	20	0
Hadj (s)	-0.39	-0.43	0.19
Departure Headway (s)	3.8	3.9	4.4
Degree Utilization, x	0.16	0.03	0.11
Capacity (veh/h)	927	879	782
Control Delay (s)	7.5	7.0	8.0
Approach Delay (s)	7.5	7.0	8.0
Approach LOS	A	A	A

Intersection Summary			
Delay	7.6		
Level of Service	A		
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	110	3	14	58	6
Future Vol, veh/h	21	110	3	14	58	6
Peak Hour Factor	0.53	0.95	0.38	0.70	0.81	0.38
Heavy Vehicles, %	0	0	0	0	2	0
Mvmt Flow	40	116	8	20	72	16
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.4	6.9	8
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	16%	91%
Vol Thru, %	18%	0%	9%
Vol Right, %	82%	84%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	17	131	64
LT Vol	0	21	58
Through Vol	3	0	6
RT Vol	14	110	0
Lane Flow Rate	28	155	87
Geometry Grp	1	1	1
Degree of Util (X)	0.029	0.157	0.107
Departure Headway (Hd)	3.746	3.627	4.41
Convergence, Y/N	Yes	Yes	Yes
Cap	945	978	810
Service Time	1.81	1.691	2.452
HCM Lane V/C Ratio	0.03	0.158	0.107
HCM Control Delay	6.9	7.4	8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.6	0.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	70	458	137	72	625	307	156	172	55	152	141	70
Future Volume (vph)	70	458	137	72	625	307	156	172	55	152	141	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			2%			0%			1%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1778	3522	1570	1785	4820		1805	1795		1744	3352	
Flt Permitted	0.20	1.00	1.00	0.42	1.00		0.57	1.00		0.26	1.00	
Satd. Flow (perm)	371	3522	1570	788	4820		1076	1795		477	3352	
Peak-hour factor, PHF	0.80	0.93	0.78	0.75	0.87	0.91	0.80	0.83	0.66	0.84	0.75	0.92
Adj. Flow (vph)	88	492	176	96	718	337	195	207	83	181	188	76
RTOR Reduction (vph)	0	0	97	0	47	0	0	10	0	0	30	0
Lane Group Flow (vph)	88	492	79	96	1008	0	195	280	0	181	234	0
Confl. Peds. (#/hr)				3		3						
Confl. Bikes (#/hr)			2			2						1
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%	0%	1%	2%	3%	3%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2			8			4		
Actuated Green, G (s)	76.6	67.5	67.5	77.0	67.7		45.7	28.5		47.7	29.5	
Effective Green, g (s)	76.6	67.5	67.5	77.0	67.7		45.7	28.5		47.7	29.5	
Actuated g/C Ratio	0.51	0.45	0.45	0.51	0.45		0.30	0.19		0.32	0.20	
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Vehicle Extension (s)	3.0	8.0	8.0	3.0	8.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	274	1584	706	466	2175		411	341		305	659	
v/s Ratio Prot	c0.02	0.14		0.01	c0.21		0.05	c0.16		c0.07	0.07	
v/s Ratio Perm	0.14		0.05	0.09			0.09			0.12		
v/c Ratio	0.32	0.31	0.11	0.21	0.46		0.47	0.82		0.59	0.36	
Uniform Delay, d1	19.9	26.4	23.9	19.0	28.6		40.7	58.3		40.0	52.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.5	0.3	0.2	0.7		0.9	14.7		3.1	0.3	
Delay (s)	20.6	26.9	24.2	19.2	29.3		41.5	73.0		43.1	52.4	
Level of Service	C	C	C	B	C		D	E		D	D	
Approach Delay (s)		25.5			28.4			60.3			48.6	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.5
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	88	492	176	96	1055	195	290	181	264
v/c Ratio	0.32	0.31	0.22	0.20	0.47	0.46	0.83	0.59	0.38
Control Delay	21.5	29.3	5.0	19.4	28.8	36.2	75.0	40.2	45.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.5	29.3	5.0	19.4	28.8	36.2	75.0	40.2	45.1
Queue Length 50th (ft)	39	160	0	43	238	136	265	125	102
Queue Length 95th (ft)	74	248	30	73	329	149	316	147	107
Internal Link Dist (ft)		667			846		233		376
Turn Bay Length (ft)	200		200	245		300		180	
Base Capacity (vph)	297	1586	804	490	2224	527	423	414	814
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.31	0.22	0.20	0.47	0.37	0.69	0.44	0.32

Intersection Summary

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	54	92	279	61	110	235
Future Volume (Veh/h)	54	92	279	61	110	235
Sign Control	Stop		Free			Free
Grade	5%		0%			0%
Peak Hour Factor	0.68	0.89	0.78	0.85	0.69	0.77
Hourly flow rate (vph)	79	103	358	72	159	305
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						601
pX, platoon unblocked						
vC, conflicting volume	1017	394			430	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1017	394			430	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	65	84			86	
cM capacity (veh/h)	228	659			1135	

Direction, Lane #	NW 1	NE 1	SW 1	SW 2
Volume Total	182	430	159	305
Volume Left	79	0	159	0
Volume Right	103	72	0	0
cSH	525	1700	1135	1700
Volume to Capacity	0.35	0.25	0.14	0.18
Queue Length 95th (ft)	38	0	12	0
Control Delay (s)	19.1	0.0	8.7	0.0
Lane LOS	C		A	
Approach Delay (s)	19.1	0.0	3.0	
Approach LOS	C			

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	5.6

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	54	92	279	61	110	235
Future Vol, veh/h	54	92	279	61	110	235
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	55	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	0	-	-	0
Peak Hour Factor	68	89	78	85	69	77
Heavy Vehicles, %	0	0	1	0	1	2
Mvmt Flow	79	103	358	72	159	305

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1017	394	0	0	430	0
Stage 1	394	-	-	-	-	-
Stage 2	623	-	-	-	-	-
Critical Hdwy	7.4	6.7	-	-	4.11	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	200	624	-	-	1135	-
Stage 1	615	-	-	-	-	-
Stage 2	453	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	172	624	-	-	1135	-
Mov Cap-2 Maneuver	172	-	-	-	-	-
Stage 1	615	-	-	-	-	-
Stage 2	390	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	25.3	0	3
HCM LOS	D		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	172	624	1135	-
HCM Lane V/C Ratio	-	-	0.462	0.166	0.14	-
HCM Control Delay (s)	-	-	42.7	11.9	8.7	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	2.2	0.6	0.5	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	157	235	92	153	375	231
Future Volume (vph)	157	235	92	153	375	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12
Grade (%)	0%			1%	-2%	
Total Lost time (s)	5.5	4.0	6.5	5.5	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1818	1516	1796	1872	1642	1510
Flt Permitted	1.00	1.00	0.57	1.00	0.95	1.00
Satd. Flow (perm)	1818	1516	1075	1872	1642	1510
Peak-hour factor, PHF	0.82	0.83	0.79	0.78	0.92	0.90
Adj. Flow (vph)	191	283	116	196	408	257
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	191	283	116	196	408	257
Heavy Vehicles (%)	1%	3%	0%	1%	11%	8%
Turn Type	NA	Free	pm+pt	NA	Prot	Free
Protected Phases	1		2	6	4	
Permitted Phases		Free	6			Free
Actuated Green, G (s)	35.5	120.0	52.5	52.5	56.0	120.0
Effective Green, g (s)	35.5	120.0	52.5	52.5	56.0	120.0
Actuated g/C Ratio	0.30	1.00	0.44	0.44	0.47	1.00
Clearance Time (s)	5.5		6.5	5.5	6.0	
Lane Grp Cap (vph)	537	1516	533	819	766	1510
v/s Ratio Prot	c0.11		0.02	c0.10	c0.25	
v/s Ratio Perm		0.19	0.08			0.17
v/c Ratio	0.36	0.19	0.22	0.24	0.53	0.17
Uniform Delay, d1	33.2	0.0	23.9	21.2	22.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	0.3	0.9	0.7	2.6	0.2
Delay (s)	35.1	0.3	24.9	21.9	25.4	0.2
Level of Service	D	A	C	C	C	A
Approach Delay (s)	14.3			23.0	15.7	
Approach LOS	B			C	B	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	191	283	116	196	408	257
v/c Ratio	0.36	0.19	0.22	0.24	0.53	0.17
Control Delay	35.6	0.3	23.5	22.2	25.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.6	0.3	23.5	22.2	25.9	0.2
Queue Length 50th (ft)	116	0	54	93	219	0
Queue Length 95th (ft)	165	0	80	124	316	0
Internal Link Dist (ft)	299			336	373	
Turn Bay Length (ft)			150			260
Base Capacity (vph)	537	1516	524	819	766	1510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.19	0.22	0.24	0.53	0.17

Intersection Summary

Appendix 15.21

APPENDIX C: M-NCPPC MODEL OUTPUT SHEETS

Travel/4MP Shady Grove Loaded Network
2016Existing (PM)

X=1256394.5,1278777.7,Y=530356.93,544948.16

F:__Travel4MP\TEMP\ShadyGrove Data to MCDOT\i4_Assign_Output_2016Exist(02.2019).net

cube

Travel/4MP Shady Grove Loaded Network
2016Existing (Daily)

X=1256394.5,1278777.7,Y=530356.93,544948.16

F:__Travel4MP\TEMP\ShadyGrove Data to MCDOT\i4_Assign_Output_2016Exist(02.2019).net

cube

Travel/4MP Shady Grove Loaded Network
2040NoBuild (PM)

F:__Travel4MP\TEMP\ShadyGrove Data to MCDOT\i4_Assign_Output_2040NB_Re(07.2019).net

cube

Travel/4MP Shady Grove Loaded Network
2040NoBuild (Daily)

F:__Travel4MP\TEMP\ShadyGrove Data to MCDOT\i4_Assign_Output_2040NB_Re(07.2019).net

cube

Appendix 15.22

APPENDIX D: 2040 NO-BUILD CONDITIONS (SYNCHRO OUTPUT SHEETS)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	227	956	301	924	1572	210
Future Volume (vph)	227	956	301	924	1572	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-2%			1%	-1%	
Total Lost time (s)	6.0	6.0	4.5	6.0	6.0	
Lane Util. Factor	0.97	0.88	0.97	0.91	0.91	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3368	2760	3167	4779	4674	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3368	2760	3167	4779	4674	
Peak-hour factor, PHF	0.92	0.95	0.92	0.94	0.94	0.92
Adj. Flow (vph)	247	1006	327	983	1672	228
RTOR Reduction (vph)	0	11	0	0	0	0
Lane Group Flow (vph)	247	995	327	983	1900	0
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	5%	4%	10%	8%	10%	6%
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 1	1	6	2	
Permitted Phases						
Actuated Green, G (s)	44.8	64.5	13.7	93.2	75.0	
Effective Green, g (s)	44.8	64.5	13.7	93.2	75.0	
Actuated g/C Ratio	0.30	0.43	0.09	0.62	0.50	
Clearance Time (s)	6.0		4.5	6.0	6.0	
Vehicle Extension (s)	4.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1005	1186	289	2969	2337	
v/s Ratio Prot	0.07	c0.36	c0.10	0.21	c0.41	
v/s Ratio Perm						
v/c Ratio	0.25	0.84	1.13	0.33	0.81	
Uniform Delay, d1	39.8	38.1	68.2	13.5	31.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	5.6	93.2	0.3	3.2	
Delay (s)	40.0	43.7	161.3	13.8	34.8	
Level of Service	D	D	F	B	C	
Approach Delay (s)	43.0			50.7	34.8	
Approach LOS	D			D	C	

Intersection Summary			
HCM 2000 Control Delay	41.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	5	141	22	4	10	47	1184	7	4	2510	22
Future Volume (vph)	28	5	141	22	4	10	47	1184	7	4	2510	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-2%			-1%			1%			-1%	
Total Lost time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.91		1.00	0.91	
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.96		1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1777	1615		1719		1796	4722		1814	4817	
Flt Permitted		0.73	1.00		0.80		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1351	1615		1419		1796	4722		1814	4817	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.98	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	5	153	24	4	11	51	1208	8	4	2728	24
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	35	153	0	29	0	51	1216	0	4	2752	0
Confl. Peds. (#/hr)									3			
Heavy Vehicles (%)	0%	25%	1%	0%	0%	13%	0%	9%	33%	0%	8%	17%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8								
Actuated Green, G (s)		17.1	17.1		17.1		8.4	112.5		1.4	105.5	
Effective Green, g (s)		17.1	17.1		17.1		8.4	112.5		1.4	105.5	
Actuated g/C Ratio		0.11	0.11		0.11		0.06	0.75		0.01	0.70	
Clearance Time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Vehicle Extension (s)		0.2	0.2		3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		154	184		161		100	3541		16	3387	
v/s Ratio Prot							c0.03	0.26		0.00	c0.57	
v/s Ratio Perm		0.03	c0.09		0.02							
v/c Ratio		0.23	0.83		0.18		0.51	0.34		0.25	0.81	
Uniform Delay, d1		60.4	65.0		60.1		68.8	6.3		73.8	15.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3	25.2		0.5		4.3	0.3		8.1	2.2	
Delay (s)		60.7	90.2		60.7		73.1	6.6		81.8	17.6	
Level of Service		E	F		E		E	A		F	B	
Approach Delay (s)		84.7			60.7			9.3			17.7	
Approach LOS		F			E			A			B	

Intersection Summary			
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	436	178	397	1159	222	161	57	135	103	75	162
Future Volume (vph)	93	436	178	397	1159	222	161	57	135	103	75	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			-2%			4%			1%	
Total Lost time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Lane Util. Factor	1.00	0.91		1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1589	4394		1597	4820		1474	1572	1281	1484	1750	1448
Flt Permitted	0.16	1.00		0.30	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	271	4394		502	4820		1474	1572	1281	1484	1750	1448
Peak-hour factor, PHF	0.92	0.94	0.92	0.98	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93
Adj. Flow (vph)	101	464	193	405	1260	241	175	62	147	112	82	174
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	101	657	0	405	1501	0	117	120	147	112	82	174
Confl. Peds. (#/hr)	1		1	5		5	1		1	1		1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	13%	8%	20%	14%	5%	8%	14%	6%	23%	21%	8%	10%
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		3	3	1	4	4	5
Permitted Phases	2			6					3			4
Actuated Green, G (s)	62.2	52.1		93.0	77.4		19.0	19.0	54.4	18.5	18.5	28.6
Effective Green, g (s)	62.2	52.1		93.0	77.4		19.0	19.0	54.4	18.5	18.5	28.6
Actuated g/C Ratio	0.41	0.35		0.62	0.52		0.13	0.13	0.36	0.12	0.12	0.19
Clearance Time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Vehicle Extension (s)	3.0	0.2		3.0	0.2		5.0	5.0	3.0	5.0	5.0	3.0
Lane Grp Cap (vph)	201	1526		569	2487		186	199	464	183	215	276
v/s Ratio Prot	0.03	0.15		c0.17	0.31		c0.08	0.08	0.07	0.08	0.05	c0.04
v/s Ratio Perm	0.17			c0.27					0.04			0.08
v/c Ratio	0.50	0.43		0.71	0.60		0.63	0.60	0.32	0.61	0.38	0.63
Uniform Delay, d1	27.4	37.6		16.1	25.5		62.2	61.9	34.4	62.3	60.5	55.8
Progression Factor	1.37	0.69		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.9		4.2	1.1		9.1	7.4	0.4	8.5	2.4	4.6
Delay (s)	39.5	26.8		20.3	26.6		71.2	69.3	34.8	70.8	62.8	60.5
Level of Service	D	C		C	C		E	E	C	E	E	E
Approach Delay (s)		28.5			25.3			56.7			64.1	
Approach LOS		C			C			E			E	

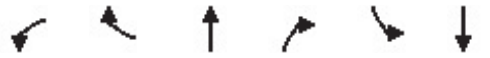
Intersection Summary			
HCM 2000 Control Delay	33.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	494	33	27	1211	174	42	2	19	145	4	450
Future Volume (vph)	171	494	33	27	1211	174	42	2	19	145	4	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-1%			2%			2%	
Total Lost time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.86			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1703	4673	1509	1726	4771		1567	1539			1649	1494
Flt Permitted	0.07	1.00	1.00	0.44	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	122	4673	1509	803	4771		1567	1539			1649	1494
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.91
Adj. Flow (vph)	186	537	36	29	1316	189	46	2	21	158	4	495
RTOR Reduction (vph)	0	0	16	0	13	0	0	20	0	0	0	100
Lane Group Flow (vph)	186	537	20	29	1492	0	46	3	0	0	162	395
Confl. Peds. (#/hr)				1		1						
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	6%	11%	7%	5%	7%	6%	14%	0%	6%	9%	0%	7%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	pm+ov
Protected Phases	1	6	3	5	2		3	3		4	4	1
Permitted Phases	6		6	2								4
Actuated Green, G (s)	85.7	74.9	85.2	66.0	61.7		10.3	10.3			35.5	53.0
Effective Green, g (s)	85.7	74.9	85.2	66.0	61.7		10.3	10.3			35.5	53.0
Actuated g/C Ratio	0.57	0.50	0.57	0.44	0.41		0.07	0.07			0.24	0.35
Clearance Time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Vehicle Extension (s)	3.0	3.0	5.0	3.0	3.0		5.0	5.0			3.0	3.0
Lane Grp Cap (vph)	254	2333	857	379	1962		107	105			390	527
v/s Ratio Prot	c0.09	0.11	0.00	0.00	0.31		c0.03	0.00			0.10	c0.09
v/s Ratio Perm	c0.33		0.01	0.03								0.18
v/c Ratio	0.73	0.23	0.02	0.08	0.76		0.43	0.03			0.42	0.75
Uniform Delay, d1	38.3	21.2	14.2	23.9	37.8		67.0	65.2			48.5	42.7
Progression Factor	1.00	1.00	1.00	0.66	0.66		1.00	1.00			1.00	1.00
Incremental Delay, d2	17.0	0.2	0.0	0.1	2.4		5.7	0.3			3.2	9.4
Delay (s)	55.3	21.5	14.2	15.9	27.4		72.7	65.5			51.7	52.1
Level of Service	E	C	B	B	C		E	E			D	D
Approach Delay (s)		29.4			27.2			70.3			52.0	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	34.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	8	28	4	25	94	4
Future Volume (vph)	8	28	4	25	94	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	30	4	27	102	4

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	39	31	106
Volume Left (vph)	9	0	102
Volume Right (vph)	30	27	0
Hadj (s)	-0.36	-0.45	0.23
Departure Headway (s)	3.8	3.6	4.2
Degree Utilization, x	0.04	0.03	0.12
Capacity (veh/h)	903	962	837
Control Delay (s)	7.0	6.8	7.8
Approach Delay (s)	7.0	6.8	7.8
Approach LOS	A	A	A

Intersection Summary			
Delay	7.5		
Level of Service	A		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	48	778	103	57	310	133	133	99	80	302	135	53
Future Volume (vph)	48	778	103	57	310	133	133	99	80	302	135	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			2%			0%			1%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.93		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1744	3487	1530	1554	4516		1719	1637		1694	3189	
Flt Permitted	0.46	1.00	1.00	0.25	1.00		0.62	1.00		0.31	1.00	
Satd. Flow (perm)	836	3487	1530	402	4516		1128	1637		554	3189	
Peak-hour factor, PHF	0.92	0.96	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	810	112	62	337	145	145	108	87	328	147	58
RTOR Reduction (vph)	0	0	62	0	42	0	0	21	0	0	28	0
Lane Group Flow (vph)	52	810	50	62	440	0	145	174	0	328	177	0
Confl. Peds. (#/hr)				4								
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	3%	3%	5%	15%	7%	10%	5%	9%	6%	6%	9%	5%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2			8			4		
Actuated Green, G (s)	74.2	67.6	67.6	75.6	68.3		35.5	21.2		55.1	34.3	
Effective Green, g (s)	74.2	67.6	67.6	75.6	68.3		35.5	21.2		55.1	34.3	
Actuated g/C Ratio	0.49	0.45	0.45	0.50	0.46		0.24	0.14		0.37	0.23	
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Vehicle Extension (s)	3.0	8.0	8.0	3.0	8.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	453	1571	689	258	2056		323	231		411	729	
v/s Ratio Prot	0.01	c0.23		c0.01	0.10		0.04	0.11		c0.15	0.06	
v/s Ratio Perm	0.05		0.03	0.11			0.06			c0.15		
v/c Ratio	0.11	0.52	0.07	0.24	0.21		0.45	0.75		0.80	0.24	
Uniform Delay, d1	19.8	29.5	23.4	20.7	24.6		47.7	61.9		38.2	47.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.2	0.2	0.5	0.2		1.0	12.9		10.3	0.2	
Delay (s)	19.9	30.7	23.6	21.2	24.9		48.7	74.7		48.5	47.4	
Level of Service	B	C	C	C	C		D	E		D	D	
Approach Delay (s)		29.3			24.5			63.6			48.1	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	37.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	64	87	216	30	48	261
Future Volume (Veh/h)	64	87	216	30	48	261
Sign Control	Stop		Free			Free
Grade	5%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.95
Hourly flow rate (vph)	70	95	235	33	52	275
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						601
pX, platoon unblocked						
vC, conflicting volume	630	252			268	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	630	252			268	
tC, single (s)	6.4	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.3	
p0 queue free %	84	88			96	
cM capacity (veh/h)	426	772			1235	

Direction, Lane #	NW 1	NE 1	SW 1	SW 2
Volume Total	165	268	52	275
Volume Left	70	0	52	0
Volume Right	95	33	0	0
cSH	1004	1700	1235	1700
Volume to Capacity	0.16	0.16	0.04	0.16
Queue Length 95th (ft)	15	0	3	0
Control Delay (s)	12.3	0.0	8.0	0.0
Lane LOS	B		A	
Approach Delay (s)	12.3	0.0	1.3	
Approach LOS	B			

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	76	378	197	174	182	103
Future Volume (vph)	76	378	197	174	182	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12
Grade (%)	0%			1%	-2%	
Total Lost time (s)	5.5	4.0	6.5	5.5	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1801	1473	1694	1800	1642	1510
Flt Permitted	1.00	1.00	0.70	1.00	0.95	1.00
Satd. Flow (perm)	1801	1473	1254	1800	1642	1510
Peak-hour factor, PHF	0.92	0.94	0.93	0.92	0.92	0.89
Adj. Flow (vph)	83	402	212	189	198	116
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	83	402	212	189	198	116
Heavy Vehicles (%)	2%	6%	6%	5%	11%	8%
Turn Type	NA	Free	pm+pt	NA	Prot	Free
Protected Phases	1		2	6	4	
Permitted Phases		Free	6			Free
Actuated Green, G (s)	26.5	120.0	54.5	54.5	54.0	120.0
Effective Green, g (s)	26.5	120.0	54.5	54.5	54.0	120.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.45	1.00
Clearance Time (s)	5.5		6.5	5.5	6.0	
Lane Grp Cap (vph)	397	1473	648	817	738	1510
v/s Ratio Prot	0.05		c0.06	0.10	0.12	
v/s Ratio Perm		c0.27	c0.09			0.08
v/c Ratio	0.21	0.27	0.33	0.23	0.27	0.08
Uniform Delay, d1	38.2	0.0	21.5	20.0	20.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.5	1.3	0.7	0.9	0.1
Delay (s)	39.4	0.5	22.9	20.6	21.5	0.1
Level of Service	D	A	C	C	C	A
Approach Delay (s)	7.1			21.8	13.6	
Approach LOS	A			C	B	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	247	1006	327	983	1900
v/c Ratio	0.25	0.86	1.14	0.33	0.81
Control Delay	40.5	47.5	152.9	13.9	35.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	40.5	47.5	152.9	13.9	35.2
Queue Length 50th (ft)	94	496	~192	160	561
Queue Length 95th (ft)	132	606	#296	187	627
Internal Link Dist (ft)	1412			518	770
Turn Bay Length (ft)	230		460		
Base Capacity (vph)	1010	1151	288	2967	2337
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.24	0.87	1.14	0.33	0.81

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	35	153	39	51	1216	4	2752
v/c Ratio	0.23	0.84	0.23	0.44	0.33	0.06	0.80
Control Delay	61.5	98.3	47.6	78.9	6.0	70.5	19.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.5	98.3	47.6	78.9	6.0	70.5	19.3
Queue Length 50th (ft)	32	149	25	49	102	4	648
Queue Length 95th (ft)	66	220	60	94	211	17	906
Internal Link Dist (ft)	175		190		251		385
Turn Bay Length (ft)				220		200	
Base Capacity (vph)	319	382	344	185	3682	187	3424
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.40	0.11	0.28	0.33	0.02	0.80

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	101	657	405	1501	117	120	147	112	82	174
v/c Ratio	0.50	0.43	0.71	0.60	0.63	0.60	0.31	0.62	0.38	0.62
Control Delay	38.5	29.3	23.3	29.0	76.1	73.9	19.5	76.0	64.3	59.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.5	29.3	23.3	29.0	76.1	73.9	19.5	76.0	64.3	59.1
Queue Length 50th (ft)	39	128	187	364	115	118	67	106	75	151
Queue Length 95th (ft)	108	160	330	539	182	183	66	166	126	205
Internal Link Dist (ft)		1185		1058		325			341	
Turn Bay Length (ft)	330		300		270			185		
Base Capacity (vph)	292	1527	592	2486	299	319	494	306	361	362
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.43	0.68	0.60	0.39	0.38	0.30	0.37	0.23	0.48

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	186	537	36	29	1505	46	23	162	495
v/c Ratio	0.73	0.22	0.04	0.07	0.75	0.37	0.16	0.42	0.73
Control Delay	50.7	20.2	0.3	10.1	26.2	72.9	26.6	54.8	34.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.7	20.2	0.3	10.1	26.2	72.9	26.6	54.8	34.5
Queue Length 50th (ft)	118	108	0	8	197	44	2	139	300
Queue Length 95th (ft)	#223	137	2	m13	183	86	32	225	479
Internal Link Dist (ft)		591			224		51	121	
Turn Bay Length (ft)	500		75	225					
Base Capacity (vph)	254	2454	1051	466	2016	182	198	390	681
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.22	0.03	0.06	0.75	0.25	0.12	0.42	0.73

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	28	4	25	94	4
Future Vol, veh/h	8	28	4	25	94	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	4	33	0	1	33
Mvmt Flow	9	30	4	27	102	4
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	6.9	7.3	7.8
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	22%	96%
Vol Thru, %	14%	0%	4%
Vol Right, %	86%	78%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	29	36	98
LT Vol	0	8	94
Through Vol	4	0	4
RT Vol	25	28	0
Lane Flow Rate	32	39	107
Geometry Grp	1	1	1
Degree of Util (X)	0.036	0.04	0.124
Departure Headway (Hd)	4.093	3.715	4.202
Convergence, Y/N	Yes	Yes	Yes
Cap	873	952	855
Service Time	2.128	1.786	2.219
HCM Lane V/C Ratio	0.037	0.041	0.125
HCM Control Delay	7.3	6.9	7.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.1	0.4

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	52	810	112	62	482	145	195	328	205
v/c Ratio	0.11	0.51	0.15	0.23	0.23	0.44	0.78	0.79	0.27
Control Delay	19.1	32.4	4.2	20.6	22.2	36.0	73.7	49.2	39.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.1	32.4	4.2	20.6	22.2	36.0	73.7	49.2	39.0
Queue Length 50th (ft)	24	302	0	29	87	95	164	244	71
Queue Length 95th (ft)	52	418	34	61	131	136	241	311	104
Internal Link Dist (ft)		667			846		233		376
Turn Bay Length (ft)	200		200	245		300		180	
Base Capacity (vph)	499	1597	768	294	2133	496	390	425	792
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.51	0.15	0.21	0.23	0.29	0.50	0.77	0.26

Intersection Summary

Intersection	
Int Delay, s/veh	3.5

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	64	87	216	30	48	261
Future Vol, veh/h	64	87	216	30	48	261
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	55	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	95
Heavy Vehicles, %	2	8	6	0	13	8
Mvmt Flow	70	95	235	33	52	275

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	631	252	0	0	268	0
Stage 1	252	-	-	-	-	-
Stage 2	379	-	-	-	-	-
Critical Hdwy	7.42	6.78	-	-	4.23	-
Critical Hdwy Stg 1	6.42	-	-	-	-	-
Critical Hdwy Stg 2	6.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.372	-	-	2.317	-
Pot Cap-1 Maneuver	373	746	-	-	1235	-
Stage 1	737	-	-	-	-	-
Stage 2	623	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	357	746	-	-	1235	-
Mov Cap-2 Maneuver	357	-	-	-	-	-
Stage 1	737	-	-	-	-	-
Stage 2	597	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.5	0	1.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	357	746	1235	-
HCM Lane V/C Ratio	-	-	0.195	0.127	0.042	-
HCM Control Delay (s)	-	-	17.5	10.5	8	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.4	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	83	402	212	189	198	116
v/c Ratio	0.21	0.27	0.33	0.23	0.27	0.08
Control Delay	39.9	0.5	24.2	20.9	21.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	0.5	24.2	20.9	21.9	0.1
Queue Length 50th (ft)	53	0	102	87	94	0
Queue Length 95th (ft)	99	0	159	138	149	0
Internal Link Dist (ft)	299			336	373	
Turn Bay Length (ft)			150			260
Base Capacity (vph)	397	1473	637	817	738	1510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.27	0.33	0.23	0.27	0.08

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	247	553	959	1851	964	288
Future Volume (vph)	247	553	959	1851	964	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-2%			1%	-1%	
Total Lost time (s)	6.0	6.0	4.5	6.0	6.0	
Lane Util. Factor	0.97	0.88	0.97	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3502	2787	3450	4963	4872	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3502	2787	3450	4963	4872	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.92	0.92
Adj. Flow (vph)	268	601	1042	1948	1048	313
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	268	599	1042	1948	1361	0
Heavy Vehicles (%)	1%	3%	1%	4%	4%	1%
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 1	1	6	2	
Permitted Phases						
Actuated Green, G (s)	28.9	89.8	54.9	109.1	49.7	
Effective Green, g (s)	28.9	89.8	54.9	109.1	49.7	
Actuated g/C Ratio	0.19	0.60	0.37	0.73	0.33	
Clearance Time (s)	6.0		4.5	6.0	6.0	
Vehicle Extension (s)	4.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	674	1668	1262	3609	1614	
v/s Ratio Prot	0.08	c0.22	c0.30	0.39	c0.28	
v/s Ratio Perm						
v/c Ratio	0.40	0.36	0.83	0.54	0.84	
Uniform Delay, d1	52.9	15.4	43.2	9.2	46.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.2	4.5	0.6	5.6	
Delay (s)	53.5	15.6	47.7	9.8	52.1	
Level of Service	D	B	D	A	D	
Approach Delay (s)	27.3			23.0	52.1	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	31.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	5	107	18	6	17	197	2726	29	12	1463	39
Future Volume (vph)	34	5	107	18	6	17	197	2726	29	12	1463	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-2%			-1%			1%			-1%	
Total Lost time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.91		1.00	0.91	
Frpb, ped/bikes		1.00	1.00		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1838	1615		1700		1796	5004		1814	4995	
Flt Permitted		0.78	1.00		0.85		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1491	1615		1472		1796	5004		1814	4995	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	5	116	20	7	18	214	2869	32	13	1590	42
RTOR Reduction (vph)	0	0	0	0	16	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	42	116	0	29	0	214	2901	0	13	1630	0
Confl. Peds. (#/hr)				2		2				1		1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	1%	7%	0%	0%	0%	3%	0%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8								
Actuated Green, G (s)		16.1	16.1		16.1		23.0	111.8		3.1	91.9	
Effective Green, g (s)		16.1	16.1		16.1		23.0	111.8		3.1	91.9	
Actuated g/C Ratio		0.11	0.11		0.11		0.15	0.75		0.02	0.61	
Clearance Time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		160	173		157		275	3729		37	3060	
v/s Ratio Prot							c0.12	c0.58		0.01	0.33	
v/s Ratio Perm		0.03	c0.07		0.02							
v/c Ratio		0.26	0.67		0.18		0.78	0.78		0.35	0.53	
Uniform Delay, d1		61.5	64.4		61.0		61.0	11.6		72.5	16.7	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9	9.8		0.6		13.0	1.7		5.7	0.7	
Delay (s)		62.4	74.2		61.5		74.0	13.2		78.1	17.4	
Level of Service		E	E		E		E	B		E	B	
Approach Delay (s)		71.0			61.5			17.4			17.9	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

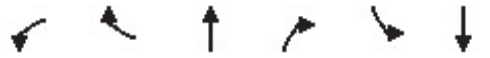
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	1002	167	303	595	178	291	101	421	199	85	174
Future Volume (vph)	155	1002	167	303	595	178	291	101	421	199	85	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			-2%			4%			1%	
Total Lost time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Lane Util. Factor	1.00	0.91		1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1618	4661		1381	4703		1648	1668	1567	1663	1719	1516
Flt Permitted	0.32	1.00		0.22	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	551	4661		314	4703		1648	1668	1567	1663	1719	1516
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	168	1089	182	329	647	193	316	110	458	216	92	189
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	168	1271	0	329	840	0	212	214	458	216	92	189
Confl. Peds. (#/hr)	1		1	6		6						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	11%	6%	20%	32%	5%	12%	2%	5%	1%	8%	10%	6%
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		3	3	1	4	4	5
Permitted Phases	2			6					3			4
Actuated Green, G (s)	42.5	41.0		51.2	51.2		25.6	25.6	58.3	25.7	25.7	48.2
Effective Green, g (s)	42.5	41.0		51.2	51.2		25.6	25.6	58.3	25.7	25.7	48.2
Actuated g/C Ratio	0.28	0.27		0.34	0.34		0.17	0.17	0.39	0.17	0.17	0.32
Clearance Time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Vehicle Extension (s)	3.0	0.2		3.0	0.2		5.0	5.0	3.0	5.0	5.0	3.0
Lane Grp Cap (vph)	316	1274		339	1605		281	284	609	284	294	487
v/s Ratio Prot	0.08	c0.27		c0.21	0.18		c0.13	0.13	0.16	c0.13	0.05	0.06
v/s Ratio Perm	0.07			0.12					0.13			0.07
v/c Ratio	0.53	1.00		0.97	0.52		0.75	0.75	0.75	0.76	0.31	0.39
Uniform Delay, d1	47.2	54.5		44.3	39.6		59.2	59.2	39.6	59.2	54.4	39.5
Progression Factor	0.67	0.67		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	23.1		40.8	1.2		12.9	12.7	5.2	13.3	1.3	0.5
Delay (s)	32.9	59.8		85.2	40.8		72.1	71.9	44.8	72.5	55.7	40.0
Level of Service	C	E		F	D		E	E	D	E	E	D
Approach Delay (s)		56.7			53.3			57.9			57.0	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	56.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	348	1139	109	52	674	236	84	13	55	191	5	344
Future Volume (vph)	348	1139	109	52	674	236	84	13	55	191	5	344
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-1%			2%			2%	
Total Lost time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1752	4940	1583	1778	4806		1686	1599			1742	1567
Flt Permitted	0.16	1.00	1.00	0.22	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	302	4940	1583	406	4806		1686	1599			1742	1567
Peak-hour factor, PHF	0.92	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	378	1225	118	57	733	257	91	14	60	208	5	374
RTOR Reduction (vph)	0	0	27	0	42	0	0	54	0	0	0	95
Lane Group Flow (vph)	378	1225	91	57	948	0	91	20	0	0	213	279
Confl. Peds. (#/hr)				2		2						
Heavy Vehicles (%)	3%	5%	2%	2%	3%	5%	6%	9%	2%	3%	0%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	pm+ov
Protected Phases	1	6	3	5	2		3	3		4	4	1
Permitted Phases	6		6	2								4
Actuated Green, G (s)	90.0	77.2	92.3	60.3	54.0		15.1	15.1			26.4	55.9
Effective Green, g (s)	90.0	77.2	92.3	60.3	54.0		15.1	15.1			26.4	55.9
Actuated g/C Ratio	0.60	0.51	0.62	0.40	0.36		0.10	0.10			0.18	0.37
Clearance Time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Vehicle Extension (s)	3.0	3.0	5.0	3.0	3.0		5.0	5.0			3.0	3.0
Lane Grp Cap (vph)	466	2542	974	220	1730		169	160			306	583
v/s Ratio Prot	c0.16	0.25	0.01	0.01	0.20		c0.05	0.01			c0.12	0.09
v/s Ratio Perm	c0.33		0.05	0.09								0.08
v/c Ratio	0.81	0.48	0.09	0.26	0.55		0.54	0.13			0.70	0.48
Uniform Delay, d1	28.0	23.5	11.8	27.7	38.3		64.1	61.4			58.0	35.9
Progression Factor	1.00	1.00	1.00	0.74	0.85		1.00	1.00			1.00	1.00
Incremental Delay, d2	14.2	0.7	0.1	0.5	1.1		5.9	0.7			12.4	2.8
Delay (s)	42.2	24.1	11.9	21.1	33.5		70.1	62.2			70.4	38.7
Level of Service	D	C	B	C	C		E	E			E	D
Approach Delay (s)		27.3			32.9			66.5			50.2	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	25	133	4	16	70	7
Future Volume (vph)	25	133	4	16	70	7
Peak Hour Factor	0.92	0.95	0.92	0.92	0.92	0.38
Hourly flow rate (vph)	27	140	4	17	76	18

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	167	21	94
Volume Left (vph)	27	0	76
Volume Right (vph)	140	17	0
Hadj (s)	-0.47	-0.49	0.19
Departure Headway (s)	3.7	3.8	4.4
Degree Utilization, x	0.17	0.02	0.12
Capacity (veh/h)	946	881	780
Control Delay (s)	7.5	6.9	8.0
Approach Delay (s)	7.5	6.9	8.0
Approach LOS	A	A	A

Intersection Summary			
Delay	7.6		
Level of Service	A		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	85	554	166	87	755	371	189	208	66	184	171	85
Future Volume (vph)	85	554	166	87	755	371	189	208	66	184	171	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			2%			0%			1%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1778	3522	1570	1786	4810		1805	1809		1744	3332	
Flt Permitted	0.15	1.00	1.00	0.35	1.00		0.57	1.00		0.24	1.00	
Satd. Flow (perm)	276	3522	1570	665	4810		1079	1809		443	3332	
Peak-hour factor, PHF	0.92	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	596	180	95	821	403	205	226	72	200	186	92
RTOR Reduction (vph)	0	0	101	0	50	0	0	8	0	0	42	0
Lane Group Flow (vph)	92	596	79	95	1174	0	205	290	0	200	236	0
Confl. Peds. (#/hr)				3		3						
Confl. Bikes (#/hr)			2			2						1
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%	0%	1%	2%	3%	3%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2			8			4		
Actuated Green, G (s)	74.9	66.0	66.0	75.1	66.1		46.6	28.9		50.4	30.8	
Effective Green, g (s)	74.9	66.0	66.0	75.1	66.1		46.6	28.9		50.4	30.8	
Actuated g/C Ratio	0.50	0.44	0.44	0.50	0.44		0.31	0.19		0.34	0.21	
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Vehicle Extension (s)	3.0	8.0	8.0	3.0	8.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	226	1549	690	400	2119		420	348		318	684	
v/s Ratio Prot	c0.02	0.17		0.01	c0.24		0.06	c0.16		c0.08	0.07	
v/s Ratio Perm	0.18		0.05	0.10			0.09			0.13		
v/c Ratio	0.41	0.38	0.11	0.24	0.55		0.49	0.83		0.63	0.34	
Uniform Delay, d1	21.8	28.3	24.8	20.2	31.0		40.2	58.2		38.7	51.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.7	0.3	0.3	1.1		0.9	15.6		3.9	0.3	
Delay (s)	23.0	29.0	25.1	20.5	32.1		41.1	73.8		42.5	51.3	
Level of Service	C	C	C	C	C		D	E		D	D	
Approach Delay (s)		27.6			31.3			60.5			47.6	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	37.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.5
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	65	111	337	74	133	284
Future Volume (Veh/h)	65	111	337	74	133	284
Sign Control	Stop		Free			Free
Grade	5%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	121	366	80	145	309
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						601
pX, platoon unblocked						
vC, conflicting volume	1005	406			446	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1005	406			446	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	70	81			87	
cM capacity (veh/h)	234	649			1120	

Direction, Lane #	NW 1	NE 1	SW 1	SW 2
Volume Total	192	446	145	309
Volume Left	71	0	145	0
Volume Right	121	80	0	0
cSH	634	1700	1120	1700
Volume to Capacity	0.30	0.26	0.13	0.18
Queue Length 95th (ft)	32	0	11	0
Control Delay (s)	17.4	0.0	8.7	0.0
Lane LOS	C		A	
Approach Delay (s)	17.4	0.0	2.8	
Approach LOS	C			

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	189	284	111	185	453	279
Future Volume (vph)	189	284	111	185	453	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12
Grade (%)	0%			1%	-2%	
Total Lost time (s)	5.5	4.0	6.5	5.5	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1818	1516	1796	1872	1642	1510
Flt Permitted	1.00	1.00	0.55	1.00	0.95	1.00
Satd. Flow (perm)	1818	1516	1038	1872	1642	1510
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	205	309	121	201	492	303
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	205	309	121	201	492	303
Heavy Vehicles (%)	1%	3%	0%	1%	11%	8%
Turn Type	NA	Free	pm+pt	NA	Prot	Free
Protected Phases	1		2	6	4	
Permitted Phases		Free	6			Free
Actuated Green, G (s)	35.5	120.0	52.5	52.5	56.0	120.0
Effective Green, g (s)	35.5	120.0	52.5	52.5	56.0	120.0
Actuated g/C Ratio	0.30	1.00	0.44	0.44	0.47	1.00
Clearance Time (s)	5.5		6.5	5.5	6.0	
Lane Grp Cap (vph)	537	1516	520	819	766	1510
v/s Ratio Prot	c0.11		0.02	0.11	c0.30	
v/s Ratio Perm		c0.20	0.08			0.20
v/c Ratio	0.38	0.20	0.23	0.25	0.64	0.20
Uniform Delay, d1	33.5	0.0	24.6	21.3	24.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	0.3	1.0	0.7	4.1	0.3
Delay (s)	35.6	0.3	25.7	22.0	28.5	0.3
Level of Service	D	A	C	C	C	A
Approach Delay (s)	14.4			23.4	17.7	
Approach LOS	B			C	B	

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	268	601	1042	1948	1361
v/c Ratio	0.40	0.37	0.83	0.54	0.84
Control Delay	54.5	16.2	48.9	10.0	52.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	54.5	16.2	48.9	10.0	52.7
Queue Length 50th (ft)	119	164	474	290	457
Queue Length 95th (ft)	162	168	507	335	#645
Internal Link Dist (ft)	1412			518	770
Turn Bay Length (ft)	230		460		
Base Capacity (vph)	723	1807	1529	3611	1615
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.37	0.33	0.68	0.54	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	42	116	45	214	2901	13	1632
v/c Ratio	0.26	0.67	0.26	0.78	0.76	0.16	0.53
Control Delay	63.7	82.4	42.8	79.6	13.3	72.8	18.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.7	82.4	42.8	79.6	13.3	72.8	18.7
Queue Length 50th (ft)	38	111	24	204	415	13	320
Queue Length 95th (ft)	76	174	63	283	834	37	454
Internal Link Dist (ft)	175		190		251		385
Turn Bay Length (ft)				220		200	
Base Capacity (vph)	303	328	313	336	3838	332	3061
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.35	0.14	0.64	0.76	0.04	0.53

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	168	1271	329	840	212	214	458	216	92	189
v/c Ratio	0.53	1.00	0.96	0.52	0.75	0.75	0.74	0.76	0.31	0.38
Control Delay	40.2	60.4	84.0	42.7	75.8	75.4	29.3	75.9	56.0	22.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.2	60.4	84.0	42.7	75.8	75.4	29.3	75.9	56.0	22.7
Queue Length 50th (ft)	76	215	281	244	209	211	214	203	79	85
Queue Length 95th (ft)	m127	#544	#577	319	298	302	#313	288	131	108
Internal Link Dist (ft)		1185		1058		325			341	
Turn Bay Length (ft)	330		300		270			185		
Base Capacity (vph)	316	1274	342	1605	335	338	619	343	355	492
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	1.00	0.96	0.52	0.63	0.63	0.74	0.63	0.26	0.38

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	378	1225	118	57	990	91	74	213	374
v/c Ratio	0.81	0.47	0.11	0.24	0.56	0.54	0.35	0.70	0.51
Control Delay	40.1	24.1	4.4	14.0	31.5	75.5	23.7	71.6	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	24.1	4.4	14.0	31.5	75.5	23.7	71.6	21.9
Queue Length 50th (ft)	223	282	16	19	132	85	12	202	163
Queue Length 95th (ft)	#380	331	40	m35	184	146	63	#322	266
Internal Link Dist (ft)		591			224		51	121	
Turn Bay Length (ft)	500		75	225					
Base Capacity (vph)	465	2583	1098	423	1772	196	239	306	735
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.47	0.11	0.13	0.56	0.46	0.31	0.70	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	133	4	16	70	7
Future Vol, veh/h	25	133	4	16	70	7
Peak Hour Factor	0.92	0.95	0.92	0.92	0.92	0.38
Heavy Vehicles, %	0	0	0	0	2	0
Mvmt Flow	27	140	4	17	76	18
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.4	6.9	8.1
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	16%	91%
Vol Thru, %	20%	0%	9%
Vol Right, %	80%	84%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	20	158	77
LT Vol	0	25	70
Through Vol	4	0	7
RT Vol	16	133	0
Lane Flow Rate	22	167	95
Geometry Grp	1	1	1
Degree of Util (X)	0.023	0.168	0.116
Departure Headway (Hd)	3.787	3.626	4.427
Convergence, Y/N	Yes	Yes	Yes
Cap	934	976	807
Service Time	1.854	1.695	2.469
HCM Lane V/C Ratio	0.024	0.171	0.118
HCM Control Delay	6.9	7.4	8.1
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.6	0.4

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	92	596	180	95	1224	205	298	200	278
v/c Ratio	0.40	0.39	0.23	0.24	0.56	0.48	0.84	0.62	0.38
Control Delay	24.7	31.4	5.1	20.7	31.9	35.3	75.8	40.0	41.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	31.4	5.1	20.7	31.9	35.3	75.8	40.0	41.5
Queue Length 50th (ft)	42	206	0	44	302	140	274	137	100
Queue Length 95th (ft)	88	306	54	91	417	175	364	172	133
Internal Link Dist (ft)		667			846		233		376
Turn Bay Length (ft)	200		200	245		300		180	
Base Capacity (vph)	247	1548	790	422	2167	538	424	414	831
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.39	0.23	0.23	0.56	0.38	0.70	0.48	0.33

Intersection Summary

Intersection	
Int Delay, s/veh	5

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	65	111	337	74	133	284
Future Vol, veh/h	65	111	337	74	133	284
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	55	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	1	2
Mvmt Flow	71	121	366	80	145	309

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1005	406	0	0	446	0
Stage 1	406	-	-	-	-	-
Stage 2	599	-	-	-	-	-
Critical Hdwy	7.4	6.7	-	-	4.11	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	204	614	-	-	1120	-
Stage 1	605	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	178	614	-	-	1120	-
Mov Cap-2 Maneuver	178	-	-	-	-	-
Stage 1	605	-	-	-	-	-
Stage 2	408	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	21.8	0	2.8
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	178	614	1120	-
HCM Lane V/C Ratio	-	-	0.397	0.197	0.129	-
HCM Control Delay (s)	-	-	37.9	12.3	8.7	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	1.7	0.7	0.4	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	205	309	121	201	492	303
v/c Ratio	0.38	0.20	0.24	0.25	0.64	0.20
Control Delay	36.1	0.3	23.8	22.3	29.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.1	0.3	23.8	22.3	29.2	0.3
Queue Length 50th (ft)	126	0	56	96	283	0
Queue Length 95th (ft)	197	0	97	150	404	0
Internal Link Dist (ft)	299			336	373	
Turn Bay Length (ft)			150			260
Base Capacity (vph)	537	1516	511	819	766	1510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.20	0.24	0.25	0.64	0.20

Intersection Summary

Appendix 15.23

APPENDIX E: 2040 BUILD CONDITIONS - CRABBS BRANCH WAY EXTENSION (SYNCHRO OUTPUT SHEETS)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	224	915	288	927	1573	209
Future Volume (vph)	224	915	288	927	1573	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-2%			1%	-1%	
Total Lost time (s)	6.0	6.0	4.5	6.0	6.0	
Lane Util. Factor	0.97	0.88	0.97	0.91	0.91	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3368	2760	3167	4779	4674	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3368	2760	3167	4779	4674	
Peak-hour factor, PHF	0.92	0.95	0.92	0.94	0.94	0.92
Adj. Flow (vph)	243	963	313	986	1673	227
RTOR Reduction (vph)	0	11	0	0	0	0
Lane Group Flow (vph)	243	952	313	986	1900	0
Confl. Bikes (#/hr)		1				
Heavy Vehicles (%)	5%	4%	10%	8%	10%	6%
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 1	1	6	2	
Permitted Phases						
Actuated Green, G (s)	44.2	64.5	14.3	93.8	75.0	
Effective Green, g (s)	44.2	64.5	14.3	93.8	75.0	
Actuated g/C Ratio	0.29	0.43	0.10	0.63	0.50	
Clearance Time (s)	6.0		4.5	6.0	6.0	
Vehicle Extension (s)	4.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	992	1186	301	2988	2337	
v/s Ratio Prot	0.07	c0.34	c0.10	0.21	c0.41	
v/s Ratio Perm						
v/c Ratio	0.24	0.80	1.04	0.33	0.81	
Uniform Delay, d1	40.2	37.2	67.8	13.3	31.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	4.2	62.6	0.3	3.2	
Delay (s)	40.4	41.5	130.5	13.6	34.8	
Level of Service	D	D	F	B	C	
Approach Delay (s)	41.2			41.7	34.8	
Approach LOS	D			D	C	

Intersection Summary			
HCM 2000 Control Delay	38.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	5	32	22	4	10	11	1174	7	4	2469	22
Future Volume (vph)	28	5	32	22	4	10	11	1174	7	4	2469	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-2%			-1%			1%			-1%	
Total Lost time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.91		1.00	0.91	
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.96		1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1777	1615		1719		1796	4722		1814	4817	
Flt Permitted		0.82	1.00		0.79		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1521	1615		1403		1796	4722		1814	4817	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.98	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	5	35	24	4	11	12	1198	8	4	2684	24
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	35	35	0	29	0	12	1206	0	4	2708	0
Confl. Peds. (#/hr)									3			
Heavy Vehicles (%)	0%	25%	1%	0%	0%	13%	0%	9%	33%	0%	8%	17%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8								
Actuated Green, G (s)		7.4	7.4		7.4		3.1	122.2		1.4	120.5	
Effective Green, g (s)		7.4	7.4		7.4		3.1	122.2		1.4	120.5	
Actuated g/C Ratio		0.05	0.05		0.05		0.02	0.81		0.01	0.80	
Clearance Time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Vehicle Extension (s)		0.2	0.2		3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		75	79		69		37	3846		16	3869	
v/s Ratio Prot							c0.01	0.26		0.00	c0.56	
v/s Ratio Perm		c0.02	0.02		0.02							
v/c Ratio		0.47	0.44		0.41		0.32	0.31		0.25	0.70	
Uniform Delay, d1		69.4	69.3		69.2		72.4	3.5		73.8	6.6	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7	1.4		4.0		5.1	0.2		8.1	1.1	
Delay (s)		71.0	70.7		73.2		77.5	3.7		81.8	7.7	
Level of Service		E	E		E		E	A		F	A	
Approach Delay (s)		70.9			73.2			4.4			7.8	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	417	178	380	1072	239	161	66	135	162	92	297
Future Volume (vph)	120	417	178	380	1072	239	161	66	135	162	92	297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			-2%			4%			1%	
Total Lost time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Lane Util. Factor	1.00	0.91		1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1589	4383		1597	4797		1474	1583	1280	1484	1750	1448
Flt Permitted	0.15	1.00		0.30	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	250	4383		507	4797		1474	1583	1280	1484	1750	1448
Peak-hour factor, PHF	0.92	0.94	0.92	0.98	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93
Adj. Flow (vph)	130	444	193	388	1165	260	175	72	147	176	100	319
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	130	637	0	388	1425	0	122	125	147	176	100	319
Confl. Peds. (#/hr)	1		1	5		5	1		1	1		1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	13%	8%	20%	14%	5%	8%	14%	6%	23%	21%	8%	10%
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		3	3	1	4	4	5
Permitted Phases	2			6					3			4
Actuated Green, G (s)	61.8	49.5		86.3	68.5		19.5	19.5	50.8	24.7	24.7	37.0
Effective Green, g (s)	61.8	49.5		86.3	68.5		19.5	19.5	50.8	24.7	24.7	37.0
Actuated g/C Ratio	0.41	0.33		0.58	0.46		0.13	0.13	0.34	0.16	0.16	0.25
Clearance Time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Vehicle Extension (s)	3.0	0.2		3.0	0.2		5.0	5.0	3.0	5.0	5.0	3.0
Lane Grp Cap (vph)	212	1446		519	2190		191	205	433	244	288	357
v/s Ratio Prot	0.05	0.15		c0.16	0.30		c0.08	0.08	0.07	0.12	0.06	c0.07
v/s Ratio Perm	0.20			c0.27					0.04			0.15
v/c Ratio	0.61	0.44		0.75	0.65		0.64	0.61	0.34	0.72	0.35	0.89
Uniform Delay, d1	28.6	39.4		19.3	31.5		61.9	61.7	37.1	59.4	55.5	54.6
Progression Factor	1.37	0.69		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.1	1.0		5.8	1.5		9.4	7.4	0.5	12.2	1.5	23.4
Delay (s)	44.3	28.1		25.1	33.0		71.3	69.0	37.5	71.6	57.0	78.0
Level of Service	D	C		C	C		E	E	D	E	E	E
Approach Delay (s)		30.9			31.3			58.0			72.6	
Approach LOS		C			C			E			E	

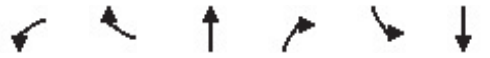
Intersection Summary			
HCM 2000 Control Delay	41.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	502	33	27	1267	174	42	2	19	145	4	417
Future Volume (vph)	163	502	33	27	1267	174	42	2	19	145	4	417
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-1%			2%			2%	
Total Lost time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.86			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1703	4673	1509	1726	4775		1567	1539			1649	1494
Flt Permitted	0.06	1.00	1.00	0.44	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	105	4673	1509	796	4775		1567	1539			1649	1494
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	177	546	36	29	1377	189	46	2	21	158	4	453
RTOR Reduction (vph)	0	0	16	0	12	0	0	20	0	0	0	98
Lane Group Flow (vph)	177	546	20	29	1554	0	46	3	0	0	162	355
Confl. Peds. (#/hr)				1		1						
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	6%	11%	7%	5%	7%	6%	14%	0%	6%	9%	0%	7%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	pm+ov
Protected Phases	1	6	3	5	2		3	3		4	4	1
Permitted Phases	6		6	2								4
Actuated Green, G (s)	85.7	74.9	85.2	66.0	61.7		10.3	10.3			35.5	53.0
Effective Green, g (s)	85.7	74.9	85.2	66.0	61.7		10.3	10.3			35.5	53.0
Actuated g/C Ratio	0.57	0.50	0.57	0.44	0.41		0.07	0.07			0.24	0.35
Clearance Time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Vehicle Extension (s)	3.0	3.0	5.0	3.0	3.0		5.0	5.0			3.0	3.0
Lane Grp Cap (vph)	246	2333	857	376	1964		107	105			390	527
v/s Ratio Prot	c0.08	0.12	0.00	0.00	c0.33		c0.03	0.00			0.10	c0.08
v/s Ratio Perm	0.33		0.01	0.03								0.16
v/c Ratio	0.72	0.23	0.02	0.08	0.79		0.43	0.03			0.42	0.67
Uniform Delay, d1	40.9	21.3	14.2	23.9	38.5		67.0	65.2			48.5	41.1
Progression Factor	1.00	1.00	1.00	0.76	0.68		1.00	1.00			1.00	1.00
Incremental Delay, d2	16.6	0.2	0.0	0.1	2.6		5.7	0.3			3.2	6.7
Delay (s)	57.5	21.5	14.2	18.2	28.8		72.7	65.5			51.7	47.9
Level of Service	E	C	B	B	C		E	E			D	D
Approach Delay (s)		29.6			28.6			70.3			48.9	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	41	9	39	18	37	133
Future Volume (vph)	41	9	39	18	37	133
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.38
Hourly flow rate (vph)	45	10	42	20	40	350

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	55	62	390
Volume Left (vph)	45	0	40
Volume Right (vph)	10	20	0
Hadj (s)	0.07	0.19	0.53
Departure Headway (s)	5.1	4.7	4.6
Degree Utilization, x	0.08	0.08	0.50
Capacity (veh/h)	650	741	759
Control Delay (s)	8.5	8.1	12.3
Approach Delay (s)	8.5	8.1	12.3
Approach LOS	A	A	B

Intersection Summary			
Delay		11.3	
Level of Service		B	
Intersection Capacity Utilization		29.0%	ICU Level of Service A
Analysis Period (min)		15	

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	48	764	117	51	306	129	137	103	62	289	148	53
Future Volume (vph)	48	764	117	51	306	129	137	103	62	289	148	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			2%			0%			1%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.94		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1744	3487	1530	1554	4520		1719	1654		1694	3196	
Flt Permitted	0.46	1.00	1.00	0.26	1.00		0.61	1.00		0.33	1.00	
Satd. Flow (perm)	846	3487	1530	423	4520		1113	1654		592	3196	
Peak-hour factor, PHF	0.92	0.96	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	796	127	55	333	140	149	112	67	314	161	58
RTOR Reduction (vph)	0	0	67	0	41	0	0	16	0	0	25	0
Lane Group Flow (vph)	52	796	60	55	432	0	149	163	0	314	194	0
Confl. Peds. (#/hr)				4								
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	3%	3%	5%	15%	7%	10%	5%	9%	6%	6%	9%	5%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2			8			4		
Actuated Green, G (s)	76.0	69.5	69.5	77.0	70.0		34.8	20.0		53.5	32.2	
Effective Green, g (s)	76.0	69.5	69.5	77.0	70.0		34.8	20.0		53.5	32.2	
Actuated g/C Ratio	0.51	0.46	0.46	0.51	0.47		0.23	0.13		0.36	0.21	
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Vehicle Extension (s)	3.0	8.0	8.0	3.0	8.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	467	1615	708	269	2109		318	220		409	686	
v/s Ratio Prot	0.00	c0.23		c0.01	0.10		0.05	0.10		c0.14	0.06	
v/s Ratio Perm	0.05		0.04	0.10			0.06			c0.14		
v/c Ratio	0.11	0.49	0.09	0.20	0.20		0.47	0.74		0.77	0.28	
Uniform Delay, d1	18.8	28.0	22.5	19.7	23.6		48.4	62.5		38.9	49.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.1	0.2	0.4	0.2		1.1	12.2		8.4	0.2	
Delay (s)	18.9	29.1	22.7	20.0	23.8		49.5	74.7		47.3	49.5	
Level of Service	B	C	C	C	C		D	E		D	D	
Approach Delay (s)		27.7			23.4			63.3			48.2	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.5
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	32	80	213	25	70	260
Future Volume (Veh/h)	32	80	213	25	70	260
Sign Control	Stop		Free			Free
Grade	5%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.95
Hourly flow rate (vph)	35	87	232	27	76	274
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						601
pX, platoon unblocked						
vC, conflicting volume	672	246			259	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	672	246			259	
tC, single (s)	6.4	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.3	
p0 queue free %	91	89			94	
cM capacity (veh/h)	395	778			1244	

Direction, Lane #	NW 1	NE 1	SW 1	SW 2
Volume Total	122	259	76	274
Volume Left	35	0	76	0
Volume Right	87	27	0	0
cSH	1092	1700	1244	1700
Volume to Capacity	0.11	0.15	0.06	0.16
Queue Length 95th (ft)	9	0	5	0
Control Delay (s)	11.6	0.0	8.1	0.0
Lane LOS	B		A	
Approach Delay (s)	11.6	0.0	1.8	
Approach LOS	B			

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	76	378	164	174	182	95
Future Volume (vph)	76	378	164	174	182	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12
Grade (%)	0%			1%	-2%	
Total Lost time (s)	5.5	4.0	6.5	5.5	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1801	1473	1694	1800	1642	1510
Flt Permitted	1.00	1.00	0.70	1.00	0.95	1.00
Satd. Flow (perm)	1801	1473	1254	1800	1642	1510
Peak-hour factor, PHF	0.92	0.94	0.93	0.92	0.92	0.89
Adj. Flow (vph)	83	402	176	189	198	107
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	83	402	176	189	198	107
Heavy Vehicles (%)	2%	6%	6%	5%	11%	8%
Turn Type	NA	Free	pm+pt	NA	Prot	Free
Protected Phases	1		2	6	4	
Permitted Phases		Free	6			Free
Actuated Green, G (s)	26.5	120.0	54.5	54.5	54.0	120.0
Effective Green, g (s)	26.5	120.0	54.5	54.5	54.0	120.0
Actuated g/C Ratio	0.22	1.00	0.45	0.45	0.45	1.00
Clearance Time (s)	5.5		6.5	5.5	6.0	
Lane Grp Cap (vph)	397	1473	648	817	738	1510
v/s Ratio Prot	0.05		0.05	0.10	0.12	
v/s Ratio Perm		c0.27	0.07			0.07
v/c Ratio	0.21	0.27	0.27	0.23	0.27	0.07
Uniform Delay, d1	38.2	0.0	20.8	20.0	20.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.5	1.0	0.7	0.9	0.1
Delay (s)	39.4	0.5	21.8	20.6	21.5	0.1
Level of Service	D	A	C	C	C	A
Approach Delay (s)	7.1			21.2	14.0	
Approach LOS	A			C	B	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	243	963	313	986	1900
v/c Ratio	0.24	0.82	1.04	0.33	0.81
Control Delay	40.8	44.9	126.2	13.8	35.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	40.8	44.9	126.2	13.8	35.2
Queue Length 50th (ft)	92	463	~178	161	561
Queue Length 95th (ft)	130	567	#279	188	627
Internal Link Dist (ft)	1412			518	770
Turn Bay Length (ft)	230		460		
Base Capacity (vph)	1010	1162	301	2986	2337
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.24	0.83	1.04	0.33	0.81

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	35	35	39	12	1206	4	2708
v/c Ratio	0.42	0.39	0.44	0.15	0.30	0.06	0.67
Control Delay	82.0	79.8	67.0	72.7	3.1	70.5	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	82.0	79.8	67.0	72.7	3.1	70.5	7.5
Queue Length 50th (ft)	34	34	27	12	64	4	247
Queue Length 95th (ft)	72	72	66	35	151	17	575
Internal Link Dist (ft)	175		190		251		385
Turn Bay Length (ft)				220		200	
Base Capacity (vph)	359	382	340	185	4073	187	4065
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.09	0.11	0.06	0.30	0.02	0.67

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	130	637	388	1425	122	125	147	176	100	319
v/c Ratio	0.60	0.44	0.74	0.65	0.64	0.61	0.33	0.72	0.35	0.88
Control Delay	46.5	30.7	28.7	35.6	76.1	73.3	20.5	75.3	57.3	74.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	30.7	28.7	35.6	76.1	73.3	20.5	75.3	57.3	74.0
Queue Length 50th (ft)	65	126	200	383	121	123	63	165	88	290
Queue Length 95th (ft)	127	154	350	#605	187	190	71	238	139	347
Internal Link Dist (ft)		1185		1058		325			341	
Turn Bay Length (ft)	330		300		270			185		
Base Capacity (vph)	283	1446	554	2190	299	321	477	309	365	424
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.44	0.70	0.65	0.41	0.39	0.31	0.57	0.27	0.75

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	177	546	36	29	1566	46	23	162	453
v/c Ratio	0.72	0.22	0.04	0.07	0.78	0.37	0.16	0.42	0.67
Control Delay	52.3	20.2	0.3	11.4	27.6	72.9	26.6	54.8	31.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.3	20.2	0.3	11.4	27.6	72.9	26.6	54.8	31.2
Queue Length 50th (ft)	117	110	0	7	191	44	2	139	254
Queue Length 95th (ft)	#218	139	2	m14	282	86	32	225	414
Internal Link Dist (ft)		591			224		51	121	
Turn Bay Length (ft)	500		75	225					
Base Capacity (vph)	247	2454	1051	463	2017	182	198	390	679
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.22	0.03	0.06	0.78	0.25	0.12	0.42	0.67

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Intersection	
Intersection Delay, s/veh	10
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	41	9	39	18	37	133
Future Vol, veh/h	41	9	39	18	37	133
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.38
Heavy Vehicles, %	0	4	33	0	1	33
Mvmt Flow	45	10	42	20	40	350
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	8.4	8.2	10.5
HCM LOS	A	A	B

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	82%	22%
Vol Thru, %	68%	0%	78%
Vol Right, %	32%	18%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	57	50	170
LT Vol	0	41	37
Through Vol	39	0	133
RT Vol	18	9	0
Lane Flow Rate	62	54	390
Geometry Grp	1	1	1
Degree of Util (X)	0.083	0.075	0.445
Departure Headway (Hd)	4.797	4.958	4.102
Convergence, Y/N	Yes	Yes	Yes
Cap	750	726	866
Service Time	2.806	2.962	2.18
HCM Lane V/C Ratio	0.083	0.074	0.45
HCM Control Delay	8.2	8.4	10.5
HCM Lane LOS	A	A	B
HCM 95th-tile Q	0.3	0.2	2.3

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	52	796	127	55	473	149	179	314	219
v/c Ratio	0.11	0.48	0.16	0.19	0.22	0.45	0.76	0.76	0.31
Control Delay	18.3	30.7	5.4	19.5	21.3	37.4	75.0	48.3	42.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	30.7	5.4	19.5	21.3	37.4	75.0	48.3	42.3
Queue Length 50th (ft)	23	290	2	25	84	99	154	234	80
Queue Length 95th (ft)	51	400	46	54	126	141	228	301	116
Internal Link Dist (ft)		667			846		233		376
Turn Bay Length (ft)	200		200	245		300		180	
Base Capacity (vph)	514	1643	786	306	2183	486	389	426	768
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.48	0.16	0.18	0.22	0.31	0.46	0.74	0.29

Intersection Summary

Intersection	
Int Delay, s/veh	2.9

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	32	80	213	25	70	260
Future Vol, veh/h	32	80	213	25	70	260
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	55	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	95
Heavy Vehicles, %	2	8	6	0	13	8
Mvmt Flow	35	87	232	27	76	274

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	672	246	0	0	259	0
Stage 1	246	-	-	-	-	-
Stage 2	426	-	-	-	-	-
Critical Hdwy	7.42	6.78	-	-	4.23	-
Critical Hdwy Stg 1	6.42	-	-	-	-	-
Critical Hdwy Stg 2	6.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.372	-	-	2.317	-
Pot Cap-1 Maneuver	349	752	-	-	1244	-
Stage 1	742	-	-	-	-	-
Stage 2	585	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	328	752	-	-	1244	-
Mov Cap-2 Maneuver	328	-	-	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	549	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	12.4	0	1.8
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	328	752	1244	-
HCM Lane V/C Ratio	-	-	0.106	0.116	0.061	-
HCM Control Delay (s)	-	-	17.3	10.4	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.4	0.2	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	83	402	176	189	198	107
v/c Ratio	0.21	0.27	0.28	0.23	0.27	0.07
Control Delay	39.9	0.5	23.0	20.9	21.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	0.5	23.0	20.9	21.9	0.1
Queue Length 50th (ft)	53	0	83	87	94	0
Queue Length 95th (ft)	99	0	133	138	149	0
Internal Link Dist (ft)	299			336	373	
Turn Bay Length (ft)			150			260
Base Capacity (vph)	397	1473	637	817	738	1510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.27	0.28	0.23	0.27	0.07

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	246	531	922	1852	966	286
Future Volume (vph)	246	531	922	1852	966	286
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-2%			1%	-1%	
Total Lost time (s)	6.0	6.0	4.5	6.0	6.0	
Lane Util. Factor	0.97	0.88	0.97	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3502	2787	3450	4963	4865	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3502	2787	3450	4963	4865	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.92	0.86
Adj. Flow (vph)	267	577	1002	1949	1050	333
RTOR Reduction (vph)	0	2	0	0	0	0
Lane Group Flow (vph)	267	575	1002	1949	1383	0
Heavy Vehicles (%)	1%	3%	1%	4%	4%	1%
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 1	1	6	2	
Permitted Phases						
Actuated Green, G (s)	28.4	87.7	53.3	109.6	51.8	
Effective Green, g (s)	28.4	87.7	53.3	109.6	51.8	
Actuated g/C Ratio	0.19	0.58	0.36	0.73	0.35	
Clearance Time (s)	6.0		4.5	6.0	6.0	
Vehicle Extension (s)	4.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	663	1629	1225	3626	1680	
v/s Ratio Prot	c0.08	0.21	c0.29	0.39	c0.28	
v/s Ratio Perm						
v/c Ratio	0.40	0.35	0.82	0.54	0.82	
Uniform Delay, d1	53.4	16.3	43.9	9.0	44.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.2	4.4	0.6	4.7	
Delay (s)	53.9	16.5	48.3	9.5	49.6	
Level of Service	D	B	D	A	D	
Approach Delay (s)	28.3			22.7	49.6	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	5	22	18	6	17	42	2690	29	12	1441	39
Future Volume (vph)	34	5	22	18	6	17	42	2690	29	12	1441	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-2%			-1%			1%			-1%	
Total Lost time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.91		1.00	0.91	
Frpb, ped/bikes		1.00	1.00		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1838	1615		1699		1796	5004		1814	4995	
Flt Permitted		0.82	1.00		0.84		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1576	1615		1453		1796	5004		1814	4995	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	5	24	20	7	18	46	2832	32	13	1566	42
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	42	24	0	28	0	46	2864	0	13	1607	0
Confl. Peds. (#/hr)				2		2				1		1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	1%	7%	0%	0%	0%	3%	0%	0%	4%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8								
Actuated Green, G (s)		8.7	8.7		8.7		8.1	119.2		3.1	114.2	
Effective Green, g (s)		8.7	8.7		8.7		8.1	119.2		3.1	114.2	
Actuated g/C Ratio		0.06	0.06		0.06		0.05	0.79		0.02	0.76	
Clearance Time (s)		6.5	6.5		6.5		5.5	7.0		5.5	7.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		91	93		84		96	3976		37	3802	
v/s Ratio Prot							c0.03	c0.57		0.01	0.32	
v/s Ratio Perm		c0.03	0.01		0.02							
v/c Ratio		0.46	0.26		0.33		0.48	0.72		0.35	0.42	
Uniform Delay, d1		68.4	67.6		67.9		68.9	7.4		72.5	6.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.7	1.5		2.3		3.7	1.2		5.7	0.3	
Delay (s)		72.1	69.0		70.2		72.6	8.5		78.1	6.6	
Level of Service		E	E		E		E	A		E	A	
Approach Delay (s)		71.0			70.2			9.6			7.2	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

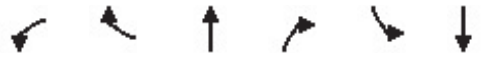
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	237	937	167	285	542	266	291	126	421	244	103	268
Future Volume (vph)	237	937	167	285	542	266	291	126	421	244	103	268
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			-2%			4%			1%	
Total Lost time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Lane Util. Factor	1.00	0.91		1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1618	4649		1381	4582		1648	1671	1567	1663	1719	1516
Flt Permitted	0.31	1.00		0.22	1.00		0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	530	4649		314	4582		1648	1671	1567	1663	1719	1516
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	258	1018	182	310	589	289	316	137	458	265	112	291
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	258	1200	0	310	878	0	224	229	458	265	112	291
Confl. Peds. (#/hr)	1		1	6		6						
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	11%	6%	20%	32%	5%	12%	2%	5%	1%	8%	10%	6%
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		3	3	1	4	4	5
Permitted Phases	2			6					3			4
Actuated Green, G (s)	42.5	41.0		47.6	47.6		26.3	26.3	55.4	28.6	28.6	51.1
Effective Green, g (s)	42.5	41.0		47.6	47.6		26.3	26.3	55.4	28.6	28.6	51.1
Actuated g/C Ratio	0.28	0.27		0.32	0.32		0.18	0.18	0.37	0.19	0.19	0.34
Clearance Time (s)	5.5	7.0		5.5	7.0		6.5	6.5	5.5	6.0	6.0	5.5
Vehicle Extension (s)	3.0	0.2		3.0	0.2		5.0	5.0	3.0	5.0	5.0	3.0
Lane Grp Cap (vph)	313	1270		306	1454		288	292	578	317	327	516
v/s Ratio Prot	0.12	c0.26		c0.20	0.19		0.14	0.14	c0.15	c0.16	0.07	0.08
v/s Ratio Perm	0.11			0.12					0.14			0.11
v/c Ratio	0.82	0.94		1.01	0.60		0.78	0.78	0.79	0.84	0.34	0.56
Uniform Delay, d1	50.5	53.4		45.8	43.2		59.1	59.1	42.2	58.4	52.6	40.4
Progression Factor	0.68	0.68		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.3	13.7		54.8	1.9		14.3	14.8	7.3	18.8	1.3	1.4
Delay (s)	48.3	49.9		100.6	45.1		73.4	73.9	49.5	77.3	53.9	41.8
Level of Service	D	D		F	D		E	E	D	E	D	D
Approach Delay (s)		49.7			59.6			61.5			57.9	
Approach LOS		D			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	56.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	331	1156	109	52	720	236	84	13	55	191	5	319
Future Volume (vph)	331	1156	109	52	720	236	84	13	55	191	5	319
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			-1%			2%			2%	
Total Lost time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1752	4940	1583	1778	4818		1686	1599			1742	1567
Flt Permitted	0.15	1.00	1.00	0.21	1.00		0.95	1.00			0.95	1.00
Satd. Flow (perm)	275	4940	1583	398	4818		1686	1599			1742	1567
Peak-hour factor, PHF	0.92	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.85
Adj. Flow (vph)	360	1243	118	57	783	257	91	14	60	208	5	375
RTOR Reduction (vph)	0	0	27	0	40	0	0	54	0	0	0	88
Lane Group Flow (vph)	360	1243	91	57	1000	0	91	20	0	0	213	287
Confl. Peds. (#/hr)				2		2						
Heavy Vehicles (%)	3%	5%	2%	2%	3%	5%	6%	9%	2%	3%	0%	2%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		Split	NA		Split	NA	pm+ov
Protected Phases	1	6	3	5	2		3	3		4	4	1
Permitted Phases	6		6	2								4
Actuated Green, G (s)	90.0	77.2	92.3	60.3	54.0		15.1	15.1			26.4	55.9
Effective Green, g (s)	90.0	77.2	92.3	60.3	54.0		15.1	15.1			26.4	55.9
Actuated g/C Ratio	0.60	0.51	0.62	0.40	0.36		0.10	0.10			0.18	0.37
Clearance Time (s)	6.5	6.0	6.5	6.5	6.0		6.5	6.5			6.0	6.5
Vehicle Extension (s)	3.0	3.0	5.0	3.0	3.0		5.0	5.0			3.0	3.0
Lane Grp Cap (vph)	455	2542	974	217	1734		169	160			306	583
v/s Ratio Prot	c0.16	0.25	0.01	0.01	0.21		c0.05	0.01			c0.12	0.10
v/s Ratio Perm	c0.32		0.05	0.09								0.09
v/c Ratio	0.79	0.49	0.09	0.26	0.58		0.54	0.13			0.70	0.49
Uniform Delay, d1	29.4	23.6	11.8	27.7	38.8		64.1	61.4			58.0	36.1
Progression Factor	1.00	1.00	1.00	0.84	0.94		1.00	1.00			1.00	1.00
Incremental Delay, d2	13.2	0.7	0.1	0.5	1.1		5.9	0.7			12.4	2.9
Delay (s)	42.6	24.3	11.9	23.8	37.5		70.1	62.2			70.4	39.1
Level of Service	D	C	B	C	D		E	E			E	D
Approach Delay (s)		27.3			36.8			66.5			50.4	
Approach LOS		C			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	35.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	36	48	126	55	25	97
Future Volume (vph)	36	48	126	55	25	97
Peak Hour Factor	0.92	0.95	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	51	137	60	27	105

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	90	197	132
Volume Left (vph)	39	0	27
Volume Right (vph)	51	60	0
Hadj (s)	-0.25	-0.18	0.05
Departure Headway (s)	4.4	4.1	4.4
Degree Utilization, x	0.11	0.22	0.16
Capacity (veh/h)	762	857	793
Control Delay (s)	7.9	8.2	8.2
Approach Delay (s)	7.9	8.2	8.2
Approach LOS	A	A	A

Intersection Summary			
Delay	8.1		
Level of Service	A		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	85	546	174	69	744	361	200	218	56	177	178	85
Future Volume (vph)	85	546	174	69	744	361	200	218	56	177	178	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		1%			2%			0%			1%	
Total Lost time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1778	3522	1570	1785	4813		1805	1820		1744	3336	
Flt Permitted	0.15	1.00	1.00	0.36	1.00		0.52	1.00		0.26	1.00	
Satd. Flow (perm)	286	3522	1570	686	4813		992	1820		475	3336	
Peak-hour factor, PHF	0.92	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	587	189	75	809	392	217	237	61	192	193	92
RTOR Reduction (vph)	0	0	104	0	49	0	0	6	0	0	39	0
Lane Group Flow (vph)	92	587	85	75	1152	0	217	292	0	192	246	0
Confl. Peds. (#/hr)				3		3						
Confl. Bikes (#/hr)			2			2						1
Heavy Vehicles (%)	1%	2%	1%	0%	0%	1%	0%	1%	2%	3%	3%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases	6		6	2			8			4		
Actuated Green, G (s)	76.1	67.1	67.1	75.1	66.6		47.7	29.1		48.1	29.3	
Effective Green, g (s)	76.1	67.1	67.1	75.1	66.6		47.7	29.1		48.1	29.3	
Actuated g/C Ratio	0.51	0.45	0.45	0.50	0.44		0.32	0.19		0.32	0.20	
Clearance Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	8.0		6.5	8.0	
Vehicle Extension (s)	3.0	8.0	8.0	3.0	8.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	234	1575	702	405	2136		416	353		311	651	
v/s Ratio Prot	c0.02	0.17		0.01	c0.24		0.06	c0.16		c0.08	0.07	
v/s Ratio Perm	0.18		0.05	0.08			0.10			0.12		
v/c Ratio	0.39	0.37	0.12	0.19	0.54		0.52	0.83		0.62	0.38	
Uniform Delay, d1	21.1	27.5	24.2	19.9	30.5		39.7	58.0		40.0	52.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.7	0.4	0.2	1.0		1.2	14.5		3.6	0.4	
Delay (s)	22.2	28.2	24.6	20.1	31.5		40.9	72.5		43.6	52.8	
Level of Service	C	C	C	C	C		D	E		D	D	
Approach Delay (s)		26.7			30.8			59.2			49.1	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.5
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	42	123	336	58	132	282
Future Volume (Veh/h)	42	123	336	58	132	282
Sign Control	Stop		Free			Free
Grade	5%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	134	365	63	143	307
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						601
pX, platoon unblocked						
vC, conflicting volume	990	396			428	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	990	396			428	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	80			87	
cM capacity (veh/h)	240	657			1137	

Direction, Lane #	NW 1	NE 1	SW 1	SW 2
Volume Total	180	428	143	307
Volume Left	46	0	143	0
Volume Right	134	63	0	0
cSH	882	1700	1137	1700
Volume to Capacity	0.20	0.25	0.13	0.18
Queue Length 95th (ft)	19	0	11	0
Control Delay (s)	14.8	0.0	8.6	0.0
Lane LOS	B		A	
Approach Delay (s)	14.8	0.0	2.7	
Approach LOS	B			

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	189	284	86	185	453	262
Future Volume (vph)	189	284	86	185	453	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	12	12
Grade (%)	0%			1%	-2%	
Total Lost time (s)	5.5	4.0	6.5	5.5	6.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1818	1516	1796	1872	1642	1510
Flt Permitted	1.00	1.00	0.55	1.00	0.95	1.00
Satd. Flow (perm)	1818	1516	1038	1872	1642	1510
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	205	309	93	201	492	285
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	205	309	93	201	492	285
Heavy Vehicles (%)	1%	3%	0%	1%	11%	8%
Turn Type	NA	Free	pm+pt	NA	Prot	Free
Protected Phases	1		2	6	4	
Permitted Phases		Free	6			Free
Actuated Green, G (s)	35.5	120.0	52.5	52.5	56.0	120.0
Effective Green, g (s)	35.5	120.0	52.5	52.5	56.0	120.0
Actuated g/C Ratio	0.30	1.00	0.44	0.44	0.47	1.00
Clearance Time (s)	5.5		6.5	5.5	6.0	
Lane Grp Cap (vph)	537	1516	520	819	766	1510
v/s Ratio Prot	c0.11		0.02	0.11	c0.30	
v/s Ratio Perm		c0.20	0.06			0.19
v/c Ratio	0.38	0.20	0.18	0.25	0.64	0.19
Uniform Delay, d1	33.5	0.0	24.0	21.3	24.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	0.3	0.8	0.7	4.1	0.3
Delay (s)	35.6	0.3	24.7	22.0	28.5	0.3
Level of Service	D	A	C	C	C	A
Approach Delay (s)	14.4			22.9	18.1	
Approach LOS	B			C	B	

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	267	577	1002	1949	1383
v/c Ratio	0.40	0.36	0.82	0.54	0.82
Control Delay	55.0	17.1	49.6	9.8	50.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	55.0	17.1	49.6	9.8	50.5
Queue Length 50th (ft)	118	161	457	287	458
Queue Length 95th (ft)	161	167	492	335	#639
Internal Link Dist (ft)	1412			518	770
Turn Bay Length (ft)	230		460		
Base Capacity (vph)	723	1806	1529	3626	1681
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.37	0.32	0.66	0.54	0.82

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	42	24	45	46	2864	13	1608
v/c Ratio	0.41	0.23	0.41	0.42	0.69	0.16	0.41
Control Delay	78.1	70.1	54.4	78.3	8.4	72.8	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.1	70.1	54.4	78.3	8.4	72.8	7.2
Queue Length 50th (ft)	40	23	26	44	295	13	193
Queue Length 95th (ft)	81	53	67	87	656	37	268
Internal Link Dist (ft)	175		190		251		385
Turn Bay Length (ft)				220		200	
Base Capacity (vph)	320	328	310	329	4176	332	3931
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.07	0.15	0.14	0.69	0.04	0.41

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	258	1200	310	878	224	229	458	265	112	291
v/c Ratio	0.82	0.94	1.00	0.60	0.78	0.78	0.78	0.84	0.34	0.56
Control Delay	57.9	50.4	97.8	46.6	76.8	77.3	32.2	80.7	55.0	25.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.9	50.4	97.8	46.6	76.8	77.3	32.2	80.7	55.0	25.2
Queue Length 50th (ft)	116	202	~305	276	221	226	214	247	94	126
Queue Length 95th (ft)	#220	#494	#534	337	317	323	#313	#374	155	170
Internal Link Dist (ft)		1185		1058		325			341	
Turn Bay Length (ft)	330		300		270			185		
Base Capacity (vph)	313	1270	309	1453	335	339	589	343	355	521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.94	1.00	0.60	0.67	0.68	0.78	0.77	0.32	0.56

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	360	1243	118	57	1040	91	74	213	375
v/c Ratio	0.79	0.48	0.11	0.25	0.59	0.54	0.35	0.70	0.51
Control Delay	40.2	24.2	4.4	15.4	35.4	75.5	23.7	71.6	23.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.2	24.2	4.4	15.4	35.4	75.5	23.7	71.6	23.0
Queue Length 50th (ft)	216	287	16	21	203	85	12	202	172
Queue Length 95th (ft)	#362	337	40	m35	256	146	63	#322	247
Internal Link Dist (ft)		591			224		51	121	
Turn Bay Length (ft)	500		75	225					
Base Capacity (vph)	454	2583	1098	420	1774	196	239	306	729
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.48	0.11	0.14	0.59	0.46	0.31	0.70	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	36	48	126	55	25	97
Future Vol, veh/h	36	48	126	55	25	97
Peak Hour Factor	0.92	0.95	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	2	0
Mvmt Flow	39	51	137	60	27	105
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.9	8.2	8.2
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	43%	20%
Vol Thru, %	70%	0%	80%
Vol Right, %	30%	57%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	181	84	122
LT Vol	0	36	25
Through Vol	126	0	97
RT Vol	55	48	0
Lane Flow Rate	197	90	133
Geometry Grp	1	1	1
Degree of Util (X)	0.217	0.108	0.158
Departure Headway (Hd)	3.977	4.35	4.285
Convergence, Y/N	Yes	Yes	Yes
Cap	887	829	824
Service Time	2.069	2.35	2.379
HCM Lane V/C Ratio	0.222	0.109	0.161
HCM Control Delay	8.2	7.9	8.2
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.8	0.4	0.6

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT
Lane Group Flow (vph)	92	587	189	75	1201	217	298	192	285
v/c Ratio	0.39	0.37	0.23	0.18	0.55	0.51	0.83	0.61	0.41
Control Delay	23.8	30.5	4.9	20.0	31.2	36.6	75.4	40.2	44.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.8	30.5	4.9	20.0	31.2	36.6	75.4	40.2	44.0
Queue Length 50th (ft)	42	197	0	34	291	151	276	132	107
Queue Length 95th (ft)	88	300	55	75	407	186	363	167	141
Internal Link Dist (ft)		667			846		233		376
Turn Bay Length (ft)	200		200	245		300		180	
Base Capacity (vph)	255	1576	807	434	2185	520	426	417	818
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.37	0.23	0.17	0.55	0.42	0.70	0.46	0.35

Intersection Summary

Intersection	
Int Delay, s/veh	4.1

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	42	123	336	58	132	282
Future Vol, veh/h	42	123	336	58	132	282
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	55	-	-	95	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	5	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	1	2
Mvmt Flow	46	134	365	63	143	307

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	990	397	0	0	428	0
Stage 1	397	-	-	-	-	-
Stage 2	593	-	-	-	-	-
Critical Hdwy	7.4	6.7	-	-	4.11	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	209	622	-	-	1137	-
Stage 1	612	-	-	-	-	-
Stage 2	472	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	183	622	-	-	1137	-
Mov Cap-2 Maneuver	183	-	-	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	413	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	17.2	0	2.7
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	183	622	1137	-
HCM Lane V/C Ratio	-	-	0.249	0.215	0.126	-
HCM Control Delay (s)	-	-	31.1	12.4	8.6	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.8	0.4	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	205	309	93	201	492	285
v/c Ratio	0.38	0.20	0.18	0.25	0.64	0.19
Control Delay	36.1	0.3	22.8	22.3	29.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.1	0.3	22.8	22.3	29.2	0.3
Queue Length 50th (ft)	126	0	43	96	283	0
Queue Length 95th (ft)	197	0	77	150	404	0
Internal Link Dist (ft)	299			336	373	
Turn Bay Length (ft)			150			260
Base Capacity (vph)	537	1516	511	819	766	1510
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.20	0.18	0.25	0.64	0.19

Intersection Summary

Appendix 15.24 Map A

1:4,514

0 0.03 0.06 0.12 mi

0 0.05 0.1 0.19 km

Parkland outline

Park Facilities

Recreation Facilities

Natural Resources

Lawn Areas

POND

Park Trail and Path System

<all other values>

Park Paths and Trail Connectors; Pathway, Hard Surface

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, CGM

MNCPPC, VITA, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA | The University of Vermont Spatial Analysis Laboratory created this map with funding from the Maryland-National Capital Park and Planning Commission. | ITI | Montgomery County Planning

Appendix 15.25

Montgomery County Parks
Preliminary Archaeological Review Form

Date Prepared: _04/08/2020_
Preparer's Name: ___Heather Bouslog_

1. Project Identification:

Project Name: _**Washington Grove Connector and Crabbs Branch Way Extension**__

Project Manager/Contact:

Matt Harper, PPSD, Natural Resources Manager; Matthew.Harper@montgomeryparks.org; 301-467-2646 (c) 301-650-4383 (w); Division: _Park Planning and Stewardship, Natural Resources Section

Douglas Stephens, PPSD, Natural Resources Specialist Douglas.Stephens@montgomeryparks.org

Darren Flusche, PPSD, Master Planner & Trails Program Supervisor

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Eli Glazier, Transportation Planner Coordinator, Eli.Glazier@montgomeryplanning.org

Kyle Lukacs, MCDOT, Kyle.Lukacs@montgomerycountymd.gov

Robert Booher, Chair, Washington Grove HPC, booherfamily@comcast.net

Wendy Harris, Archaeologist, Washington Grove, wharris.cragsmoor@gmail.com

State/Federal Funding or Permits? _____

Park Name: Washington Grove Conservation Park and Piedmont Crossing Local Park

Park Address/Location:

Washington Grove Conservation Park: 105 Ridge Road, Washington Grove, MD 20880

Piedmont Crossing Local Park, abuts Washington Grove Conservation Park: Zip Code 20855

2. Project Summary and Description of Limits of Disturbance (LOD):

MCDOT is in the design phase of the Shady Grove Sector Master Plan's (2006, 2020) recommendations for road and trail improvements. Proposed road and trail connections may have potential impacts to Washington Grove Conservation Park and the Piedmont Crossing Local Park, both which are in the PPSD Managed Meadow Program.

The proposed road and trail would connect Crabbs Branch Way and Amity Drive, creating up to an 80-foot-wide swath across the middle of Piedmont Crossing Local Park with a traffic quieting round-about proposed for the intersection at Amity Drive.

Kick-off for the project was November 2019, Public Meeting was held February 13, 2020. Discussion with Kyle Lukacs, MCDOT, suggests that the trail is more likely to be approved than a road.

Exact Limits of Disturbance are not known at this time.

Background Sources:
Shady Grove Sector Plan Approved March 15, 2006
Shady Grove Sector Plan: Minor Master Plan Amendment, Spring 2020

2. Project Setting: (check all that apply)

☒ urban/suburban; ☐ rural
☒ upland; ☐ floodplain/terrace (☐active; ☐stable terrace)

Recorded Soil(s):

Name	Drainage Class
Gaila silt loam (3-8%)	Well-drained
Glenelg silt loam (3-8%)	Well-drained
Baile silt loam (0-3%)	Poorly drained
Chrome and Conowingo Soils (3-8%)	Well-drained

Project Area Drainage(s):

Name	Distance from LOD
Unnamed tributary of Mill Creek	0 – 437 feet
Upper Rock Creek Watershed	

Slope:
☒ less than 10% ☐ greater than 10% ☐ has a portion less than 10%

Is located within the High Prehistoric Potential Zone:
☐ yes ☐ no ☒ portions are yes

Are there WSSC lines in the project area:
☐ yes ☐ no ☐ portions are yes

4. Recorded Archaeological Sites and Resources in the Vicinity of LOD - Maryland Historic Trust (MHT), Park-Owned Historic Sites (P-OHS), Locational Atlas (LA), Master Plan (MP), Archaeological Resource Files (ARF): **information about the location of archaeological sites may NOT be made available to the public**

Layer/ Database	Site/Resource Number	Name/Description	National Register	Distance from LOD
MHT	18MO621	Washington Grove Steatite Quarry (prehistoric and historic archaeological site)	No	Edge of Piedmont Crossing Local Park; ~ 200 feet from LOD (exact LOD tbd)
MHT	18MO436	Brierdale Court (archaeological site: prehistoric lithic scatter)	No	.32 miles
MHT	18MO170	Hottinger House (archaeological site: late 19th/early 20th century farmstead ruin)	No	.40 miles
MHT	M: 21-5	Washington Grove Historic District	Yes	Edge of Piedmont Crossing Local Park; ~ 200 feet from LOD (exact LOD tbd)
MHT	M: 21-183	Mount Pleasant/Magruder/Clements/ Offutt/ Casey Farm	No	Casey Farm encompassed project area historically
P-OHS	None			
LA	LA-2/220-001A	Washington Grove Humpback Bridge	No	Just southwest of Washington Grove

				National Register District
MP	None			

5. Summary:

A review of the Montgomery County GIS Archaeology Layer indicated the LOD for the *Washington Grove Connector and Crabbs Branch Way Extension* project is partially located within a predetermined High Potential Prehistoric Zone. The high potential zone marks areas that have characteristics similar to locations where prehistoric sites are most often found in Maryland, however, prehistoric sites may be encountered anywhere within the landscape. A review of archaeological site data on file with the Maryland Historic Trust indicates that two prehistoric sites were identified in the vicinity of the project area. The closest site identified during that survey, 18MO621, is on the edge of the Piedmont Crossing Local Park approximately 200 feet from the LOD. This suggests there is a potential for the presence of prehistoric resources within the LOD.

Three previous archaeological investigations have been conducted in the vicinity of the *Washington Grove Connector and Crabbs Branch Way Extension* project area. These studies were carried out in conjunction with planning the ICC. Information from the earlier study done by Epperson in 1980 was incorporated into the subsequent studies conducted in 2004 and 2006 by Louise Berger, Inc. In 2004 Shovel Testing was conducted where the 370 Ramp is now located. The soil in that area was plowed and yielded a stoneware Albany slipped ceramic sherd (1800-1940) and two quartz flakes. In 2006, Shovel Testing was conducted in the area adjacent to where Amity Local Park is located where a stormwater management (SWM) facility was proposed. The archaeologists noted a barn or shed foundation made of poured concrete, “obviously associated with the abandoned early twentieth-century house located outside the survey area to the northwest.” The beams of the collapsed structure were studded with wire nails (post 1880), and its roof was metal. Because the structure was of a recent date and the Shovel Testing did not yield any artifacts, no site was recorded (Bedell, 2006.)

A review of the Maryland Inventory of Historic Properties M:21-183, the Mount Pleasant/Magruder/Clements/ Offutt/ Casey Farm, indicate that the project area has potential to have historic archaeological resources relating to farming in the early 18th century to mid-20th century. As noted on the archaeological site form, an archaeological pedestrian survey was conducted in 2004 and discovered the presence of historical artifacts (glass bottles from early 20th century, stoneware ceramics) within the area of archaeological site, Washington Grove Steatite Quarry (18MO621.) Beginning in the early 18th century, the property passed through the Magruder, Clements, and Offutt families before being purchased by Eugene B. Casey in the early 20th century.

UPDATE: Montgomery Parks Archaeologist Heather Bouslog conducted a site visit 4/11/20; walked the proposed path alignments, noted historic barbed wire fencing. Recommend subsurface testing

6. Recommendations: It is recommended that no ground-disturbing activity, including the movement or staging of heavy equipment, occur within the project area without archaeological testing.

Trail Alignments 2 and 5 and the proposed bicycle trail (green-dotted line) are within Montgomery Parks Piedmont Crossing Local Park. The north eastern segments of Trail 5 and the proposed bicycle trail are within the area of the high prehistorical potential zone. Alignment 2 falls outside of the high prehistorical potential zone. It is recommended that systematic archaeological testing be done in the high prehistoric potential zone for Trail Alignment 5 and the proposed bicycle trail. A sample of subsurface testing should be conducted for areas outside the high prehistorical potential zone (Trail 2).

If MCDOT is receiving any Federal or State funding and/or permits, the formal Section 106 of the National Historic Preservation Act and the Maryland Historical Trust Act of 1985 Consultation process takes place. MCDOT initiates consultation and Montgomery Parks Cultural Resources Stewardship Section Archaeologists would be

invited to be a consulting party. MCDOT defines the scope of the undertaking and determines its effect on National Register (NR) listed or eligible properties with the goal of protecting and documenting any archaeological resources through avoidance or mitigation.

Project Background Resources:

Master Plans:
Shady Grove Sector Plan Approved March 15, 2006
Shady Grove Sector Plan: Minor Master Plan Amendment, Spring 2020
https://montgomeryplanning.org/wp-content/uploads/2020/03/Shady-Grove-Minor-Master-Plan-Amendment-Public-Hearing-Draft-3-29-20-web.pdf
Updated to revisit the 2006's implementation of transportation recommendations.

Previous Archaeological Investigations:

Phase I Archaeological Reconnaissance of Proposed Interstate 370 in the Vicinity of Gaithersburg, Montgomery County, Maryland by Terrence W. Epperson, 1980, (Maryland Geological Survey, Division of Archaeology) for MD SHA

Phase I Archaeological Survey of the Intercounty Connector Project Montgomery and Prince George's Counties, Maryland by John Bedell, Steward Fiedel, Eric Griffits, Charles LeeDecker and Daniel Wagner, 2004 (Louis Berger Group, Inc.) for MD SHA

Archaeological Survey of the Intercounty Connector Project Montgomery and Prince George's Counties, Maryland ADDENDUM by John Bedell and Charles LeeDecker, 2006 (Louis Berger Group, Inc.) for MD SHA

Historical Background:

Washington Grove: https://washingtongrovemd.org/residents/wg-outdoors/wg-conservation-meadow/
Plats: MCAtlas.org/plats

Maryland Inventory of Historic Properties:

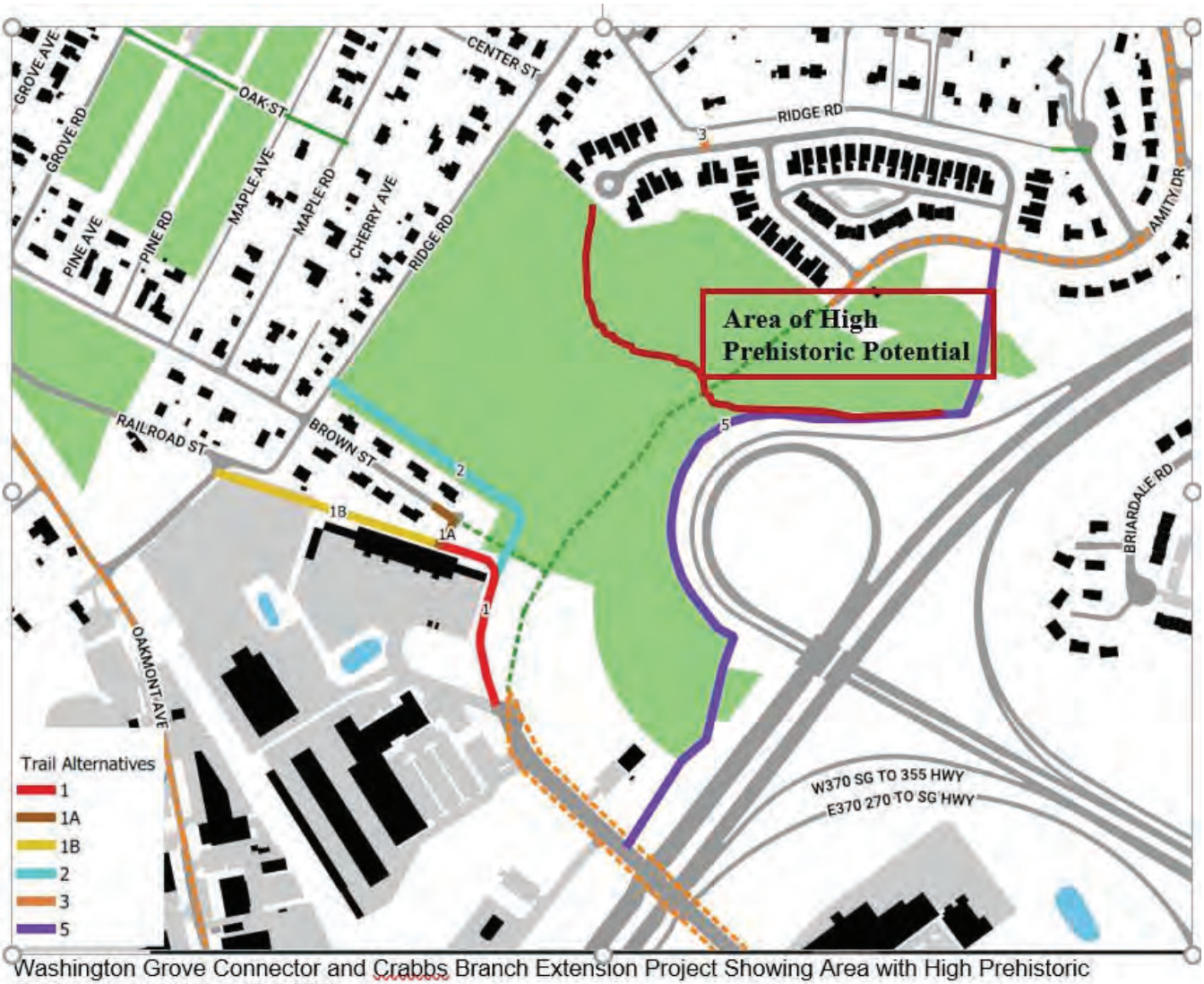
Washington Grove Historic District (M: 21-5):
https://mht.maryland.gov/nr/NRDetail.aspx?FROM=NRHDCountyList.aspx&NRID=619&propertyName=Washington%20Grove%20Historic%20District&mapLocation=nrb619.jpg&COUNTY=Montgomery

Mount Pleasant/Magruder/Clements/Offutt/Casey Property (M:21-183):
https://mht.maryland.gov/mihp/MIHPCard.aspx?MIHPNo=M%3a+21-183

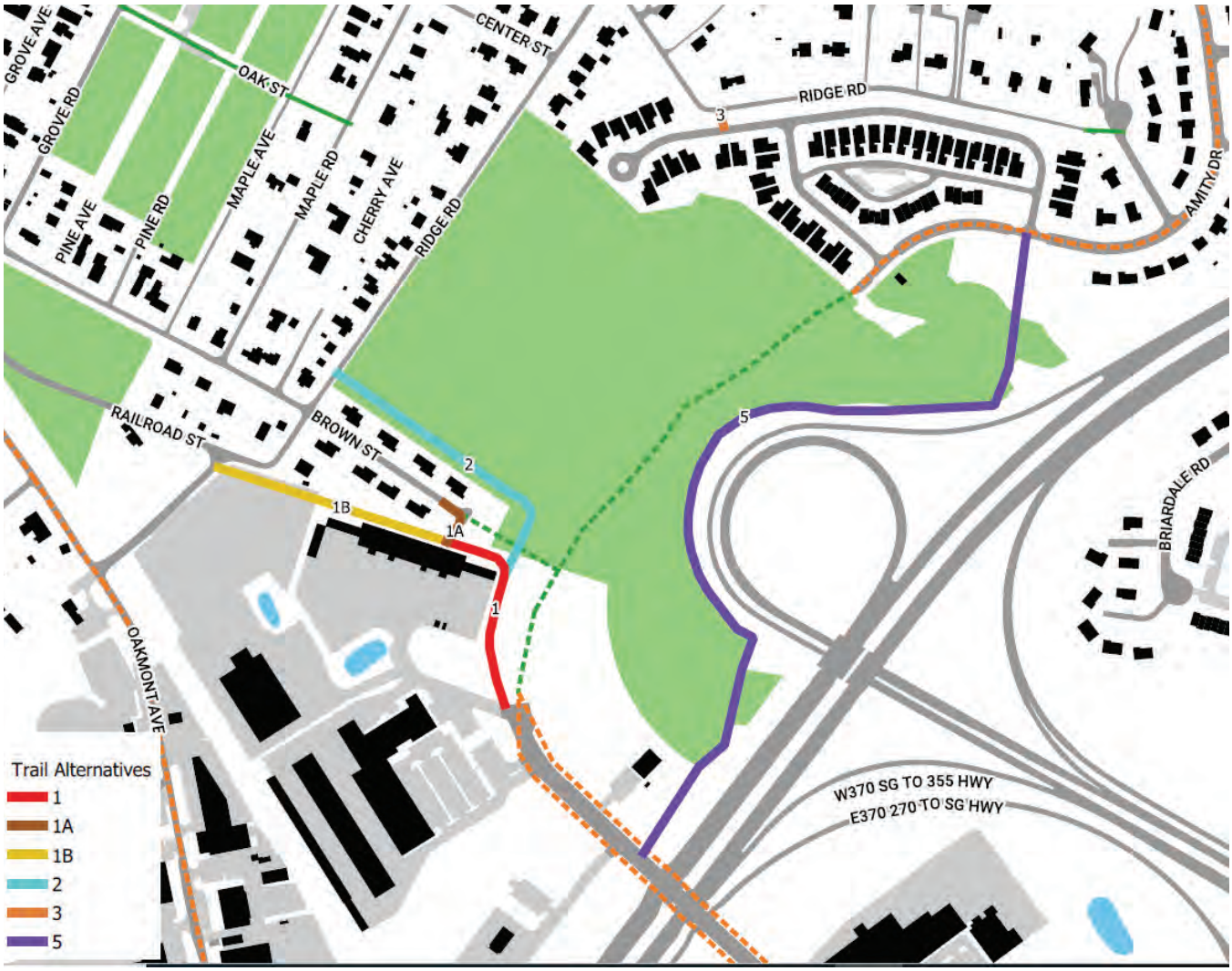
Notes:
The property, known as the Casey Property at Washington Grove, became part of the Legacy Open Space Functional Master Plan as a Heritage Resource and is jointly owned by the Town of Washington Grove and M-NCPPC

Attachments: Project/LOD Map

- Washington Grove Trail Alignment
- 2020 MCDOT Proposed Roadway and Trail through Piedmont Crossing Local Park
- Washington Grove Historic District showing 2020 NR boundary including the Washington Grove Conservation Park (Washington Grove NR Nomination Form, p. 128)
- 1865 Martenet and Bond Map showing L. Clements P. property in the vicinity of the Washington Grove Conservation Park (Library of Congress)
- 1879 Hopkins Atlas Showing the "Washington Grove Camp Grounds" which abuts the Washington Grove Conservation Park (Library of Congress)



Washington Grove Connector and Crabbs Branch Extension Project Showing Area with High Prehistoric Archaeological Potential (2020)



Washington Grove Trail Alignments 2020

2020 MCDOT Proposed Roadway and Trail through Piedmont Crossing Local Park

Washington Grove Historic District showing 2020 NR boundary including the Washington Grove Conservation Park (Washington Grove NR Nomination Form, p. 128)

1865 Martenet and Bond Map showing L. Clements P. property in the vicinity of the Washington Grove Conservation Park (Library of Congress)

1879 Hopkins Atlas Showing the “Washington Grove Camp Grounds” which abuts the Washington Grove Conservation Park (Library of Congress)

Appendix 15.26 Land Acquisition Agreement Deed

for such advances and contributions as provided in said Chapter 370.

5. It is further understood and agreed, in accordance with the Capper-Cramton Act and said Chapter 370, that the title to all lands acquired under the provisions of this Basic Agreement or any Supplementary Agreement shall vest in the State of Maryland, and that no part of any land purchased for park or recreational purposes with the funds provided by the National Commission, in whole or in part, shall at any time be conveyed, sold, leased, exchanged, or in any manner used or developed for other than park purposes by the Maryland Commission, and the development and administration of said lands shall be under the Maryland Commission but the development thereof shall be in accordance with plans approved by the National Commission, or the necessary approval of the Congress of the United States.

6. It is further understood and agreed that the provisions of this Basic Agreement shall constitute and be adopted by the Maryland Commission as the rules and regulations under which the bonds authorized by paragraph (r) of Section 6 of said Chapter 370 and not exceeding the aggregate amount of $1,200,000 shall be sold.

7. It is further understood and agreed that this Basic Agreement shall not be effective until it shall have received the approval of the President of the United States of America, the Governor of the State of Maryland, and the

Appendix 15.27

ROBINSON
&
ASSOCIATES, INC.
725 15TH STREET, N.W.
SUITE 600
WASHINGTON, D.C. 20005
202.234.2333
WWW. ROBINSON-INC.COM

MEMO

To: Wendy Harris and Bob Booher
Town of Washington Grove, Historic Preservation Commission

From: Daria Gasparini
Robinson & Associates, Inc.

Date: January 14, 2020

Re: Phase II Viewshed Documentation - FINAL

The purpose of this viewshed documentation is to identify and record the historic properties and landscapes that comprise the broader setting of the Washington Grove Historic District and contribute to its visual character and historic context. The National Register of Historic Places defines setting as the physical environment of a historic property that illustrates the character of the place. Setting often reflects the basic physical conditions under which a resource was built or developed and the functions it was intended to serve. The physical features that constitute the setting of a historic resource can be either natural or manmade, including such elements as topographic features, vegetation, buildings, structures, or open space. The integrity of a historic district's setting can be retained if there are visual buffers that block or screen intrusions into viewsheds, such as modern or incompatible development. This analysis does not address the internal setting of the historic district, which is also crucial to its historic integrity.

With the goal of documenting baseline conditions to help protect the historic district and preserve its broader setting, attached please find a) photographs of each property/landscape that comprise the historic setting of the historic district, b) a map detail showing each of the viewshed areas and the sightlines between the photographer and the subject of the photographs, and c) a short narrative describing the property/landscape and the significance of its relationship to the historic district.

1. WASHINGTON GROVE MEADOW CONSERVATION PARK

Description of Property/Landscape: The 12-acre Washington Grove Meadow Conservation Park is located east of Ridge Road. While the town owns the land, the park is wholly maintained and operated by the Maryland-National Capital Park and Planning Commission (M-NCPPC). The park features a native meadow habitat with forested edges and natural surface trails. Built structures are limited to park signage and an informational kiosk. Along the western edge of the park are remnants of agricultural fencing consisting of wood posts and barbed wire. Documentation of a steatite quarry in the adjacent Piedmont Crossing Local Park suggests the potential for archaeological resources within the park. The park's open spaces, small-scale features, and views reinforce interpretation of the historic district within the context of Montgomery County's agricultural heritage. For these reasons, in 2002, the M-NCPPC designated the meadow a Heritage Resource (rather than a Natural Resource) within its Legacy Open Space Functional Master Plan.

Significance of Relationship to Historic District: The original boundaries of Washington Grove once included a 48-acre farm on the east side of Ridge Road. This farm, which encompassed the land now part of the Washington Grove Meadow Conservation Park, was sold in 1890 to Andrew Ragan to help pay off association debt. For decades, this parcel and other agricultural resources on the fringes of Washington Grove defined its rural character and reinforced the idea of the Grove as a "place apart." The farm contributed to Montgomery County's strong agricultural heritage, which influenced the region's settlement and land use patterns well into the twentieth century. Today, the park provides a critical buffer between the town and surrounding high-density residential and highway development and preserves the rural, open vistas and spatial organization of the agricultural fields that historically formed the setting of Washington Grove.

View 1A: Looking northeast from the western edge of the Washington Grove Meadow Conservation Park. The tree lines at the edges of the park have the beneficial visual effect of partially blocking views of high-density residential development on Picea View Court.

View 1B: Looking south from the northern half of the park. Tree coverage partially blocks views of residences along Brown Street and views of the salt barn located within the Montgomery County fleet management depot on Crabbs Branch Way, which has a negative impact on the broader setting of the historic district. Another visual intrusion to the setting is the cellular communications tower (at center of image).

View 1C: Looking west-southwest along a trail within the park toward 102 Ridge Road. The Washington Grove Meadow Conservation Park preserves views of Washington Grove from adjacent areas.

View 1D: Looking northeast from the south edge of the park. Vegetation diminishes modern intrusions that are present within the broader setting of the historic district, including the residential development bordering the park on the north.

2. PIEDMONT CROSSING LOCAL PARK

Description of Property/Landscape: The Piedmont Crossing Local Park is a Montgomery County property that extends from the eastern edge of the Washington Grove Meadow Conservation Park to Interstate 370. Formerly farmland, the stream valley parkland features a meadow habitat with forested edges. A trail through the park provides a local connection between the Shady Grove Metrorail Station and Amity Drive, a residential street in the neighborhood north of the park. (A second trail connecting to Brown Street in Washington Grove is currently cut off by stormwater detention construction.) A break in the tree line along the west edge of the park provides an entry point to the Washington Grove Meadow Conservation Park.

Significance of Relationship to Historic District: The park's meadow habitat and forested edges reinforce the historic rural setting of the historic district, and the tree-lined edge along the western perimeter of the park blocks noise and screens views of nearby highway and residential development. The Piedmont Crossing Local Park contains an archaeological site listed on the Maryland Inventory of Historic Properties (Site # 18MO6221, Washington Grove Steatite Quarry). The site, located within the forest buffer along the western edge of the park, is comprised of five distinct areas of archaeological interest that represent evidence of Euro-American and possibly Native American use of the area as a quarrying site. The quarry may have been used as a source of building materials for local farmers and early residents of Washington Grove.

View 2A: Looking west-southwest toward Brown Street from the break in the tree line between the Washington Grove Meadow Conservation Park and the Piedmont Crossing Local Park.

View 2B: Looking north from one of the natural surface trails within the Piedmont Crossing Local Park. The park's meadow habitat and forested edges reinforce the historic rural setting of the historic district.

View 2C: Looking southeast from the break in the tree line at the western edge of the park. Grading and vegetation screen views of the entrance/exit ramp to Interstate 370 (at center of image). Due to distances and sightlines, the interstate is not visible from Washington Grove.

View 2D: Looking northwest toward the Washington Grove Historic District from the entrance/exit ramp to Interstate 370. The Piedmont Crossing Local Park creates a buffer between highway development and the historic district.

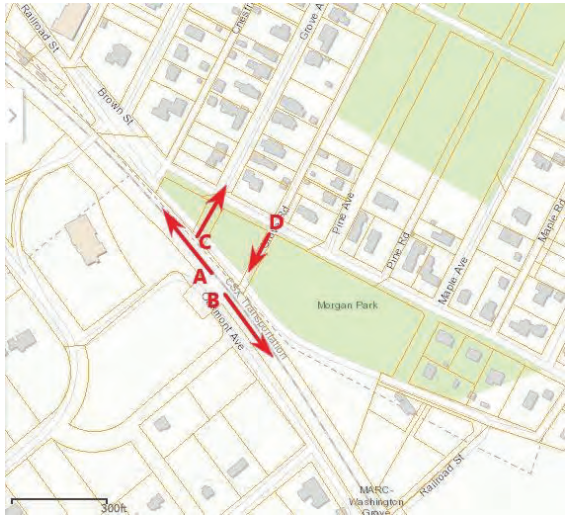
3. METROPOLITAN BRANCH OF THE BALTIMORE & OHIO RAILROAD

Description of Property/Landscape: The Metropolitan Branch of the Baltimore & Ohio (B&O) Railroad opened to passengers and freight on May 25, 1873. It stretched from the northwest corner of Washington, D.C., to the mouth of the Monocacy River and revolutionized transportation and trade in Montgomery County. The railroad served as a corridor for growth and brought an immediate increase in county land values. It provided convenient, reliable access from Washington, D.C., to Washington Grove and facilitated the Grove's growth and development. The Washington Grove Station features a small, frame station house, waiting platform, and pull-in parking areas. The Metropolitan Branch of the B&O is listed on the Maryland Inventory of Historic Properties (MIHP # M:37-16) and was determined eligible for the National Register of Historic Places in 2000 due to its significance in the areas of architecture, community planning, economics, engineering, exploration/settlement, industry, transportation, and local history.

Significance of Relationship to Historic District: The Metropolitan Branch of the B&O played a central role in the establishment of Washington Grove and its evolution from a Methodist campground into a thriving suburban community of year-round residents. It carried excursionists and residents as well as building materials and camp supplies. The Washington Grove Station (in all its various iterations) was an important offloading point for residents and visitors traveling to and from Washington Grove. Views north and south along the railroad tracks from the station and views of the station from Grove Avenue were important to the experience of arriving at or departing from Washington Grove, and these views continue to contribute to the broader setting of Washington Grove. The railroad corridor extends along the southern boundary of the historic district and is a significant part of its setting due to its association with transportation and settlement in Montgomery County.

View 3A: Looking northwest from the Washington Grove Station platform toward the Humpback Bridge. The long view north along the tracks from the station was meaningful to the experience of arriving at or departing from Washington Grove.

View 3B: Looking southeast from the Washington Grove Station. Views along the rail line encompass nearby commercial buildings (including Hershey's Restaurant at right of image), engineering structures (such as the Humpback Bridge), and railside agricultural buildings.



View 3C: Looking northeast from the east side of the tracks across Railroad Street toward the entrance to Grove Avenue. For decades, Grove Avenue was the principal pedestrian route into Washington Grove. Its southern length followed along the crest of a ridgeline that provided a relatively dry path for residents and excursionists entering the camp meeting grounds on foot from the railroad station.

View 3D: Looking southwest from Grove Road. Grove Road historically served as the principal vehicular entrance into Washington Grove. Morgan Park, which flanks the south end of Grove Road, was officially decreed a park in 1890 due to its significance as the "front door" of Washington Grove.

4. HUMPBACK BRIDGE

Description of Property/Landscape: The Humpback Bridge crosses the Metropolitan Branch of the Baltimore & Ohio (B&O) Railroad at East Deer Park Drive. Originally built in the 1870s, it was a timber, pony truss bridge located about 600 feet northwest of the Washington Grove Station. By 1945, the bridge had become dilapidated, and the nineteenth-century structure was replaced with a three span, timber bridge with a humpback shape. In 1986, CSX Transportation Inc. took over ownership and authority of the B&O line and two years later carried out a major rehabilitation that replaced the timber beams with steel I-beams. Additional changes occurred in 2001 and in 2009. The most recent rehabilitation occurred in 2014. At that time, the bridge superstructure was disconnected from the approaches and substructure and demolished. The cap timbers of the bents were replaced with new cap timbers to raise the height of the bridge and support five new curved, steel I-beams. New wood decking and laminated guardrails were also installed. The Humpback Bridge is listed on the Maryland Inventory of Historic Properties (MIHP # M:21-220) and was determined eligible for the National Register of Historic Places in 2009 due to its significance in the areas of transportation, community planning, and architecture/engineering.

Significance of Relationship to Historic District: As one of only two bridges built by the B&O over the Metropolitan Branch, the Humpback Bridge contributes to the history and significance of the railroad. The Metropolitan Branch played a central role in the founding and development of Washington Grove, and the bridge was a significant element of the local transportation network, providing a vital east-west connection between the towns of Oakmont and Washington Grove. It provided a safe above-grade crossing for passengers and goods and facilitated communication, travel, and trade across the railroad tracks. Located immediately south of the historic district, the Humpback Bridge is an important element of its setting that reinforces its historic association with the themes of transportation and suburban growth.

View 4A: Looking northwest from the deck of the Humpback Bridge. This view encompasses a historic feed mill/silo and service yards that were constructed along the route of the railroad and are important vestiges of the area's agricultural heritage.

View 4B: Looking north-northwest from the Humpback Bridge toward the southwest corner of the historic district. Historically, Washington Grove's commercial buildings and the Odd Fellow's Hall (visible through the tree line at right of image) were clustered near the intersection of Railroad Street and Washington Grove Lane, close to the railroad tracks.

View 4C: Looking southeast toward the Washington Grove Station and the entrance to Grove Avenue.

View 4D: Looking southeast from the Humpback Bridge. Historically and today, Morgan Park provides a wooded buffer between the railroad tracks and the residential development within Washington Grove.

5. RAILROAD STREET CORRIDOR

Description of Property/Landscape: Railroad Street skirts the southern edge of the Washington Grove Historic District. For over half its length, it follows a slightly curved route that roughly parallels the alignment of the B&O Railroad tracks. The southern length of Railroad Street turns sharply southwest where it crosses the tracks of the Metropolitan Branch before coming to an end at Oakmont Avenue. This intersection is known as Aitchison Crossing. The street is level along most of its length with the notable exception of the approach to the Humpback Bridge, where it features a sharp rise and drop. Historically, the street provided access to the railroad station from points north and south. The street also linked the station with roads south of the tracks via the Humpback Bridge.

Significance of Relationship to Historic District: Railroad Street was an important offloading point for residents and visitors traveling to and from Washington Grove and a vital part of the local transportation network used by farmers and tradesman. Several buildings and structures associated with the area's agricultural past are located along the north end of Railroad Street and on East Diamond Avenue. In addition, although originally platted for residential development, the lots at the corner of Washington Grove Lane and Railroad Street (today's Commercial Corner) have historically been used for a mix of nonresidential purposes. The Railroad Street corridor, including its associated views, its landscape features, the buildings and structures that represent the area's agricultural heritage, and Aitchison Crossing evoke the area's rural past and contribute to the setting of the historic district.

View 5A: Looking southeast along Railroad Street from its intersection with Brown Street. The Railroad Street corridor encompasses the Humpback Bridge and its approaches (center of image).

View 5B: Looking west from the intersection of Railroad Street and Hickory Road. The feed mill and silos (center of image) at 671-681 East Diamond Avenue reinforce interpretation of the historic district within the context of Montgomery County's agricultural and transportation heritage. The East Diamond Avenue property has been documented by Gail Littlefield and Judy Christensen in a draft Maryland Inventory of Historic Properties Form titled, "Gaithersburg Farmers' Supply, Wayne Feed, Sunshine Feed, Thomas I. Fulks Store."

View 5C: Looking southwest along Washington Grove Lane toward Railroad Street. The historic feed mill/silo along Railroad Street forms a focal point within the view from Washington Grove Lane.

View 5D: Looking east-southeast from East Diamond Avenue toward Washington Grove. Where Railroad Street ends and East Diamond Avenue begins, modern development introduces visual elements that are incompatible with the character of the historic district's setting.

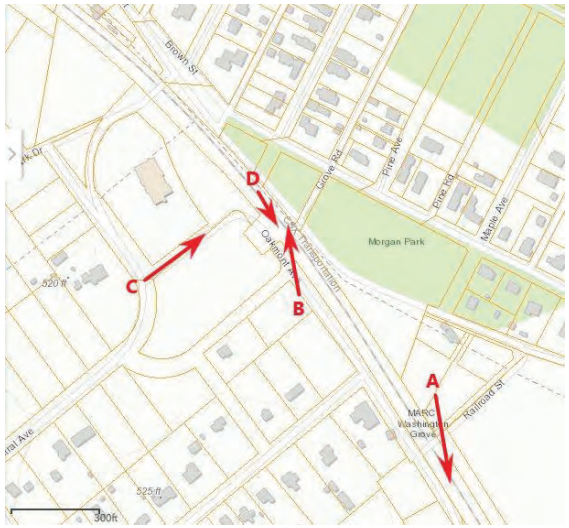
6. OAKMONT AVENUE

Description of Property/Landscape: Oakmont Avenue extends from Central Avenue on the north to just beyond Shady Grove Road on the south outside the boundaries of the Washington Grove Historic District. For a portion of its length near the Washington Grove Station, Oakmont Avenue parallels the railroad tracks. Originally a private lane, the avenue was developed as part of the subdivision of Oakmont, one of many suburban communities developed along the Metropolitan Branch of the Baltimore & Ohio Railroad in the late nineteenth century. Its developers took advantage of the popularity of Washington Grove and the conveniences of the railroad station to sells lots. The parcels were smallest near the railroad station and grew progressively larger as the subdivision extended west.

Significance of Relationship to Historic District: The subdivision of Oakmont on the west side of the tracks from Washington Grove was platted in 1888 by Henry Beard and James G. Craighead of Washington, D.C. Oakmont's development is closely tied to the history of Washington Grove. The initial plat for Oakmont included a public park that was located directly across from the Washington Grove railroad depot. The property at 17030 Oakmont Avenue (now Hershey's Restaurant) has served the Washington Grove and Oakmont communities since the late nineteenth century. For decades, it was the location of the Washington Grove post office. While many of the residential and rural settings that existed along the corridor were erased after Oakmont Avenue was rezoned from residential to light industrial, the route retains some vestiges of the past that contribute to the broader setting of the historic district.

View 6A: Looking south-southwest toward Oakmont Avenue from the forest retention area at the intersection of Railroad Street and the B&O Railroad tracks. Creating a forest buffer at this location will help minimize visual intrusions of modern development on the setting of the historic district.

View 6B: Looking north-northwest from Oakmont Avenue (in front of Hershey's Restaurant) toward the Washington Grove Station.



View 6C: Looking northeast along Oakmont Avenue from the intersection of Oakmont and Central avenues. The open space and views that define the park area at the eastern end of Oakmont contribute to the rural setting of Washington Grove. The sidewalk, recently installed by the county, reinforces the residential connection between Oakmont and the train station.

View 6D: Looking southeast from Washington Grove Station. Oakmont Avenue (at right of image) runs parallel to the railroad tracks at this location. The businesses operating from the commercial building on the right (now Hershey's Restaurant) have served the Washington Grove and Oakmont communities since the late nineteenth century, and the property is an important element of the broader setting of Washington Grove.

NPS Form 10-900
(Expires 5-31-2012)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Washington Grove Historic District (Boundary Increase and Additional Documentation)

other names M: 21-5

2. Location

street & number _____ ☐ not for publication

city or town Town of Washington Grove ☐ vicinity

state Maryland code MD county Montgomery code 031 zip code 20880

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☐ locally. (☐ See continuation sheet for additional comments).

_____ _____
Signature of certifying official/Title Date

_____
State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments).

_____
Signature of certifying official/Title Date

_____
State or Federal agency and bureau

4. National Park Service Certification

I hereby, certify that this property is:
☐ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register.
☐ See continuation sheet.
☐ Determined not eligible for the National Register.
☐ removed from the National Register.
☐ other (explain): _____

Signature of the Keeper Date of Action

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☒ private
- ☒ public-local
- ☐ public-State
- ☐ public-Federal

Category of Property
(Check only one box)

- ☐ building(s)
- ☒ district
- ☐ site
- ☐ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
177	46	buildings
15	0	sites
1	1	structures
0	0	objects
193	47	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing)

N/A

number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

RELIGION/religious facility
DOMESTIC/camp
DOMESTIC/single dwelling
LANDSCAPE/forest
LANDSCAPE/park
RECREATION AND CULTURE/outdoor recreation
RECREATION AND CULTURE/sports facility
SOCIAL/meeting hall
SOCIAL/clubhouse
GOVERNMENT/town hall
AGRICULTURE/SUBSISTENCE/agricultural field

Current Functions
(Enter categories from instructions)

DOMESTIC/single dwelling
LANDSCAPE/forest
LANDSCAPE/park
RECREATION AND CULTURE/outdoor recreation
RECREATION AND CULTURE/sports facility
COMMERCE/TRADE/specialty store
SOCIAL/clubhouse
SOCIAL/meeting hall
GOVERNMENT/town hall
GOVERNMENT/post office
RELIGION/religious facility

7. Description

Architectural Classification
(Enter categories from instructions)

LATE VICTORIAN
Other: Carpenter Gothic
LATE 19th AND 20th CENTURY REVIVALS/Colonial Revival
LATE 19th AND 20th CENTURY REVIVALS/Tudor Revival
LATE 19th AND EARLY 20th CENTURY AMERICAN MOVEMENTS/Bungalow Craftsman
MODERN MOVEMENT/Ranch
MODERN MOVEMENT/Moderne
MODERN MOVEMENT
Other: Minimal Traditional

Materials
(Enter categories from instructions)

foundation	WOOD
	CONCRETE
walls	WOOD/weatherboard
	BRICK
	SYNTHETICS/Vinyl
	CONCRETE
roof	ASPHALT
other	

Description Summary

The Washington Grove Historic District encompasses approximately 225 acres east of Gaithersburg in central Montgomery County, Maryland. It encompasses nearly all of the land within the municipal boundary of the Town of Washington Grove, as well as three early twentieth-century residential properties on the west side of Washington Grove Lane that were developed on land that was historically part of Washington Grove and the Washington Grove Meadow Conservation Park, which borders the town on the east. Within the district are 216 single-family houses, 3 commercial buildings, 2 municipal buildings, a community clubhouse, and a church set within a secluded, wooded landscape that vividly reflects its origins as a nineteenth-century Methodist camp meeting. The district is bound on the south by the historic Metropolitan Branch of the Baltimore & Ohio Railroad (today CSX Transportation) and is surrounded by various types of development, including light industrial, commercial, residential, and county and municipal parkland.

The houses within the Washington Grove Historic District represent a range of late nineteenth- and twentieth-century architectural styles and forms. Of particular note is a significant collection of architecturally distinctive Carpenter Gothic cottages that, in their form, scale, and material, complement the forest – the "sacred grove" – that formed the setting of the outdoor religious revival from which the historic district evolved. Originally constructed as modest summer residences, the cottages were converted into year-round homes and adapted to modern living through additions that took various forms – side or rear wings, enclosed porches, gabled dormers – and often occurred as a sequence of renovations over years, even decades. The result is an architecture of accretions that gives Washington Grove's camp meeting era cottages a highly eclectic and distinct character. The district's twentieth-century residential styles and forms provide architectural diversity, reflect national trends, and represent Washington Grove's successful transition from a camp meeting to an independent municipality. These houses include bungalows and other popular domestic forms, revivalist styles, and modern-era designs that emphasize open plans and integration with nature. Contributing to the sense of place is the landscape, which combines towering oaks, broad, pedestrian avenues, public parks, a recreational pond, and woodlands to create a sylvan suburban experience, which lends Washington Grove the moniker "A Town within a Forest."

The Washington Grove Historic District was listed on the National Register of Historic Places (National Register) on April 9, 1980. This amended nomination reevaluates the local, state, regional, and national events and trends that have shaped the development, design, and character of Washington Grove to provide a broader context for understanding its significance. The nomination defines a period of significance of 1873 to 1969 and identifies and describes the architectural resources, landscape characteristics, and viewsheds that add to the historic associations, qualities, and values for which the historic district is significant. The nomination expands the previous limits of the historic district to encompass nearly the entire town, as well as key resources on its borders that contribute to its historic associations. Lastly, this amended nomination brings the Washington Grove Historic District documentation to current National Register standards by identifying its historic and current functions, defining a period of significance, and identifying contributing and noncontributing resources.

This amended nomination identifies 193 contributing resources within the expanded boundaries of the Washington Grove Historic District: 177 contributing buildings, 15 contributing sites, and 1 contributing structure. In addition, this nomination identifies 64 "historic associated features" of the district. This term is used to enumerate and describe the significant features of the landscape that are not individually countable according to National Register guidelines and may apply to elements of the circulation system, views, small-scale features or systems of features, and other landscape characteristics. A table at the end of Section 7 identifying each contributing and noncontributing resource within the historic district is followed by a list of the historic associated features.

General Description

The Washington Grove Historic District encompasses a residential landscape that began as a Methodist camp meeting in 1873, evolved into a popular suburban summer resort by the late nineteenth century, and became an independent municipality by 1937. Infrastructure improvements and a "boomlet" of new residential development characterized the early municipal period, and Washington Grove emerged in the postwar era primed to absorb a portion of the region's increased demand for suburban housing. Concurrently, new religious and recreational facilities were introduced into the landscape, reflecting a continuum of land use patterns that originated in the late nineteenth century.

The resources within the Washington Grove Historic District are the result of five periods of development: founding and early development (1873-1901), early twentieth century (1902-1936), early municipal (1937-1945), post-World War II (1946-1969), and current (1970-present).

The founding period encompasses the establishment of the Washington Grove Camp Meeting in 1873 and its evolution in the 1880s into a summer religious resort. The site selected for the camp meeting was a 267-acre tract of wooded farmland east of Gaithersburg along the Metropolitan Branch of the Baltimore & Ohio (B&O) Railroad. The land offered a diverse range of natural settings – sylvan paths, secluded nooks, verdure, and shade – that encouraged contemplation, renewal, relaxation, and recreation among those who attend the annual camp meetings. The location also provided all of the amenities and attractions expected from a religious resort of the time. The earliest dwellings were temporary canvas tents, which were gradually replaced by Carpenter Gothic-style cottages.

During the early twentieth century, Washington Grove transitioned from a summer religious resort into a flourishing suburb of Washington, D.C., with a growing population of year-round residents. Driven by Progressive Era reforms aimed at improving sanitation, as well as the introduction of Chautauqua and other factors, residential development substantially expanded into previously unbuilt areas of the land. The single-family homes built in Washington Grove during this period embraced the broad spectrum of residential forms and architectural styles popular in suburban communities throughout the United States. They ranged from

modest Craftsman-style bungalows to more elaborate Colonial Revival styles. Gradually, the physical vestiges of early camp meeting life were dismantled. The diminished the role of religion within the community, changes in land use, park beautification projects, and infrastructure improvements would have an important impact on the historic district during the early twentieth century.

The Town of Washington Grove was chartered by the state of Maryland in 1937. As a municipal corporation under state law, the town possessed the legislative and administrative power to levy taxes for much needed modernization projects. Home rule gave Washington Grove control over planning and zoning, which had a significant impact on the town's development. During this period, platted but unoccupied lots were sold off, and the corner of Railroad Street and Washington Grove Lane was officially declared a commercial zone.

The period after World War II was a time of intense residential building and remodeling in Washington Grove. New architectural forms characterized the infill development, and subjects such as the changing relationship between cities and suburbs and the environmental movement shaped the physical fabric of the town. The current period is characterized by a continuation of the community's postwar efforts to preserve and protect the natural and built resources and the cultural traditions that contribute to Washington Grove's sense of place.

The following narrative first provides a description of the historic district's setting, describing landscape characteristics and identifying contributing resources and historic associated features. This is followed by a description of the district's architectural resources, covering all five periods of Washington Grove's development.

For the most part, Washington Grove's roads and avenues run in a southwest-northeast direction, and the principal streets run northwest-southeast. For ease of understanding and readability, in Section 7 and throughout the nomination, cardinal directions are used to describe the orientation of resources. As such, a building with a southeast exposure, for example, will be described as facing east.

SETTING

Tent Department

During the initial period of Washington Grove's development, the spiritual and cultural focus of the Methodist camp was the preacher's stand and its surrounding assembly area, which were located on a high point within the landscape. A sketch map of Washington Grove created in 1873, the year of the first camp meeting, reveals that the assembly area was originally a square clearing in the woods, and the canvas tents that provided the earliest form of shelter were arranged around it in a grid. This arrangement was soon replaced with a wheel plan, featuring radial paths that met at a circular assembly area, which came to be known as the "Sacred Circle," or simply the Circle. The collection of tents, and later cottages, surrounding the **Circle (contributing site)** and

lining the avenues radiating from it came to be known as the Tent Department.[1] In 1877, the preacher's stand and assembly area, which were unsheltered, were replaced with a rectangular, timber-frame pavilion known as the tabernacle (no longer extant). According to a contemporary source, the tabernacle measured 48 by 70 feet.[2] The tabernacle sat within a circular lawn shaded with trees, and around the lawn was a pedestrian path. The Circle was the location of the first drainage improvement project at Washington Grove in 1880, when terra cotta pipes were laid under the site to prevent puddling and flooding in the vicinity of the tabernacle.[3] In 1905, the tabernacle was torn down (replaced by other assembly buildings), and the character of the Circle evolved once again. The grounds were "beautified" by clearing away debris, draining the site, filling and leveling the ground, and planting grass seed.[4] In 1913, the residents of the cottages surrounding Circle, at their own expense, had "new walks laid out, parking made in front of the cottages and grass sown in the circle space."[5] In 1964, improvements included planting a red dogwood, four rhododendron, and sixty-four azaleas.[6] Today, the Circle is composed of a turf lawn planted with new and mature trees and surrounded by a turf and gravel **path (historic associated feature)**. Four planted beds, as well as azaleas, holly, and other shrubs, create an intimate setting for two concrete and wood-slat benches and a plaque set on a concrete base that commemorates the Circle as the site of the first Washington Grove Camp Meeting. **Views from the Circle of the surrounding cottages and along each of the radial avenues (historic associated feature)** contribute to its sense of place.

The radial paths that converged at the Circle were designated First through Sixth avenues. Today, these narrow avenues retain their historic alignments, remain limited to pedestrian use, and are surfaced with gravel or a combination of turf and gravel. **First Avenue (historic associated feature)** extends between Center Street on the south and the Circle on the north. It was paved with crushed rock as early as 1896.[7] Today, residential development is limited to the lots along the east side of the avenue. **Second Avenue (historic associated feature)** runs between Grove Avenue on the west and the Circle on the east. The course of Second Avenue has

[1] The term "tent department" was in use as early as 1894. The President's Report from that year reads, "What is now termed the tent department, is the territory first used in the holding of camp-meetings…." See President's Report, May 1894, Washington Grove Archives (hereafter shortened to WGA), Box D-1, File DA.0001.21.

[2] T. H. S. Boyd, *The History of Montgomery County, Maryland: From its Earliest Settlement in 1650 to 1879* (Baltimore, MD: W. K. Boyle & Son, 1879), 117.

[3] "At Washington Grove," *Washington Post*, July 3, 1880.

[4] Grounds Committee Report, June 1908, WGA, Box H-4, File DA.00H4.34.

[5] Photocopied pages from the minutes of the Washington Grove Association annual stockholders meeting, May 30, 1913, courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

[6] Information Bulletin, October 1964, WGA, Box H-2, Town Publications, Grove (Town) Bulletin, 1956-1985.

[7] President's Report, May 1896, WGA, Box D-1, File DA.0001.22.

not changed from its historic alignment, and it remains a narrow pedestrian path paved with gravel. **Third Avenue (historic associated feature)** also connects Grove Avenue with the Circle. As originally platted, **Fourth Avenue (historic associated feature)** extended north from the Circle to Laytonsville Road (today Washington Grove Lane). However, like Fifth Avenue and Sixth Avenue to the east, most development along its route occurred below McCauley Street. Today, Fourth Avenue follows a roughly linear course between the Circle and McCauley Street. Along the east side of Fourth Avenue is a small park named Wade Park. **Fifth Avenue (historic associated feature)** extends between the Circle on the south and McCauley Street on the north. It follows a slightly curved course that was likely shaped by the natural contours of the terrain. **Sixth Avenue (historic associated feature)** follows a slightly curved course between the Circle on the south and Grove Road on the north. Like Fifth Avenue, its route was likely determined by the natural contours of the land. In addition to the historically designated avenues, in recent times, the short, unpaved corridor that extends between the Circle and Grove Road (between the cottages at 1 the Circle and 9 the Circle) has been identified as Seventh Avenue. This avenue does not appear by name on the 1886 Lang plan of Washington Grove, the 1897 Maddox plan, on a 1935 house number plan, or in mapping from the mid-1950s. In its 2009 Master Plan, the town identifies the route as Seventh Avenue; however, it is not consistently identified as such on current town maps. **Views from the radial avenues toward the Circle and encompassing the cottages along them (historic associated feature)** are an important attribute of the historic district's setting.

In addition to the radial avenues, several short, narrow, interstitial alleys once characterized the Tent Department. Today, only one remains – **Johnson Alley (historic associated feature)**. Historically, Johnson Alley provided rear access to the lots along Fourth Avenue and Broadway (now Grove Avenue). In 1898, the alley was cleared to a uniform width of 10 feet.[8] Today, Johnson Alley is a narrow, 8-foot-wide alley that extends from Acorn Lane on the south to McCauley Street on the north. The alley is paved with asphalt, and, while there are no curbs along the roadway, there are several short sections of metal safety rails along its length.

Acorn Lane (historic associated feature), which connects Chestnut Road with McCauley Street, dates to circa 1939, when the pattern of roads around the Circle was modified to accommodate automobile traffic.[9] Today, Acorn Lane is a narrow, vehicular roadway that follows an east-west route between Chestnut Road and Fourth Avenue, at which point it turns north and passes through Wade Park before terminating at McCauley Street. It is an asphalt roadway without curbs. There are several small gravel parking areas along the length of the road that are associated with nearby houses or with Wade Park.

[8] Notes from March 11, 1898, entry in ledger entitled "Washington Grove Camp Meeting Association Records, 1893-1904," courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

[9] In his history of Washington Grove, author Philip K. Edwards states that Acorn Lane was opened up in 1939. Town Council meeting minutes, however, state that a resolution was passed in 1945 designating Acorn Lane to be opened to vehicular traffic. See Philip K. Edwards, *Washington Grove, 1873-1937: A History of the Washington Grove Camp Meeting Association* (Washington Grove, MD: P. K. Edwards, 1988), 379, and Town Council Meeting Minutes, June 11, 1945, WGA, Box D-4, File DT.00D4.05.

Miller Drive (historic associated feature) is located north of the Woman's Clubhouse. It is a circular drive that extends east from Chestnut Road. The road was put in immediately after World War II when the town was making a series of road and infrastructure improvements. Today, the drive is paved with asphalt and has a small section of asphalt curb. Along the length of the drive are several gravel parking areas used by the Woman's Club and nearby residences.

During the early development of Washington Grove, several clusters of undeveloped lots within the Tent Department were dedicated as small parks. These parks provided visual and physical respite from the closely spaced dwellings that characterized the area. They also served as a gathering space for social, religious, and secular activities. Today, three of these parks remain – Jackson Park, Knott Park, and Wade Park.

Jackson Park (contributing site) started out as a small, irregularly shaped park east of Grove Avenue and northwest of the Circle between Third Avenue and Johnson Alley. Based on available records, it is believed the park was named in honor of Richard Plummer Jackson (1816-1891), an early stockholder of Washington Grove.[10] Town records indicate that there was a well and pump in Jackson Park. A local effort by the Washington Conference of Methodists' Ladies Guild to "beautify" the park in 1916 included plans to plant shrubbery and lay walks.[11] Part of Jackson Park was eliminated when Acorn Lane was established (circa 1939). The space identified today as Jackson Park differs from its historic counterpart. Today, Jackson Park is comprised of what historically has been the north end of Howard Park. It is located west of Grove Avenue and bound by Acorn Lane, Chestnut Road, and Miller Drive. Along the edge of Miller Drive is a small parking area, paved with gravel. Otherwise, the park features a turf lawn planted with evergreen and deciduous trees and shrubs. Small-scale features include a wood bench and a small statue of a seated girl (both located near the intersection of Chestnut Road and Acorn Lane) and signage.

Knott Park (contributing site) is a small, triangular park bound by Grove Avenue on the west and First Avenue on the east. It may have been named after Ignatius Knott, an active member of the Washington Grove Camp Meeting Association whose wife Mary was also one of the original stockholders.[12] The Knotts had a cottage on First Avenue that was known for its garden. A newspaper account from 1884 reads, "Perhaps the prettiest cottage in the grove is that of Mr. Ignatius Knott. It is surrounded with a miniature garden in which are tiny beds of flowers in unique design and several urns filled with flowering plants."[13] As early as 1878, Knott Park was the location a furniture warehouse operated by Washington B. Williams, a merchant from

[10] Jackson was an attorney in Washington, D.C., and the author of a history of Georgetown. See research memo prepared by Patricia Patula, Town Archivist, February 1, 2019.

[11] Grounds Committee Report, April 1916, WGA, Box H-4, File DA.00H4.60.

[12] Research memo prepared by Patricia Patula, Town Archivist, February 1, 2019.

[13] "City in the Woods: Religious Services as Washington Grove – The Guests of the Hotel," *Washington Post*, August 15, 1884.

Washington, D.C.[14] This building (no longer extant) was later repurposed as a Young People's Hall. In 1902, it was moved out of Knott Park (to an unknown location) to be used in part as a stable. In 1906, the Ladies Guild requested the privilege to beautify the newly cleared park.[15] Today, Knott Park is planted with shade trees and shrubs, including a notable English yew. Its edges are defined by the gravel roadbeds of First Avenue and Grove Avenue.

Wade Park (contributing site) is located north of the Circle between Fourth Avenue on the west and Fifth Avenue on the east. It was named after John W. Wade, a founding layman member of the Washington Grove Camp Meeting Association and its treasurer for fourteen years beginning in 1884.[16] During the camp meeting period, a topographically high point in Wade Park known as **Political Hill (historic associated feature)** was a popular gathering place for politicians who attended camp meetings to make speeches and visit with constituents. A recent restoration (circa 2018) of the rock that was the centerpiece of Political Hill involved clearing overgrowth and making a path around the outcropping.[17] In 1915, Wade Park was also the focus of improvements by the Ladies Guild.[18] A flagpole was installed and dedicated in the park in 1921.[19] Around 1939, when Acorn Lane was established, its route passed through Wade Park, roughly bisecting the space. Today, the park features shade and evergreen trees, turf, and hedges. Small-scale features include concrete and wood-slat benches, the flagpole, and signage. Within the park are small parking areas associated with Acorn Lane. They are paved with gravel and feature timber curbs.

[14] Williams also reportedly provided postal services and operated a barber shop and lodging rooms in the building. See Edwards, *Washington Grove, 1873-1937,* 87. Edwards refers to the merchant as "Wash" B. Williams; contemporary newspaper articles provide his full name of Washington B. Williams.

[15] Notes on the June 23, 1906, Washington Grove Association Board of Trustees Minutes, courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

[16] Research memo prepared by Patricia Patula, Town Archivist, February 1, 2019.

[17] The restoration focused on a rock outcropping in Wade Park located between Acorn Lane and Fifth Avenue. However, sources differ in their location of Political Hill. The first known reference to its location was written in 1927 and refers to an outcropping of rocks between Fifth and Sixth avenues. A later source gives its location as between Fourth and Fifth avenues in Wade Park. See Patricia Patula, Town Archivist, From the Archives, "'Rocks and Politicians,' The Story of Political Hill," accessed November 30, 2018, available at https://washingtongrovemd.org/town-bulletins/town-bulletin-october-2013/.

[18] Notes on the September 3, 1915, Washington Grove Association Board of Trustees Minutes, courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

[19] President's Report, May 1921, WGA, Box D-1, File DA.0001.44.03.

B&O Railroad Corridor and Associated Features

The Metropolitan Branch of the B&O, which commenced passenger and freight operations on May 25, 1873, stretched at its completion from the northwest corner of Washington, D.C., to the mouth of the Monocacy River and revolutionized transportation and trade in Montgomery County.[20] Washington Grove had a dedicated stop along the Metropolitan Branch, which carried excursionists and residents to the annual gatherings. In 1873, the railroad built a train depot (no longer extant) at the Washington Grove station. It was a large, frame structure that sheltered an open waiting area. In the 1870s, the B&O Railroad built a timber, pony truss bridge about 600 feet northwest of the Washington Grove station. Called the Humpback Bridge after its distinctive shape, the structure greatly facilitated local travel, trade, and communication by providing a safe above-grade crossing at a blind curve in the tracks.[21] Following completion of double-tracking between Washington and Gaithersburg by 1893, the railroad expanded its facilities at Washington Grove in 1906 when it built a station house (no longer extant) on the opposite side of the tracks from the depot.[22] The station house had a ticket office and separate men's and women's waiting rooms.

The Metropolitan Branch was integral to the development of Washington Grove. Indeed, the founders of the camp meeting deliberately selected a site that was located along the route of the railroad, and the popularity of its trains (as many as twenty Sunday excursion trains a day during camp meetings) its success.[23] The freight carried on the trains, delivered to Washington Grove's freight yard, brought camp supplies and building materials used to construct cottages and other structures. In 1919, there were nine trains stopping at Washington Grove per day, enabling residents to commute to work. The railroad also fostered the development of Oakmont,

[20] The Metropolitan Branch of the B&O is listed on the Maryland Inventory of Historic Properties (M: 37-16) and was determined eligible for the National Register of Historic Places in 2000 due to its significance in the areas of architecture, community planning, economics, engineering, exploration/settlement, industry, transportation, and local history. See Tim Tamburrino, KCI Technologies, Inc., Maryland Historical Trust Determination of Eligibility Form, "Metropolitan Branch, Baltimore & Ohio Railroad (M: 37-16)," January 2000.

[21] In 2009, the Humpback Bridge (M: 21-220) was determined eligible for the National Register of Historic Places under Criterion A due to its significance in the areas of transportation and community planning. See AD Marble & Company, Maryland Historical Trust Determination of Eligibility Form, "Washington Grove Humpback Bridge (M: 21-220)," 2009, and Town of Washington Grove Historic Preservation Commission, 2014 Montgomery County Historic Preservation Awards Nomination Form, "Washington Grove Hump Back Bridge," 2014. As one of only two bridges built by the B&O over the Metropolitan Branch, the Humpback Bridge is also significant as a scare historic resource. The other bridge is the 1918 Talbot Avenue bridge (M: 36-33), a steel girder bridge near Silver Spring. The Talbot Avenue bridge is in the way of construction of a light rail project and is slated for demolition in 2020 or 2021.

[22] Edwards, *Washington Grove, 1873-1937,* 187.

[23] Edwards reports that on one Sunday in 1882, 12,000 people attended the Washington Grove camp meeting. See Edwards, *Washington Grove, 1873-1937,* 95.

the late nineteenth-century subdivision across the tracks from Washington Grove, and the growth of Emory Grove, a nearby Methodist camp meeting established by African Americans.[24]

Today, a segment of the 66-foot-wide railroad corridor extends along the southern municipal boundary of Washington Grove, and the northern edge of the rail corridor forms part of the boundary of the historic district. **Views in both directions along Railroad Street of the railroad corridor and Washington Grove station, views from Railroad Street of the Humpback Bridge and its approaches, and views north from Railroad Street along Grove Avenue and Grove Road (historic associated features)** were important to the experience of arriving at or departing from Washington Grove, and these views continue to contribute to the setting of the historic district.

Cottage Department

Although Washington Grove's initial layout derived from camp meeting traditions, as the summer community grew, additional building lots were needed, which were arranged according to a gridiron system characteristic of many late nineteenth-century railroad and streetcar suburbs. The first area of expansion outside the Tent Department occurred along Grove Avenue, which served as the principal pedestrian route into the campground from the railroad station. In a plat map recorded with the county in 1883, the 1,000-foot-long avenue was divided into thirty-nine lots that measured 50 feet by 150 feet.[25] These generously sized and regularly spaced lots contrasted greatly with the small, often irregular parcels around the Circle. The layout of Grove Avenue influenced the subdivision of the undeveloped land outside the Tent Department, which came to be known as the Cottage Department. These different development areas are reflected in current zoning, which distinguishes between the RR2 Zone (Tent Department) with small, irregular lots of 7,500 square feet versus the RR1 Zone (Cottage Department) with lots measuring 11,250 square feet.

The development of the Cottage Department was principally guided by two plans – the 1886 Lang plan and the 1897 Maddox plan. The Lang plan created new building lots along a system of alternating avenues (for pedestrian use) and roads (for vehicular use).[26] The Maddox plan carried over many of the concepts of the Lang

[24] The Emory Grove camp meeting was located within Johnson's Park, which is located north of the Midcounty Highway between Woodfield Road and Washington Grove Lane in Montgomery County. For a detailed history of the Emory Grove Camp Meeting and a description of the physical character of the site, see Elizabeth Jo Lampl and Clare Lise Kelly, "Historic Context Report, 'A Harvest in the Open for Saving Souls,' The Camp Meetings of Montgomery County," prepared for the Maryland Historical Trust, 2004, 35-61 (hereafter shortened to Lampl and Kelly, "'A Harvest in the Open for Saving Souls,' The Camp Meetings of Montgomery County," 2004.)

[25] Montgomery County, Circuit Court Land Records, Plat Book EBP 28, Page 58. The plat is also available in the Washington Grove Archives.

[26] National Register documentation for the Linden Historic District in Montgomery County notes that, according to oral history sources, the suburban development of Linden, platted in 1873, also featured separate vehicular and pedestrian routes. See Michael F.

plan, but took into account the entire property, with the exception of the woods west of Washington Grove Lane. Outside the Tent Department, the Maddox plan laid out generous building lots, 50-foot-wide avenues, and 25-foot-wide roads. In contrast with the Lang plan, in the Maddox plan the roads and avenues east of Grove Avenue were set parallel to it rather than parallel to Ridge Road, eliminating many of the irregular lots of the earlier plan and defining a gridiron system. With the 1897 plan, several parks, together with some streets, were given the names of deceased Washington Grove pioneers or active members of the Washington Grove Camp Meeting Association who held positions of trust.[27]

Cottage Department Circulation System

As the Maddox plan was implemented, Washington Grove's north-south (pedestrian) avenues came to include Chestnut Avenue, Cherry Avenue, Grove Avenue, Maple Avenue, and Pine Avenue. The north-south (vehicular) roads included Cherry Road (no longer extant), Chestnut Road, Grove Road, Maple Road, Pine Road, and Hickory Road. Contributing to the grid were several east-west streets, including Brown Street, Center Street, McCauley Street, and Oak Street. Boundary roads included Washington Grove Lane on the west, Railroad Street on the south, Ridge Street on the east, and Boundary Street on the north. With the exception of the roads that predated Washington Grove, the pedestrian and vehicular routes delineated in the Maddox plan were cleared and graded gradually, as residential development spread across the landscape.[28]

Avenues

Chestnut Avenue (historic associated feature) was platted in the 1886 Lang plan as a single block running parallel to Grove Avenue on the west with nine lots along its east side that measured 120 feet deep. The 1897 Maddox plan shifted Chestnut Avenue to the west to allow for deeper, 150-foot lots on the east side of the avenue and extended it north to Washington Grove Lane. By 1905, part of Chestnut Avenue was surfaced with crushed stone.[29] Construction on many Chestnut Avenue lots was hindered due to poor drainage, and, for a time, the land west of the northern end of Chestnut Avenue was left as a meadow, which the superintendent of

Dwyer, Maryland-National Capital Parks and Planning Commission, Maryland Historical Trust Nomination Form for the National Register of Historic Places, "Linden Historic District," June 3, 1975.

[27] President's Report, May 1897, WGA, Box D-1, File DA.0001.23.

[28] The northern length of Grove Avenue aligned with an old country road to Laytonsville and was used by participants of the Emory Grove Camp Meeting, which predates Washington Grove. The northern length of Grove Road followed the alignment of an old trail that branched off from the country road to Laytonsville and led to Mineral Springs. See Edwards, *Washington Grove, 1873-1937*, 32-33, 67.

[29] Grounds Committee, May 1905, WGA, Box H-4, File DA.00H4.27.

the grounds was permitted to use for cutting grass and wood.[30] Drainage conditions along the southern end of Chestnut Avenue improved in 1910, when the area was ditched to channel away surface water. The project succeeded in creating "a demand and sale of lots that heretofore have been flooded in every heavy storm."[31] By March 1959, the undeveloped land along the northern end of Chestnut Avenue had been partially cleared, and surveyors were hired to determine boundary lines for building lots, which were improved beginning in the 1960s.[32] The northern segment of Chestnut Avenue, however, was never cleared of the mature trees that stand along its route. Today, Chestnut Avenue is a turf pedestrian path with an uneven topography. Its alignment parallels both Grove Avenue and Chestnut Road, which follow a straight course from Brown Street to just north of Center Street where they take a slight bend to the west. At the intersection of Oak Street and Chestnut Road stands a notable shortleaf pine tree, which has the distinction of being the largest specimen of its kind in the state. Other tree species along the well-shaded route include tulip poplar, maple, and oak. An asphalt lined drainage channel, which runs east-west and roughly aligns with Acorn Lane, crosses Chestnut Avenue. **Views along Chestnut Avenue in both directions (historic associated feature)** are an important attribute of the historic district.

Initially platted on the 1886 Lang plan to run parallel to Ridge Road, the orientation of **Cherry Avenue (historic associated feature)** was revised in the 1897 Maddox plan to parallel the route of Grove Avenue. Development along the 50-foot-wide avenue was slow, and when residents began to build along Ridge Road in the 1920s and 1930s, part of Cherry Avenue became a service road for those houses. In 1959, the town's Planning Commission recommended grading and "topping" the service road and designating the rest of the avenue as a pedestrian walkway.[33] Today, Cherry Avenue runs from Brown Street on the south to the East Woods on the north. While a short section of Cherry Avenue is paved with gravel, for most of its length Cherry Avenue is a turf pedestrian path. Along the paved section of the avenue are several timber curbs. The trees and other vegetation along the avenue are not cut back to a regular width, giving the route an informal character. **Views along Cherry Avenue in both directions (historic associated feature)** are an important attribute of the historic district.

The southern length of **Grove Avenue (historic associated feature)** followed along the crest of a ridgeline and provided a high, dry path for residents and excursionists entering Washington Grove on foot from the railroad station. Towering oak trees shaded the route during the hot summer months. An 1883 newspaper article described Grove Avenue as "…ever an inviting walk, because of its deep and cooling shade."[34] The first lots

[30] Grounds Committee, September 1905, WGA, Box H-4, File DA.00H4.28.

[31] Grounds Committee, May 1910, WGA, Box H-4, File DA.00H4.38.

[32] Grove Bulletin, March 1959, WGA, Box H-2.

[33] Grove Bulletin, August 1959, WGA, Box H-2.

[34] "Washington Grove, A Delightful Resort – the Grounds and Cottages – Opening of the Camp," *Washington Post*, August 5, 1883.

made available in the Cottage Department were on Grove Avenue, and, by 1885, eight cottages had been built along the route.[35] The lots on Grove Avenue were backed by informal alleys, which became Grove Road and Chestnut Road. These service roads provided access for delivery wagons and the daily services of the scavengers, who cleaned out the privies in the back yards of the cottages. In 1890, timbers were used to curb the avenue, and, by 1896, it was paved with crushed rock.[36] The northern section of the avenue (originally designated as Broadway) was graded and covered with fine stone in 1900.[37] Although the avenue was platted as 50 feet wide, records suggest that the paved section was limited to 30 feet. Key public buildings were located along Grove Avenue, including market stalls (no longer extant), a hotel (no longer extant), and the assembly hall (today McCathran Hall). A sewer was constructed along the west side of Grove Avenue in 1905. Today, Grove Avenue is a broad, turf and gravel pedestrian path lined with majestic oaks and other shade trees. It extends from Railroad Street on the south to McCauley Street on the north. Its sylvan character is enhanced by several public parks that are located along its length. The **views along Grove Avenue in both directions, views from Grove Avenue encompassing McCathran Hall and the Woman's Clubhouse in Howard Park, and the view of the Washington Grove railroad station from Grove Avenue (historic associated features)** contribute to the setting of the historic district.

Maple Avenue (historic associated feature) was platted in the 1886 Lang plan as one of four residential avenues east of Grove Avenue. The 1897 Maddox plan extended the avenue north to Boundary Street and dedicated three blocks along its west side as a public park known as Woodward Park. Maple Avenue was not "opened," meaning cleared of underbrush and trees in anticipation of development, until 1905.[38] This was the same year that an auditorium for Chautauqua (no longer extant) was built in Woodward Park. Three years later, the avenue was graded and rolled. Maple Avenue was adjacent to a low-lying area of the Grove that had poor drainage, which was why residential development along its length was relatively slow. Today, Maple Avenue is a turf and gravel pedestrian path lined with tall shade trees. For much of its length, Maple Avenue forms the eastern edge of Woodward Park, and, with one exception (108 Maple Avenue), development is limited to the east side of the avenue. **Views along Maple Avenue in both directions and the broad, sweeping views from the avenue across Woodward Park (historic associated feature)** are an important attribute of the historic district.

Pine Avenue (historic associated feature) was platted in the 1886 Lang plan as one of four residential avenues east of Grove Avenue. The 1897 Maddox plan extended the avenue two blocks north of Center Street where it reached an end at Dorsey Street. The route of Pine Avenue traveled over a low-lying area of the Grove that had

[35] Edwards, *Washington Grove, 1873-1937*, 91.

[36] President's Report, May 1896, WGA, Box D-1, File DA.0001.22.

[37] President's Report, May 1900, WGA, Box D-1, File DA.0001.26.

[38] Grounds Committee, May 1905, WGA, Box H-4, File DA.00H4.27.

poor drainage, and, except for several lots at the south end of the avenue, it was never developed for residential use. Instead, it was set aside as parkland when Woodward Park was expanded west to Grove Road and when the blocks east of Grove Road, west of Maple Avenue, south of Oak Street, and north of the building lots on Brown Street were set apart for recreational purposes and designated as "Athletic Park" (now part of Woodward Park). The buildable lots at the south end of Pine Avenue were not developed until after World War II. Today, Pine Avenue extends roughly 250 feet north of Brown Street before it ends at Woodward Park. **Views north from Pine Avenue into Woodward Park (historic associated feature)** contribute to the setting of the historic district.

Roads

Chestnut Road (historic associated feature) was laid out in the 1897 Maddox plan as a 25-foot-wide lane between Chestnut Avenue on the west and Grove Avenue on the east. It extended the length of the Grove, from Washington Grove Lane on the north to the intersection of Brown Street and Railroad Street on the south. Near the center of the Grove, the road passed two public parks – Chapel Park and Howard Park. During World War II, the town planted Victory Gardens within the lots west of Chestnut Road and north of Center Street.[39] Today, Chestnut Road is paved with asphalt. Above Center Street, the road abuts the Washington Grove United Methodist Church parking lot.

Grove Road (historic associated feature) was platted in the 1886 Lang plan of Washington Grove, but not identified by name. Eleven years later, the 1897 Maddox plan depicted it as a 25-foot-wide lane between Grove Avenue on the west and Pine Avenue on the east. Between Railroad and Center streets, Grove Road followed a linear route. In contrast, the northern length of Grove Road followed the irregular course of an old trail that branched off from the country road to Laytonsville and led to Mineral Springs.[40] Grove Road terminated at Dorsey Street on the north. For many years, the train depot was located on Railroad Street at the foot of Grove Road. In 1912, the association installed a sewer under Grove Road. Today, Grove Road is paved with asphalt and extends between Railroad Street on the south and McCauley Street on the north. The road passes through Morgan Park and defines the western edge of Woodward Park. It serves as a principal vehicular entrance into Washington Grove from Railroad Street. **Panoramic views from Grove Road encompassing Woodward Park (historic associated feature)** are an important attribute of the historic district.

Hickory Road (historic associated feature), between Chestnut Avenue and Washington Grove Lane, was initially called Switch Road. It starts at Railroad Street on the south and terminates at a small park on the north. It is a vehicular road paved with asphalt. A short section of the south end of the road, which provides access to the back entrances of the commercial buildings along Washington Grove Lane, features concrete curbs.

[39] Town Council Meeting Minutes, Special Council Meeting, March 27, 1943, WGA, Box D-4, DT.00D4.03.

[40] Edwards, *Washington Grove, 1873-1937*, 33.

Maple Road (historic associated feature) was platted in the 1886 Lang plan, but not identified by name. It was laid out in the 1897 Maddox plan as a 25-foot-wide lane between Maple Avenue on the west and Cherry Avenue on the east. Today, Maple Road is a narrow vehicular route paved with asphalt. It follows a linear course between Brown Street on the south and the East Woods on the north and is shaded by a mature tree canopy.

The route of **Pine Road (historic associated feature)** was laid out in the 1897 Maddox plan as a 25-foot-wide lane between Pine Avenue on the west and Maple Avenue on the east. The road traveled over a low-lying area of the Grove that had poor drainage, and it was eventually incorporated into Woodward Park. Today, Pine Road is a narrow vehicular lane paved with asphalt. It extends roughly 200 feet between Brown Street on the south and Woodward Park on the north.

Streets and Lanes

Brown Street (historic associated feature), at the southern end of Washington Grove, was originally called South Avenue.[41] In the 1886 Lang plan, South Avenue extended from Chestnut Road on the west to Ridge Road on the east. South Avenue, along with Grove, Chestnut, and Maple avenues, was one of the earliest streets in Washington Grove to be opened. In 1897, the street was renamed after Reverend Benjamin Peyton Brown, one of the founders of Washington Grove.[42] The 1897 Maddox plan designated two parcels along the south side of Brown Street (between Chestnut Road and Maple Avenue) as parks – the larger of which was named Morgan Park. Lots with frontages along the north side of Brown Street measured 50 feet wide by 140 feet deep and backed up onto a 10-foot-wide alley. In 1929, the alley was closed, and the depth of the lots along the north side of Brown were extended by 10 feet.[43] (The lots along the south side of Brown Street all had different sizes due to the shape of the block.) Today, Brown Street extends from Railroad Street on the west and to an outlot on the east. For about half of its length, Brown Street forms the northern boundary of Morgan Park, which continues to serve today as a wooded buffer between the railroad tracks and Washington Grove's residential streets. A metal gate at the western end of Brown Street controls automobile access from Railroad Street and Hickory Road, and near this junction along the north side of the street are the remains of a low, **stone perimeter wall (historic associated feature)**. Farther east, at the northwest corner of Brown Street and Grove Road, there is a remnant of a stone culvert that has been carefully maintained by the town as a significant element of the historic

[41] In 1994, the town annexed 2.88 acres of land east of Ridge Road, which was laid out as an extension of Brown Street and subdivided for residential development. This section of Brown Street, which features eight single-family houses built in the late 1990s, is not included within the boundary of the historic district because it lacks historic integrity.

[42] Reverend B. Peyton Brown (1830-1896) was a pastor at several Methodist churches in Washington, D.C., including Foundry Methodist Church. He was part of the search committee that selected the site for Washington Grove.

[43] Montgomery County, Circuit Court Land Records, Plat No. 418, January 1930.

landscape. (See additional text below related to the town's historic drainage system.) Between Railroad Street and Ridge Road, Brown Street is paved with asphalt, but lacks curbs and sidewalks.[44] **Views along Brown Street in both directions (historic associated feature)** are an important attribute of the historic district.

Center Street (historic associated feature) was recorded as Park Street in the 1886 Lang plan, which platted it from Grove Avenue on the west to Ridge Road on the east. The 1897 Maddox plan expanded Center Street to Washington Grove Lane on the west. Today, the aptly named street follows a roughly east-west course through the center of town between Washington Grove Lane and Ridge Road. For most of its length, Center Street is a paved asphalt road. Only a short section of the street west of Chestnut Road has an asphalt curb. A small section of the west end of the street is not paved with asphalt, as vehicular access from Center Street to Washington Grove Lane is prohibited. As Center Street passes through Woodward Park, it serves in part as a gravel access road to the town's maintenance building and in part as gravel pedestrian path. Functional transitions along the street are marked with split rail fencing, such as at the east edge of Woodward Park, and a post-and-chain barrier, such as near Washington Grove Lane. A metal gate spans Center Street near the entrance to the maintenance area. The gate hangs on timbers salvaged from the 2009 rehabilitation of the Humpback Bridge. **Views along Center Street in both directions and views along Center Street encompassing McCathran Hall (historic associated feature)** enhance the experience of the landscape and are an important attribute of the historic district.

In 1987, the town annexed a 1-acre parcel of land along Washington Grove Lane known as "Stewart's Addition," which was laid out as Daylily Lane and subdivided into four residential lots. Today, Daylily Lane (noncontributing) extends roughly 350 feet northwest from Washington Grove Lane along the eastern edge of the West Woods and terminates at a dead end. It is a narrow roadway, paved with asphalt. A single streetlamp lights the road.

Dorsey Street (historic associated feature) extended two blocks between Sixth Avenue and Maple Avenue in the 1897 Maddox plan of Washington Grove. The street was likely named after the Dorsey family, whose cottage was located at the west end of the street, at what is now 409 Sixth Avenue. The residential lots at the east end of the street were never developed and eventually became part of Woodward Park. Today, Dorsey Street is a vehicular road that extends the short length between Sixth Avenue and Grove Road.

In the 1897 Maddox plan of Washington Grove, **McCauley Street (historic associated feature)**, formerly called North Street, extended from Chestnut Road on the west to Ridge Road on the east. Reverend James A. McCauley, after whom the street was named, was a part of the search committee that selected the site for

[44] Although the President's Report of 1907 states that stone walks were laid along Brown Street, no physical evidence of this feature exists. See President's Report, May 1907, WGA, Box D-1, File DA.0001.33.

Washington Grove.[45] Since the Maddox plan oriented most of the Grove's residential lots toward the avenues, McCauley Street was likely planned as a vehicular route and few early cottages were built facing the street. For a period, the grounds north of McCauley Street were used as pasturage.[46] No development occurred along the eastern half of McCauley Street, which became part of Woodward Park and the East Woods, and development along the western half of the street occurred mainly in the second half of the twentieth century. In fact, for many years, the lots north of McCauley Street were beyond the town's water and sewage system.[47] Today, McCauley Street extends from McCauley Park on the west to Grove Road. The street is paved with asphalt. **Views in both directions along McCauley Street (historic associated feature)** contribute to the historic setting of Washington Grove.

In the 1886 Lang plan of Washington Grove, **Oak Street (historic associated feature)** was named Oak Avenue. It had a discontinuous route with a short western section (between Grove Avenue and Chestnut Avenue) that was located south of its longer eastern section (between Grove Avenue to Ridge Road). While the location of the western section was corrected (shifted north) in the 1897 Maddox plan to create a single east-west route, for many years, reluctant property owners who held the title for Lot 25 on Grove Avenue (later designated as Lot 9) refused to turn over the parcel to the city, creating an interruption between Grove Avenue and Chestnut Road. Despite this, improvements along the western half of Oak Street occurred before the eastern half, which was not opened and cleared until about 1905, the same year the Chautauqua auditorium (no longer extant) was built in Woodward Park.[48] Soon after, a boardwalk was laid along Oak Street that connected Grove Road with a stone pathway to the auditorium. Today, Oak Street features a variety of paving materials along its length. It is paved with asphalt at its west end, but east of Chestnut Road it is surfaced with turf except for a small section within Woodward Park that is covered with gravel where it serves as an access road to a parking lot. **Views along Oak Street in both directions (historic associated feature)** are an important attribute of the historic district.

[45] McCauley (1822-1896) was named a presiding elder of the Washington District of the Methodist Church in 1870. In 1872, we was appointed president of Dickinson College in Carlisle, Pennsylvania. See Dickinson College Archives and Special Collections, "James Andrew McCauley (1822-1896)," available at http://archives.dickinson.edu/people/james-andrew-mccauley-1822-1896, accessed January 30, 2019.

[46] Notes on the July 28, 1911, Washington Grove Association Board of Trustees Minutes, courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

[47] Town Council Meeting Minutes, August 13, 1945, WGA, Box D-4, File DT.00D4.05.

[48] Grounds Committee, May 1905, WGA, Box H-4, File DA.00H4.27.

Boundary Roads

Boundary Street (historic associated feature) forms part of the northern boundary of Washington Grove. It dates to 1878, when the Grove purchased a 5-acre parcel along the east side of Washington Grove Lane.[49] This parcel was subdivided and platted in the 1897 Maddox plan into the west end of Boundary Street, the north ends of Fifth Avenue and Sixth Avenue, and parts of three residential blocks. The entire length of Boundary Street, as shown in the Maddox plan, was never fully opened. Instead, the central and eastern lengths of the street were absorbed into Woodward Park and the East Woods. Today, Boundary Street extends from Washington Grove Lane to the northwest corner of the Woodward Park/East Woods where it intersects with a cul-de-sac (Silver Dollar Court), which is outside the town limits. It is an asphalt road with concrete curbs.

In the 1897 Maddox plan, **Railroad Street (historic associated feature)** roughly followed the alignment of the B&O Railroad tracks. The street provided access to the train depot and to roads south of the tracks via the Humpback Bridge. It was an important offloading point for residents and visitors traveling to and from the Grove and a vital part of the local transportation network. In 1888, the camp meeting trustees designated Railroad Street to the common use of the county and the association, thus giving the public access to the depot on the Washington Grove side of the tracks.[50] Today, Railroad Street follows a slightly curved route and is bound for most of its length by Morgan Park and the railroad tracks. The southern length of Railroad Street turns sharply southwest where it crosses the railroad tracks before coming to an end at Oakmont Avenue. This intersection is known as Aitchison Crossing. Railroad Street is paved with asphalt and is level along most of its length with the notable exception of the approach to the Humpback Bridge, where it features a sharp rise and drop. There are two short lengths of concrete sidewalk along Railroad Street – one along the south side of the street between Washington Grove Lane and Hickory Road and a second along the north side of the street near Grove Road. The latter provides access from Grove Road to a crosswalk that accesses the waiting shelter at Washington Grove station. Other features include a pull-in parking area along the railroad station and guardrails near the approach to Humpback Bridge. The **views in both directions along Railroad Street (historic associated features)** were important to the experience of arriving at or departing from the Grove and contributes to the setting of the historic district.

Although **Ridge Road (historic associated feature)** was the easternmost road platted in the 1886 Lang plan, the Grove's landholdings initially included farmland to the east. In 1890, the 48-acre farm and a separate 16-acre parcel, both located along the east side of Ridge Road, were sold, and the street became the eastern boundary of the Grove until the current period when the town made land acquisitions that restored some of the original landholdings. As such, the 1897 Maddox plan shows Ridge Road taking a linear route from just south of Brown Street to Boundary Street. For many years, the 30-foot-wide platted road was part of Montgomery County's rural transportation network, used by farmers to transport and trade goods. While the land along the

[49] Edwards, *Washington Grove, 1873-1937,* 124.

[50] Edwards, *Washington Grove, 1873-1937,* 123.

east side of Ridge remained agricultural for many years (remnants of agricultural fencing consisting of wood posts and barbed wire are still visible along Ridge Road), cottages were built along (or moved to) the west side of the road starting in the second decade of the twentieth century. Today, Ridge Road is bounded by residential development, the East Woods, and the Washington Grove Meadow Conservation Park. It has a dogleg-shaped route that follows a linear course between Railroad Street on the south and the East Woods on the north, turns southeast at the southeast corner of the East Woods, then turns east before terminating at a dead end. The road is paved with asphalt along its entire length, and there are several speedbumps. Near the East Woods, where Ridge Road turns southeast, there is a small section of asphalt curbing, as well as rubble to prevent road erosion. The **views from Ridge Road encompassing the residential parcels of Washington Grove along the west side and the Washington Grove Meadow Conservation Park along the east side (historic associated feature)** define the physical environment of Washington Grove and are important attributes of its setting.

In the 1897 Maddox plan, **Washington Grove Lane (historic associated feature)**, formerly Laytonsville Road, extended from Railroad Street on the south to Boundary Street on the north. For many years, the lane was part of Montgomery County's rural transportation network, used by farmers to transport goods to the railroad depot from points north. The Grove's landholdings west of Washington Grove Lane (comprising the West Woods) were not platted for residential development, and residential building along the east side of the street did not generally occur until the early twentieth century. In contrast, the south end of Washington Grove Lane at its intersection with Railroad Street was a commercial area since the camp meeting period. Today, the section of Washington Grove Lane that passes adjacent to and through the town follows a slightly curved route that features several speedbumps. It has a 50-foot-wide right-of-way and is paved with asphalt. Along the east side of the street is a concrete sidewalk. **Views along Washington Grove Lane in both directions encompassing the West Woods, the residential lots on both sides of the street, and the commercial and agricultural buildings along the railroad corridor (historic associated feature)** are an important attribute of the historic district.

Cottage Department Parks

In addition to Wade Park and Knott Park (described above as part of the description of the Tent Department), several parks were established during the founding period of Washington Grove's development that had a significant impact on the spatial organization of the landscape. They provided clearings for recreation, created large swaths of open ground that offered visual and physical respite within crowded residential areas, and established natural buffer areas that provided protection and privacy for residents.

Chapel Park (contributing site) is located along the south side of Center Street between Grove Avenue and Chestnut Road. The 1886 Lang plan set aside a block of land at the western terminus of Park Avenue (later Center Street) as a public park. The 1897 Maddox plan divided this park into two separate spaces: Chapel Park, which was located south of Center Street and measured 171 feet by 150 feet, and Howard Park along the north side of Center Street. Chapel Park was set aside for a chapel, but this use was never realized. (Instead, in 1901

an assembly hall, today McCathran Hall, was built in Howard Park.) For a period before World War II, Chapel Park was used for lawn games, including roque, croquet, and badminton.[51] Today, the park features mature oak trees on turf with some understory plantings, including a row of hydrangea shrubs along Grove Avenue. Small-scale features include a concrete and wood-slat bench. A pull-in parking area at the north end of the park along Center Street is paved with gravel. **Views within Chapel Park and across the park to nearby cottages and to Howard Park and its buildings (historic associated feature)** are important attributes of the historic district's setting.

Howard Park (contributing site) is located along the north side of Center Street between Grove Avenue and Chestnut Road. As noted above, the Lang plan set aside a block of land at the western terminus of Park Avenue (later Center Street) as a public park. The 1897 Maddox plan divided this park into Chapel Park and Howard Park (also referred to historically as Hotel Park). Howard Park was named after Dr. Flodoardo Howard, a founding trustee and the first president of the association.[52] Howard Park was once the site of a hotel and two commercial buildings, labeled "store" and "market" on the Maddox plan. Late nineteenth-century improvements to the park included removing large stones, plowing and fertilizing the soil, planting grass, paving the walks around the hotel with gravel, and enclosing the hotel grounds with a post-and-wire fence.[53] In 1901, the assembly hall (today McCathran Hall) was erected at the southern end of Howard Park. In 1927, the hotel was razed because it no longer generated revenue. In 1930, a miniature golf course was laid out on the former hotel site.[54] This amenity was eliminated in 1940, when a new assembly building for the Woman's Club was built on the site. Today, Howard Park extends from Center Street on the south to Miller Drive on the north between Chestnut Road and Grove Avenue. It provides a common green for McCathran Hall and the Woman's Club. Footpaths associated with the structures pass through the park, which otherwise features turf lawn, rhododendrons, oakleaf hydrangea, and other shrubs, and deciduous and evergreen trees, including holly, oak, pine, and tricolor beech. Behind the Woman's Club is a stand of cherry trees. The park has an uneven topography that slopes down to the northwest. Small-scale features include four concrete and wood-slat benches and various types of signage. **Views within Howard Park of McCathran Hall and the Woman's Club and across the park to nearby cottages, to Chapel Park, and to the Washington Grove United Methodist**

[51] Philip K. Edwards, *Washington Grove, 1937-1977: A History of the Town of Washington Grove, Maryland…the first forty years* (Washington Grove, MD: P. K. Edwards, 1999), 46.

[52] Dr. Howard (1814-1888) had a successful practice in Washington, D.C., and was one of the founders of the Georgetown Medical School (established in 1851), today the Georgetown University School of Medicine. See "Death of Dr. Flodoardo Howard," *Washington Post*, January 18, 1888.

[53] The walks had a clay base covered in two to three inches of crushed rock, which was then rolled. See President's Report, May 1896, WGA, Box D-1, File DA.0001.22, and President's Report, May 1898, WGA, Box D-1, File DA.0001.24.

[54] Sylvia Tate Horan, *A History of the Woman's Club of Washington Grove* (Washington Grove, MD: Woman's Club of Washington Grove, 2001): 4.

Church (historic associated feature) helped define the physical environment of historic district and are important attributes of its setting.

McCauley Park (contributing site), also known as Washington Grove Lane Park, is a small, triangular parcel that provides a verdant entrance to the Grove from Washington Grove Lane. McCauley Street passes through the park, which features shade trees, as well as smaller, flowering trees, including a magnolia. As the setting of the northern entrance to the Grove, there are several types of signage within the park. Along the western edge of the park is a concrete sidewalk.

Morgan Park (contributing site) extends between Brown Street on the north, the municipal boundary line on the south, Hickory Road on the west, and Maple Avenue on the east. With the exception of a few parcels between Pine and Maple avenues, which were platted for residential development, the majority of this area was set aside as open space in the 1886 Lang plan. Recognizing the significance of the space as the front door of Washington Grove, it was officially decreed a park in 1890.[55] The park was named after Major Thomas P. Morgan, the second president of the Washington Grove Camp Meeting Association.[56] The forested area provided a natural buffer between the noise and dust of the train depot and the tranquility of the camp meeting grounds. Later, as Washington Grove became a year-round community, Morgan Park also served as a transitional space between the rail corridor and the Grove's residential areas. In the early twentieth century, Morgan Park was the focus of improvements by the Washington Conference of Methodists' Ladies Guild.[57] In the early 1980s, as part of a reforestation effort, the town planted more than 300 evergreen trees in the park. On July 4, 2008, a plaque (affixed to a boulder) commemorating the history of Washington Grove was dedicated in Morgan Park. Today, roughly one-third of the park is emerging woodland, densely planted with trees and shrubs. A drainage ditch passes through the park from the intersection of Pine Road and Brown Street to a culvert at Railroad Street. A strip of the park along the south side of Brown Street has been cleared of understory vegetation. The section of the park traversed by Grove Road has also been cleared of understory plantings and features shade and evergreen trees on turf, flowering plants and shrubs (including rhododendrons, azaleas, and hellebores), a concrete and wood-slat bench, the commemorative plaque, and various types of signage. **Views from Morgan Park toward the Washington Grove railroad station and views from the**

[55] Edwards, *Washington Grove, 1873-1937*, 123.

[56] In addition to holding a leadership role at Washington Grove, Major Morgan (d. 1896) served many years in public office in the District of Columbia. In 1873, Morgan was elected to the Board of Fire Commissioners, then, five years later, he was appointed Chief of Police. Between November 1879 and March 1883, he served as one of the three commissioners of the District of Columbia. See Metropolitan Police Department, "Thomas P. Morgan," available at https://mpdc.dc.gov/biography/thomas-p-morgan, accessed November 29, 2018.

[57] Notes on the September 3, 1915, Washington Grove Association Board of Trustees Minutes, courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

park along Grove Avenue, Grove Road, and Brown Street (historic associated feature) are important attributes of the historic district.

The original tract of land acquired by the Washington Grove Camp Meeting Association included a 48-acre farm on the east side of Ridge Road. In 1890, the farm was sold to Andrew H. Ragan for $2,416 to help pay off association debt.[58] For decades, this parcel and other agricultural resources on the fringes of the community defined its rural character and reinforced the idea of the Grove as "a place apart." Today, the 12-acre **Washington Grove Meadow Conservation Park (contributing site)**, which is located on part of the land that once comprised the 48-acre farm, is a key component of the setting of Washington Grove.[59] The park helps contextualize the Grove within Montgomery County's agricultural heritage and preserves the rural, open vistas and spatial organization of the farmland that historically formed the setting of the Grove. The park also provides a critical buffer between Washington Grove's residential streets and surrounding high-density residential and highway development. It features a native meadow habitat with forested edges and natural surface trails. Built structures are limited to park signage and an informational kiosk. After a decade long effort to preserve the meadow from development, the town purchased the property. While the town owns the land, the park is wholly maintained and operated by the Maryland-National Capital Park and Planning Commission.[60] The broad, sweeping **views within and across the Washington Grove Meadow Conservation Park (historic associated feature)** are important attributes of the historic district that reinforce the rural setting of Washington Grove.

Within the forest buffer east of the Washington Grove Meadow Conservation Park (and outside the boundary of the Washington Grove Historic District) is the Washington Grove Steatite Quarry Site, an archaeological site listed on the Maryland Inventory of Historic Properties (Site # 18MO6221). The site is comprised of five distinct areas of archaeological interest that represent evidence of Euro-American and possibly Native American use of the area as a quarrying site. The quarry may have also been used as a source of building materials for local farmers and early residents of Washington Grove.[61] The land adjoining the Washington Grove Steatite Quarry Site, including, but not limited to, the Washington Grove Meadow Conservation park, should be considered archaeologically sensitive.

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[58] Edwards, *Washington Grove, 1873-1937*, 123, 125. Note that while Edwards describes the farm as 50 acres, deed records indicate that the boundaries encompassed 48 acres. See Maryland Land Records, Deed Book JA 23, page 70.

[59] The site was designated a conservation park by the Maryland-National Capital Park and Planning Commission in 2007.

[60] The Maryland-National Capital Park and Planning Commission holds a deed of dedication that requires it to maintain and operate the land as an open space park, and the Town of Washington Grove owns the underlying in-fee property interest. See Maryland-National Capital Park and Planning Commission, "Washington Grove Conservation Park Operation and Use Plan," Staff Draft, October 2013, 4.

[61] "Status of Washington Grove Meadow Conservation Park and Cultural Resources, Part I – Washington Grove Steatite Quarry Site," report prepared for the Washington Grove Historic Preservation Commission by Wendy Harris, draft dated December 16, 2013.

Woodward Park (contributing site) has its origins in the 1897 Maddox plan, which set aside three blocks along the west side of Maple Avenue as a public park named in honor of William Ryland Woodward, one of Washington Grove's founding trustees and the vice president of the Washington Grove Camp Meeting Association for its first fifteen years.[62] In 1905, the park was informally expanded west to Grove Road. That same year, the area bound by Oak Street on the north, Maple Avenue on the east, the building lots on Pine and Maple avenues on the south, and Grove Road on the west were set apart for recreational purposes and dedicated as "Athletic Park."[63] This land was poorly drained and consisted of mainly thicket and bog before it was adapted for recreational use.[64] A plat map dated January 6, 1930, records that the lots south, west, and north of Woodward Park (including the area known as Athletic Park) had been officially dedicated as "Park" by the association on May 30, 1925. This area, which extended from the private lots along Pine and Maple avenues on the south to Boundary Street on the north and roughly from Grove Road on the west to Maple Avenue on the east, matched the parcels surrounding Woodward Park that were shaded green for "Parks and Parking" in the 1897 Maddox plan. Historically, Woodward Park has provided Grove residents and visitors areas for both passive and active recreation. Between 1905 and 1963, an auditorium stood in Woodward Park north of Oak Street and east of the tennis courts. It was used for Chautauqua and other community activities. Other structures included a men's clubhouse (no longer extant), a girls' clubhouse (built in 1910), which was used by the Woman's Club before being destroyed by fire in 1939, and a large, stone **fireplace (contributing structure)**, built by the Athletic Club in 1935. The park's tennis courts and athletic fields were popular with residents and the public. For a period beginning in 1903 and continuing through at least 1916, track and field events were held in the park every summer.[65] They attracted athletes from Maryland as well as from neighboring states.[66] The tradition of athletic competition continues today with Labor Day events, including triathlon, foot and bicycle races, field events, croquet, and tennis. After drainage improvements were carried out along Center Street, a location along the south side of the street within Woodward Park was selected as the site for a town **maintenance building (contributing building)**, at 312 Center Street, which was built in 1955. Following the demolition of the auditorium in 1963, its site was redeveloped as part of a new Woodward Park "recreation center" that featured playground equipment and a multi-purpose, all-weather court. In 1965, a town nursery was

[62] Woodward (1819-1905) was a lawyer and the first president of the Washington Title Insurance Company. He was prominent in business and municipal affairs in the District of Columbia and was an advocate for the public school system. See "Unexpected Demise of William Ryland Woodward," *Evening Star*, August 8, 1905.

[63] Edwards, *Washington Grove, 1873-1937*, 195.

[64] Edwards, *Washington Grove, 1873-1937*, 120.

[65] "Sports at the Grove," *Washington Post*, September 8, 1903, and "Hold Athletic Meet of Numerous Events," *Washington Post*, September 5, 1916.

[66] Board of Home Missions of the Presbyterian Church in the U.S.A, *A Rural Survey in Maryland* (New York: n.p., 1912), 47; 49.

established in southeast section of the park. (In 2007, it was redefined as an arboretum.) To commemorate the Grove's centennial, celebrated in 1974, a group of volunteers built a gazebo (noncontributing structure) in the park on a site northeast of the intersection of Grove Road and Center Street.[67] (Later, in 1980, this section of the park would be dedicated as Zoe Wadsworth Park.) Today, Woodward Park consists of two distinct areas. With the exception of the clearing around the gazebo in Zoe Wadsworth Park, the section of Woodward Park north of Center Street is heavily wooded and features trails that connect it with the East Woods forest preserve. South of Center Street, the park features baseball fields, a soccer field, tennis and basketball courts, horseshoe pits, playground equipment, picnic areas, and associated features, including backstops, chain-link fencing, and a shed. Other small-scale landscape features include gravel paths and parking areas, signage, concrete and wood-slat benches, drainage ditches, a flagpole, and architectural and engineering artifacts.[68] Tree species include Virginia pine, pin oak, blackjack oak, white oak, swamp oak, black gum, American beech, and sycamore, among others. The broad, sweeping **views within and across Woodward Park encompassing the vegetation, the recreational features, and nearby cottages (historic associated feature)** are significant characteristics of Washington Grove's landscape that help define its physical environment.

Forest Preserves

The undeveloped, wooded area in the northeast quadrant of Washington Grove, now known as the **East Woods (contributing site)**, was identified in the Lang plan as a "Laundry Reserve" and "Carriage Park." Timber was harvested from the woods, and, during the early years of Washington Grove, it was the location of the camp privies and trenches for burying waste.[69] While the 1897 Maddox plan subdivided the area into residential lots, the land remained untouched until the late 1940s-early 1950s, when several parcels along the north side of Center Street were developed. In response to a confluence of factors related to metropolitan expansion into Montgomery County, including highway development, rezoning, and encroaching high density residential development, Washington Grove residents emerged in the 1960s as forceful defenders of their natural resources. In 1964, with the approval of the town's first zoning map, the area was designated as a forest preserve known as the East Woods. Its boundaries extended from Maple Avenue on the west to Ridge Road on the east and from Boundary Street on the north to the back of the residential lots along Center Street on the south. Immediately west of the East Woods was the northern section of Woodward Park. Today, the East Woods is a wooded area characterized by thick understory growth, swales, and trails. Tree species include oak, hickory, mulberry, and wild cherry, among others.[70] The woods are used for passive recreation, such as dog walking and nature hikes.

[67] Edwards, *Washington Grove, 1937-1977*, 251-52.

[68] One of the architectural artifacts is an assembly of carved granite pieces salvaged from a renovation of the Washington City Post Office (1911-14), which was designed by architect Daniel Burnham.

[69] Edwards, *Washington Grove, 1873-1937*, 104.

[70] "The Forests of Washington Grove," Town of Washington Grove website, available at http://washingtongrovemd.org/the-forests-of-washington-grove/.

The trails are primarily dirt, but some sections are surfaced with gravel, and trail amenities include a pedestrian bridge and some timber edging. Drainage ditches pass through the East Woods to absorb the town's stormwater runoff. Water mains and fire hydrants present in the woods reflect earlier plans for residential development. Other small-scale features include signage and fencing. The woods provide an important natural buffer between the town's residential areas and surrounding high density development, helping to preserve the sylvan character of Washington Grove. In an effort to ensure its preservation, the longstanding block and lot plats within the limits of the East Woods were abandoned through a zoning amendment and no longer appear on Montgomery County zoning maps. Within the East Woods, **views within the preserve and periodic views through the trees of nearby cottages (historic associated feature)** contribute to the historic district's setting.

The original, 267-acre tract of land purchased by the organizers of Washington Grove included nearly 47 acres on the west side of Washington Grove Lane now known as the **West Woods (contributing site)**. As the location of two springs (Whetstone Spring and Maple Spring), this wooded area was a vital source of water and an essential part of the camp meeting grounds. Separated by a roadway from the Tent and Cottage departments, the West Woods were never platted for building lots. In fact, the woods were not included in the 1897 Maddox survey. Instead, the woods were harvested for timber, and camp meeting attendees and summer residents used the logging trails for picnics and excursions. In 1910, construction began on Maple Lake (see description below). Improvements were made to the picnic area near Whetstone Spring when a stone fireplace (no longer extant), similar to the one built in Woodward Park, was constructed in the late 1930s. Trees were last harvested from the West Woods in 1946, and by the early 1950s, some residents advocated for subdividing or selling the land.[71] After it was found that the West Woods were not officially part of the town, the municipal limits were amended in 1953 to include the land. Improvements followed, including the restoration of Maple Lake as a swimming pond in 1954-55. As part of this work, a new access road was created from the trail that led to Whetstone Spring.[72] In March 1957, 500 seedling pines were planted against the woods around Maple Lake.[73] By 1964, with the approval of the town's first zoning map, the West Woods was designated a forest preserve. A small brick sewage pumping station that once stood within the woods was demolished in 1985. Today, the West Woods are used for passive recreation, such as dog walking, bird watching, and nature hikes, as well as for swimming and fishing. Drainage channels convey the town's stormwater runoff into the woods. A gravel road and parking area provide access to Maple Lake, which is surrounded by a fence. With the exception of the Maple Lake area, the reserve is densely wooded with a thick understory that is cut through with dirt trails. Tree species include tulip poplars, oaks, and dogwood, among others.[74] The woods provide an important natural

[71] Edwards, *Washington Grove, 1937-1977*, 221.

[72] Edwards, *Washington Grove, 1937-1977*, 120.

[73] Grove Bulletin, April 1957, WGA, Box H-2, Town Publications, Grove (Town) Bulletin, 1956-1985.

[74] "The Forests of Washington Grove," Town of Washington Grove website, available at http://washingtongrovemd.org/the-forests-of-washington-grove/.

buffer between the town's residential areas and surrounding high-density development, helping to preserve the sylvan character of Washington Grove. Within the West Woods, **periodic views through the trees of Maple Lake and the springs (historic associated feature)** contribute to the historic district's sylvan setting.

Water Features

Maple Spring (contributing site) is located in the West Woods of Washington Grove. It comes up south of and historically was a feeder to Maple Lake (see description below). During the camp meeting era, the spring was an important source of potable water and a popular destination for nature walks, picnics, and other passive recreational activities. Historic photographs indicate that early improvements at the site of the spring included the construction of a tiered, masonry spring box.[75] Maple Spring continues to run in the late winter and early spring; however, it no longer feeds Maple Lake. (As a result of adjacent development, a well and pumping system were installed to feed the lake in the early 1990s.[76]) An archaeological survey may identify remnants of historic features associated with the spring, and this site should be considered archaeologically sensitive.

Whetstone Spring (contributing site) is located in the north end of the West Woods. While it was an important source of water for Washington Grove, its location deep in the woods and far from the center of the campground made it an inconvenient source for daily use. Instead, Whetstone Spring mainly provided a cool, shady spot for outdoor gatherings. In the late 1930s, Washington Grove hired a local mason to build a stone fireplace (no longer extant) at Whetstone Spring.[77] It was located along the bank opposite the spring. Additional improvements were made in 1949 when the ground around the spring was cleared and benches were installed. The dugout area of the spring was once capped with a slab of granite. According to oral tradition, the stone was removed in the 1950s, although the reason why is unknown.[78] Today, Whetstone Springs' waters are visible during the late winter and early spring from along one of the trails that passes through the woods. The site is also considered archaeologically sensitive, as remnants of the fireplace or other features may remain.

In 1910, the Washington Grove Association (successor to the Washington Grove Camp Meeting Association) initiated a project to create an "artificial lake" by clearing and dredging the area around Maple Spring in the West Woods. **Maple Lake (contributing site)**, as it came to be known, was used for recreation in the summer and to harvest ice in the winter. Since water sports were discouraged by the Methodists, the recreational

[75] Documentation does not clarify whether this feature was built by Washington Grove or whether it was in place prior to the land being purchased by the camp meeting association.

[76] Edwards, *Washington Grove, 1937-1977, 330*-31.

[77] Edwards, *Washington Grove, 1937-1977*, 115.

[78] Washington Grove Round Table Discussion, August 31, 2018, recording available in WGA.

function of the lake did not initially flourish, and its use as an ice pond was also short lived. As a result, the lake fell into disuse for a number of years until the summer of 1927, when it was revitalized and repaired. Due to a combination of factors, however, the lake basin was not maintained during most of the 1930s and 1940s. In 1953, the town chartered a Lake Committee to guide the restoration of the site. The redesigned lake, inaugurated in 1955, measured roughly 330 feet long by 160 feet wide with a depth that varied from 30 inches to 8 feet deep.[79] It featured an island and a dock, and a new access road was created to the lake. Later improvements included a bridge to the island (1962) and a perimeter fence (1973). As noted above, in the early 1990s, a well and pumping system were installed to feed the lake. It is periodically drained and dredged. Today, Maple Lake offers both passive and active recreational opportunities in the form of picnics, birding, fishing, and swimming. These include town-organized swimming lessons and lifeguard monitored swim times. **Panoramic views across Maple Lake into the West Woods (historic associated feature)** are an important aspect of the Grove's sylvan setting.

Systems of Small-Scale Features

Small-scale features within the historic district reflect both aesthetic and functional aspects of the landscape. Elements of the well water system and the sewage and drainage system, as well as streetlights and other features, tell the story of Washington Grove's development and form an integral component of the historic district.

Washington Grove's well water system supplied water to residents for over fifty years. Remaining **elements of the well water system (historic associated feature)** comprise a group of small-scale features that contribute to the character of Washington Grove's setting. Examples include well pumps, such as those in the yard of 127 Maple Avenue and under the carport of the house at 201 Grove Avenue, and well houses. Near the back of the house at 117 Grove Avenue stands a frame well house with a hipped roof, exposed rafters, and wood siding. There is also a well house located at 12 the Circle, at the eastern end of the lot, near the Circle.

The group of small-scale features that comprise the remaining **elements of the camp meeting-era stormwater and drainage system (historic associated feature)** represents an important visible record of Washington Grove's engineered landscape and contributes to the setting of the historic district. Elements of the stormwater and drainage system, which represent several generations of infrastructure improvements, can be found throughout the landscape. Open ditches in Woodward Park and Morgan Park and associated culverts are vestiges of nineteenth-century efforts to drain the low-lying areas of the grounds. The stone retaining wall at the edge of the East Woods near Dorsey Street is part of an early system to drain the Circle. It has a flat stone vertical face and raked concrete mortar joints.[80] The stone culvert at the northwest corner of Brown Street and

[79] Edwards, *Washington Grove, 1937-1977*, 119.

[80] Gail Littlefield, Washington Grove Historic Preservation Commission, memo titled "System of Stormwater and other infrastructure," February 2019.

Grove Road likely dates to 1939, when a local mason was hired to build infrastructure to route stormwater under the town's newly paved roads. While these features, and others, are visible aboveground, underground drainpipes include a 20-foot-long, 7-inch-diameter, terra cotta drainage pipe under Maple Avenue; a 46-foot-long, 13-inch-diameter, terra cotta pipe under Brown Street at Grove Road; a 23-foot-long, 10-inch-diameter, terra cotta pipe under Grove Road near Dorsey Street; and a 5-foot-long, 12-inch-diameter, terra cotta pipe at McCauley Street and Chestnut Road.[81]

Washington Grove's **wood street signs (historic associated feature)** represent a significant system of small-scale features that contribute to the setting and character of the historic district. They were posted along the roads and avenues in the late 1930s as part of road improvements carried out by Washington Grove's new municipal government. The original signs, which had a brown field and block letters stenciled in white paint, were mounted on wood posts (painted white) with a pyramidal top. This model was replicated with few changes until 1986, when the design was slightly modified. The new signs were wood but featured routered letters (painted white) and a hand-painted picture of a native plant or animal.[82] As the signs deteriorate, they are restored or replaced in kind by community volunteers. The natural materials and rustic character of the signs complement the town's vernacular architecture.

Although none of Washington Grove's first generation of electric streetlights remain, a later generation of streetlights comprised of wood poles and spherical lights are evident throughout the landscape. There are fifteen in total – three stand along McCauley Street, four in the Tent Department, and eight at intersections throughout the Cottage Department.[83] These **spherical streetlights (historic associated feature)** are an important attribute of the historic district's setting.

Washington Grove's **historic fire hydrants (historic associated feature)** date to 1927 and represent a culmination of efforts since the founding of the camp meeting to manage the risk of fire. Two historic fire hydrants remain along the extension of Maple Avenue into the East Woods and are a reminder of the era when the forest was platted for residential development.[84] The hydrants feature a pinwheel design on the hose connection cap and a higher dome than later models.

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[81] Jim Fletcher, Maintenance Supervisor, "Town of Washington Grove, Inventory of Stormwater Storage and Conveyance Facilities," October 31, 2000.

[82] Gail Littlefield, memo titled "Washington Grove's system of wood street signs," dated February 2019.

[83] Gail Littlefield, memo titled "Washington Grove Streetlights," dated February 2019.

[84] Gail Littlefield, memo titled "Fire Hydrants in the Woods?," February 2019.

ARCHITECTURE

Founding and Early Development (1873-1901)

The residential buildings that characterize Washington Grove's founding period (1873-1901) represent a notable collection of Carpenter Gothic-style cottages that, in their form and massing, evoked the canvas tents that initially made up the community. The Carpenter Gothic style was developed by builders as an American domestic interpretation of the Gothic Revival. At Washington Grove, the style was expressed using scroll-sawn bargeboards, bracketed pendants, decorative dressings over or around windows and doors, and turned or chamfered porch posts. Many of the Grove's Carpenter Gothic cottages from this period have been modified and enlarged over time, yet they retain their essential form and massing and key architectural features.

Washington Grove's earliest cottages were built in the vicinity of the Circle on tent sites, which measured 15 feet wide by 20 feet deep or 15 by 30 feet.[85] This placed restraints on the dimensions of the building footprint with a typical cottage measuring 14 feet across and 30 feet deep. Many of the historic district's camp meeting-era cottages, such as the house at **315 Grove Avenue (contributing building)**, still retain their historic 14- by 30-foot core. The cottages were built on posts (often locust or cedar due to their resistance to decay) without foundations, and the framing was minimal, typically consisting of 2- by 4-inch studs on 54-inch centers for both walls and roof. Local builders during this period used triple-beaded, tongue-and-groove lumber, and some cottages at Washington Grove applied this distinctive material for interior paneling, exterior siding, or porch ceilings.[86] One example is the cottage at **127 Grove Avenue (contributing building)**, which features triple-beaded exterior siding. According to oral tradition, canvas was used to insulate and weatherproof the walls and roofs of some cottages. Canvas was also used for exterior passages between the main house and kitchen wings.[87] Interior spaces were high and narrow. In some cases, a loft was built to create sleeping quarters above the ground-floor level.

Washington Grove's camp meeting-era cottages often featured double doors, sometimes with flanking full-height windows. When the front doors and windows were open, much of the interior was exposed to view, evoking the character of canvas tents. Cottages in the Tent Department were frequently crowded closely together so openings on the front of the house were the primary instrument for bringing light and ventilation to the interior. Windows in the front gables served the same purpose. Another typical feature of a Washington Grove camp meeting cottage was a front porch. Porches were built on grade or were slightly raised, and most

[85] Edwards, *Washington Grove, 1873-1937*, 42.

[86] Clare Lise Cavicchi, *Places from the Past: The Tradition of Gardez Bien in Montgomery County, Maryland* (Silver Spring, MD: Maryland-National Capital Park and Planning Commission, 2001), 39.

[87] Washington Grove Round Table Discussion, August 31, 2018, recording available in WGA.

had hipped roofs that extended across the entire front façade. Porches, which simulated tent awnings, provided a place for social interaction, connected occupants with nature, and provided the opportunity for individual architectural expression through decorative detailing.

Washington Grove's earliest dwellings were clustered around the Circle, and this area is still characterized by a compact arrangement of cottages nestled among the trees. Indeed today, the cottage at **301 First Avenue (contributing building)** stands just an arm's length away from its neighbor to the north and its front porch wraps around a mature oak tree. Cottages in the Tent Department were expanded by building rear additions that often telescoped the length of the lot, as there was no space to build additional rooms along side elevations. In contrast, dwellings in the Cottage Department stood farther apart from one another, allowing for cross gable forms with side or wraparound porches and additional window openings on the secondary façades or along the roof. The one-and-a-half-story house at **206 Grove Avenue (contributing building)**, known as "Portobello," exemplifies this condition. It has a cruciform plan, a broad, wraparound porch, tall, double-hung sash windows on all four façades, and even a bay window facing Chapel Park.

At Washington Grove's annual summer gathering in 1879, Washington, D.C., resident George E. Emmons, a member of the Twelfth Street Methodist Church on Capitol Hill, was among those camping on the grounds.[88] Within a few years, Emmons upgraded from a tent to a permanent cottage, which was prominently located on the east side of the "Sacred Circle."[89] Like many early cottages built in Washington Grove, the style, massing, and form of Emmons' cottage, today **15 the Circle (contributing building)**, was influenced by the canvas structures that initially made up the community and by nineteenth-century trends in architecture and vernacular building. It was a one-and-a-half-story, Carpenter Gothic-style cottage with a steeply pitched, front-gable roof. A slightly raised porch extended across the entire front façade, which measured 14 feet wide. The porch extended the cottage's interior space into the public realm, and, given its proximity to the tabernacle, provided a comfortable and convenient place to listen to sermons. In 1906, the owner at the time requested permission to build a porch, presumably to replace the original.[90] As built, it measured 8 feet deep and 22 feet across and wrapped around the north façade. A photograph from that period shows that the new porch had a hipped, standing-seam metal roof. The photograph also indicates that the cottage had a double door in the center of the front façade with full-height windows to either side and a large window opening in the front gable. One-story additions on the back of the house extended the living space. By the 1950s, shed dormers had been added to both slopes of the main roof, bringing additional natural light to the interior. In addition, the original window in the front gable had been replaced with a sash window, the front door had been moved from the center of the

[88] "Washington Grove, Opening of the Methodist Camp-meeting Tomorrow," *Washington Post*, August 6, 1879.

[89] House History, "15 the Circle," available at http://washingtongrovemd.org/house-histories/15-the-circle/, accessed July 26, 2018. The house history lists the construction date as circa 1875-85, although it may more accurately be given as circa 1880-85.

[90] Ibid.

façade to the south bay, and the porch posts had been replaced with square columns. New owners purchased the cottage in 1975 and made extensive changes the following year. They added a Contemporary-style addition to the nearly century-old house that included a family room, loft, and decks. A restoration circa 2005 returned the front façade closer to its original appearance by installing a central door and two-over-two, double-hung sash, wood windows on the porch and a tripartite window in the gable above. The door and window openings were framed with Carpenter Gothic-style trim. Most recently, in 2017, the 1976 addition was torn down, a back deck and stairs off the kitchen were rebuilt, and a new deck was constructed on the foundation of the demolished family room. The new work used tongue-and-groove wood siding to match the rest of the house. Characteristic of Washington Grove's late nineteenth-century cottages, 15 the Circle has been expanded and modified to meet the needs of its owners, but still retains its core form and key characteristics of the camp meeting era.

The one-and-a-half-story cottage at **1 the Circle (contributing building)** was built circa 1878-85 by Richard H. Willett, a trustee of the Washington Grove Camp Meeting Association and co-owner of a Washington, D.C., lumber company.[91] Willett's house measured 14 feet wide by 40 feet deep and had a high pitched, front-gable roof. The front façade, which faced north toward the Circle, featured a double door with tall, two-over-two, double-hung sash, wood windows to either side. Starting in the 1890s, homeowners in Washington Grove began to replace original porches with chamfered or turned posts with larger porches with classical columns. This was the case at 1 the Circle, where two original porches (one that faced the Circle and one on the west side of the house) were replaced with a curved, wraparound porch that had a hipped roof supported by round columns. Except for a one-story addition on the rear and the addition of shed-roof dormers on the west slope of the roof, few changes had been made to the narrow house by the late 1970s, when the cottage was owned by William K. Teepe, who was born in the house in 1906. Later, however, the house was enlarged with the construction of two additions on the east façade. The one-story addition to the north – a sunporch – has a flat roof topped with a wood balustrade, and the two-story addition behind has a shed roof that extends from the peak of the main roof. The additions feature decorative bargeboards and brackets to harmonize with the Gothic Revival style of the original cottage. Also off the east façade is a raised porch with a hipped roof that accesses a side door. The roof of the side porch is supported by turned posts with cutout brackets. The original core of the house is lit by two-over-two, double-hung sash, wood windows, while the rest of the dwelling has double-hung sash and fixed, vinyl windows. The front gable retains its original Carpenter Gothic-style ornamentation, including scroll-sawn bargeboards and a pendant, but the window opening in the gable has been modified. Vinyl siding clads the original house and additions. The cottage's distinctive wraparound porch enhances the view from First Avenue looking toward the Circle.

[91] House History, "1 the Circle," available at https://washingtongrovemd.org/town-history/house-histories/1-the-circle/, accessed July 26, 2018.

Dating to 1878-79, **313 Grove Avenue (contributing building)** is one of the earliest cottages built in Washington Grove.[92] It is located at the intersection of Grove Avenue and Second Avenue, southwest of the Circle. The house, known as "Locust Lodge," was not used for year-round living until 1966, nearly 100 years after its construction. At that time, there was only one interior partition wall and the second floor was unfinished except for flooring. In addition, the house had no central heating and only an early form of electrical wiring. In 1966, the owners added a first-floor bedroom, relocated the stairway, finished the second floor, and added a second bathroom. Additional changes occurred in 1968, when the owners added a dining room and a two-car garage. Finally, a renovation in 1976 expanded the living room and created a den. Today, the main entrance to the house is on the west façade through an enclosed porch facing Grove Avenue. (Originally, the front entrance faced north toward Second Avenue.) The house is clad with vinyl siding, and its vinyl windows come in both double-hung and casement forms. Despite multiple renovations over the years, the gabled core of this camp meeting era cottage continues to recall its nineteenth century origins, and original features, including the decorative bargeboards in the gable ends of the main roof, remain intact.

416 Fifth Avenue (contributing building) is a typical example of a Washington Grove cottage that has taken on several additions but retains the key architectural elements that characterize the camp meeting era. It is located between Acorn Lane and Fifth Avenue along the northern edge of Wade Park. The original house, built in 1898, consisted of a one-and-a-half-story, Carpenter Gothic-style cottage with a high, peaked roof, reminiscent of the tents that originally populated the camp meeting grounds. Given the date of the house, the large wraparound porch that dominates the Fifth Avenue façade, which features round columns, a wood railing, and a wood plank floor, may also be original. On the porch is a glazed, wood, double door flanked by two-over-two, double-hung sash, wood windows. Above the porch in the gable is a stained-glass window set within a pedimented, wood surround. At some point (date unknown), a long, one-story wing was added to the rear façade, extending the cottage the entire length of the lot. One-story projections on the north and south increased the size of the cottage and enhanced the additive character of the footprint. On the south façade of the rear wing, facing Wade Park, is a gabled entry porch. With Fifth Avenue limited to pedestrian use, this has become the principal entrance to the house. While most of the cottage is clad with wood siding, the gable end facing Fifth Avenue is covered with shingles.

Development along Grove Avenue, which began in 1883 when the southern length of the avenue was platted, represented the earliest phase of growth within the Cottage Department. The generously sized and regularly spaced building lots along the avenue contrasted greatly with the small, often irregular lots within the Tent Department, making Grove Avenue attractive to many residents despite its relative distance from the Circle. Records suggest that the one-and-a-half-story house at **112 Grove Avenue (contributing building)**, built circa

[92] House History, "313 Grove Avenue," Town of Washington Grove website, available at http://washingtongrovemd.org/house-histories/313-grove-avenue/, accessed May 14, 2018.

1887-90, may have been moved to its current location from what is now 2 the Circle.[93] The central block of the house retains the characteristic form of Washington Grove's Carpenter Gothic cottages, and the steeply pitched, front-facing gable features its original sawtooth bargeboards and horizontal wood siding. A small, but finely detailed window opening pierces the front gable. In the 1920s, the cottage was bought by Laura Poole Wadsworth, who winterized the house, installed plumbing, and added side wings to accommodate bedrooms and a sunporch. Zoe Wadsworth inherited the house from her mother in the 1940s and lived in the house until her death in 1979. (In 1980, Wadsworth Park was named in her honor.) Originally, flat roofs sheltered the side wings, but at some point (date unknown) they were replaced with shed roofs to add height to the interior spaces. A raised front porch extends the full width of the front façade, which faces east toward the avenue. The front entrance exhibits the traditional configuration of double doors flanked by two-over-two, double-hung, wood windows. While the ground floor of the house is clad with vertical wood siding, the end walls of the shed-roof wings are faced with vinyl siding. There is a well under the back porch of the house and a garage at the back of the lot, which can be accessed from Chestnut Road.[94]

The practice of moving cottages from crowded areas to newly opened avenues with less development had a lasting impact on the character of Washington Grove, and the history of **119 Maple Avenue (contributing building)** exemplifies the trend. The cottage was originally built on Sixth Avenue around 1885 by James K. McCathran and his father-in-law, J. T. Harrison. It had a core that measured 14 by 40 feet and a front-gable roof that peaked at 17 feet. Two additional rooms and a pantry extended from the rear. In 1906, McCathran, who developed the house numbering system adopted by the town in 1935, relocated the cottage to a double lot on Maple Avenue, becoming one of the first Grove residents to settle east of Woodward Park.[95] The new location provided ample space to expand, and soon after the move, McCathran built a one-and-a-half-story addition on the south façade and added a raised wraparound porch along the front, which was oriented toward the avenue. The house was converted into a year-round residence in 1955. Additional modifications over the years have resulted in a house with a roughly U-shaped plan. While today 119 Maple Avenue is clad with vinyl siding and many of the original wood windows have been replaced with one-over-one, double-hung sash, vinyl windows, key elements characteristic of the camp meeting cottage that was relocated and renovated in the early twentieth century remain intact.

Through the period of Washington Grove's early development, area farmers and merchants came to rely on the B&O Railroad for the distribution of goods and supplies, and local businesses were established in the vicinity of the Washington Grove station. One extant example is Hershey's Restaurant at 17030 Oakmont Avenue. The

[93] House History, "112 Grove Avenue," Town of Washington Grove website, available at http://washingtongrovemd.org/house-histories/112-grove-avenue/, accessed May 14, 2018.

[94] Ibid.

[95] Edwards, *Washington Grove 1873-1937*, 203, 284, and House History, "119 Maple Avenue," Town of Washington Grove website, available at http://washingtongrovemd.org/house-histories/119-maple-avenue/, accessed July 20, 2018

two-and-a-half story, frame building was built in 1889 by Henry Beard and James G. Craighead, the founders of Oakmont, a subdivision located across the railroad tracks from Washington Grove. For decades, this building operated as a general store (likely with living quarters above), and, starting in 1894, the Washington Grove post office moved into part of the building, where it remained for over eighty years until 1978.[96] The general store was operated under a variety of names by several owners through the first half of the twentieth century. By 1960, Washington Grove residents Charles and Doris Hershey were the owners. In the 1970s, the Hersheys opened a tavern in the building and not long after closed the grocery store. Today, Hershey's Restaurant continues to serve the residents of Washington Grove and other nearby communities.

By the end of this period of development, Washington Grove had become an established summer resort community. As residents began to extend their stays past the summer months, demand increased for a place for religious assemblies that would provide greater comfort in poor weather than the open tabernacle. To provide such a space, the Washington Grove Camp Meeting Association built an assembly hall at the south end of Howard Park in 1901. Designed by architect A. L. Harris of Washington, D.C., the assembly hall, today known as **McCathran Hall (contributing building)**, was comprised of an octagonal hall that measured 20 feet to a side and an attached meeting room that measured 20 feet square.[97] The main hall was sheltered by an octagonal roof with deep eaves, exposed rafter tails, and a louvered cupola at its peak. The building was clad with cedar shingles. The exterior walls of the octagonal hall flared at the base – a feature that was highlighted by the application of several rows of curved shingles applied in a fishscale pattern. This pattern continued along the upper walls of the square meeting room. The principal entrance, located on the east façade of the octagonal hall, was comprised of a wide opening holding paneled double doors flanked with wood paneling and a pair of three-light, transom windows above. The assembly hall was fenestrated with generously proportioned, six-over-six, double-hung sash, wood windows, which brought ample light and ventilation to the interior. In addition to church services, the building was initially used for Sunday school activities and for Chautauqua, which had its first season at Washington Grove in 1902. In 1939, an addition was constructed on the north side of the meeting room, and, in 1951, a gabled porch was added to the front façade to shelter the entrance and create a place to hang the original bell used to summon participants to camp meeting services. (The bell originally hung from a tree and then from the belfry of the tabernacle.) The porch had square posts, a wood railing, and a painted sign. In 1955, the Washington Grove United Methodist Church was completed, and the assembly hall was repurposed as municipal offices. In 1957, it was renamed McCathran Hall after Roy McCathran, who was elected the town's first mayor in 1937 and held the office for twenty years.[98] The building was officially dedicated as the

[96] "Washington Grove Restaurant a Hub since 90-year Post Office Stint," Montgomery County Gazette, September 9, 2009, available online at http://www.gazette.net/stories/09092009/damanew231658_32546.shtml, and Edwards, *Washington Grove 1873-1937*, 170.

[97] There is little information discovered to date about the life and career of architect A. L. Harris. The attribution of McCathran Hall to Harris comes from a short article in the *Evening Star*. See "Families in Summer Quarters," *Evening Star*, June 18, 1901.

[98] Edwards, *Washington Grove, 1937-1977*, 135.

town hall in 1973. The most recent major change occurred in 1996, when the town renovated the building and constructed a one-story addition that provided office space and storage for the municipal archives. The entrance to the addition features paneled double doors with transom windows. It is sheltered under an engaged porch formed by the pyramidal roof of the rear wing. The renovation work was accomplished under a preservation easement held by the Maryland Historical Trust. The town is committed to the preservation of the building and has carried out additional work to stabilize the structure since 1996. It is regularly used for town meetings, concerts, square dancing, screenings by the town Film Society, and other events and activities.

Early Twentieth Century (1902-1936)

Early twentieth century residential development within the historic district encompassed a diverse range of architectural forms and styles. While some of the new houses constructed during this period echoed the vernacular and Carpenter Gothic architecture of the camp meeting era, other styles introduced into the streetscape reflected the evolving preferences of middle-class American families. Today, the historic district features a number of vernacular gable front houses, revivalist styles, and bungalows.

By the early twentieth century, cottages with a gable-front-and-wing plan had become a popular alternative to the front-gabled, rectangular plan of the Grove's earliest dwellings. This house form offered more space, as demonstrated by the cottage at **409 Fifth Avenue (contributing building)**. As originally built around 1909, 409 Fifth Avenue was a one-and-a-half-story house with an L-shaped plan under a cross-gable roof. It faced west toward the avenue and Wade Park. The house measured 26 feet wide and 20 feet deep, and the porch extended only the width of the front façade. The front-facing gable was ornamented with Carpenter Gothic decorative details, including a finial and pendant, and on the porch was a four-paneled, wood door with windows to either side. A two-light, rectangular window in the front gable provided additional light to the interior. The house sat on the southern half of a double lot, and at the back of the adjacent lot was a small Carpenter Gothic cottage, which by 1917 was being used for storage.[99] In 1944, the house was purchased by Wallace and Dorothy Muir, who lived there until 1953. (The Muirs had previously resided in the house next door at 406 Fifth Avenue.) At some point before 1968 (exact date unknown), the original porch was expanded to wrap around the north side of the house. It was supported with round columns. Also, a one-story gabled addition (date unknown), measuring 26 feet wide and 21 feet deep, was added to the back. Photographs of the house indicate that by 1981, a railing had been installed on the front porch, the front door had been replaced, and the columns were substituted with square posts. Sometime since 1981, the two-light window in the front gable end was replaced with an oval window. In 1997, the one-story rear addition was raised to two stories, and the house was further expanded to the back. Around 2016, an enclosed side porch (date unknown) was taken down, and during the course of work two of the round porch columns were discovered and used as the basis for installing new round (composite) porch columns.[100] The current front door and flanking windows are modern, but they replicate the placement of

[99] Town of Washington Grove, "Exhibits to Deed of Easement for 409 5th Avenue," no date, WGA.

[100] Ibid.

the original openings. The plain bargeboards have also been replaced with a more fanciful trim that reflects the period in which the house was originally built.

The one-and-a-half-story, Craftsman-style bungalow at **109 Maple Avenue (contributing building)** was constructed in 1923 by builder George Reber (d. 1931), himself a Washington Grove resident, for Reverend Albert Osborn and his wife Phebe.[101] Reverend Osborn was an author, poet, and founder of the Washington Grove United Methodist Church, where he served as pastor for twelve years starting in 1910. In 1923, one year after the reverend's retirement, the Obsorns moved from 315 Brown Street to their new home on Maple Avenue. The house was next door to their daughter Sarah and son-in-law Roy McCathran, who would become Washington Grove's first mayor. Bungalows are generally characterized by low-pitched roofs that extend to deep eaves. They are modest in size and typically set low to the ground. In the early twentieth century, the bungalow became an immensely popular house form due to its low-cost construction and informal design.[102] Craftsman-style bungalows, such as 109 Maple Avenue, were built using natural materials – stucco, clapboard, and wood shingles – and often featured wide, overhanging eaves, exposed rafters, and decorative brackets, which gave the appearance of handcraftsmanship, emphasizing Arts and Crafts ideals. Windows were typically double-hung sash with multiple panes in the upper sash and a single pane below. Pattern books and mail order companies offering prefabricated houses that could be purchased by catalog helped to popularize the bungalow form. In fact, 109 Maple Avenue is nearly identical to a "plan-cut" house offered by the Gordon-Van Tine Company of Davenport, Iowa. Home No. 507 from the company's 1921 catalog, later rebranded as "The Culver," offered seven rooms, a sewing room, and bath. The one-and-a-half-story house was advertised as one of the company's most popular bungalows because of its attractive exterior and its convenient interior.[103] Few alterations have been made to 109 Maple Avenue since its original construction, and today the house stands as one of the Grove's finest examples of a Craftsman-style bungalow. It is a frame house clad with wood shingles. Rectangular in plan, the house has a side-gable roof with deep eaves supported by cutout brackets. At the center of the roof's front slope is a large gabled dormer. The house is orientated toward Maple Avenue, and across the full width of the front (west) façade is a raised porch with a shed roof that is supported by square, compound columns on concrete piers. A wood railing spans the spaces between the columns. The porch is approached from the side (rather than from the front as in the Gordon-Van Tine Company model), and the front door is located in the south bay, closest to the porch steps. Windows are double-hung with divided upper sash. While some original wood windows have been replaced with vinyl, the exterior has not been substantially changed.

[101] Edwards, *Washington Grove, 1873-1937,* 293-94.

[102] Clark, Clifford Edward, Jr., *The American Family Home, 1800-1960* (Chapel Hill: University of North Carolina Press, 1986), 171.

[103] *Gordon-Van Tine Plan Cut Homes* (Davenport, IA, Gordon-Van Tine Company, 1931): 57, and *Gordon-Van Tine Homes* (Davenport, IA, Gordon-Van Tine Company, 1921): 50.

The one-story house at **108 Grove Avenue (contributing building)** also features Craftsman-style elements. It was built in 1908 by Dr. E. D. Huntley to replace an earlier cottage on the lot that had been destroyed by a fire. The fire, which broke out the night of December 15, 1907, burned the house to the ground and damaged three others.[104] The design of the house is attributed to architect Elliott Woods, who was appointed Architect of the Capitol in 1902 and died while still in office in 1923.[105] The original section of the house has a rectangular plan and a hipped roof with eyebrow dormers, two front-facing, projecting gables with brackets, and exposed rafter tails. The house is clad with wood siding and rests on tapered concrete piers, which is unusual for houses in Washington Grove that typically were built on wood posts. The main entrance, facing Grove Avenue, is located off-center on the east façade and consists of a solid door flanked by French doors with louvered shutters. Six windows along the east façade feature six-over-one, double-hung, wood sash and louvered shutters. Huntley built the new house for year-round living, and it was constructed with indoor plumbing. 108 Grove Avenue has been enlarged with the addition of an enclosed porch on the south and with a one-story rear wing, which has vinyl siding and vinyl windows but replicates the hipped roof form and exposed rafter tails of the original house. At the back of the lot is a two-car garage.

The Colonial Revival-style house at **103 Brown Street (contributing building)** was built in 1920 by Major Samuel H. Walker (1844-1938) for his son Robert H. Walker (d. 1939).[106] The Walkers were a prominent family in Washington Grove for many years. Samuel H. Walker made his career as a developer and builder and later expanded his business interests into insurance and banking. He served as the Superintendent of Police for the District of Columbia for six month in 1886, after which he was known as Major Walker.[107] The family first lodged in the hotel when they spent their summers at Washington Grove, then moved into a large cottage at 202 Grove Avenue (no longer extant). In 1909, Samuel Walker was elected president of the Washington Grove Camp Meeting Association, a position he held for five years. His son Robert was secretary of the association for four of those years. The Robert Walker house on Brown Street was built on a triple lot, and instead of facing Chestnut Avenue, it was oriented toward Brown Avenue. Today it remains the only residence west of Grove Avenue with a Brown Street address. Colonial Revival was the most prominent residential style in the United States in the first half of the twentieth century. Colonial Revival homes in Washington Grove, as elsewhere, borrowed elements from Georgian and Federal buildings and typically featured pedimented entrances and entry porches, elaborate doorways and window treatments, plain or decorated cornices, pilasters, and roof balustrades. 103 Brown Street consists of a two-and-a-half-story main block with one-story side wings. Sheltering the house

[104] House History, "108 Grove Avenue," Town of Washington Grove website, available at http://washingtongrovemd.org/house-histories/108-grove-avenue/, accessed May 2, 2018.

[105] John H. Pentecost, National Register of Historic Places Registration Form, "Town of Washington Grove," April 1980, 7:8.

[106] House History, "103 Brown Street," Town of Washington Grove website, available at https://washingtongrovemd.org/town-history/house-histories/103-brown-street/, accessed May 8, 2018.

[107] The Walker house in Washington, D.C., still stands at 420 Constitution Avenue, NE (formerly 420 B Street).

is a hipped roof with prominent hipped dormers. The front (south) façade is symmetrically arranged. A paneled front door in the center of the façade is crowned by an entablature and pediment and flanked by pilasters. Two pairs of six-over-six, double-hung sash, vinyl windows with louvered shutters flank the entrance. This fenestration is repeated on the upper wall of the front façade. While the dormers are lit by six-over-six, double-hung sash, wood windows, most of the rest of the house has vinyl windows. The house is clad with wood siding. A modern garage with an apartment above stands northeast of the house and is connected to it by a covered walkway. It has a pyramidal roof.

In the early twentieth century, the success of Washington Grove drove residential and commercial development around its borders, particularly along the railroad tracks and at the south end of Washington Grove Lane.

In 1897, the Washington Grove Camp Meeting Association granted Thomas I. Fulks, a prominent Gaithersburg farmer and businessman, permission to operate a general store (no longer extant) on one of its property lots near the corner of Washington Grove Lane and Railroad Street. Fulks owned a large farm on the west side of Washington Grove Lane and property along the railroad tracks. In addition, in 1901, he purchased a 1-acre parcel on Washington Grove Lane across from the store where he built a two-story house.[108] The house, at **126 Washington Grove Lane (contributing building)**, has a pyramidal roof with a hipped dormer, a full front porch with tapered wood posts that rest on concrete block piers, and paired, double-hung sash windows.

In 1920, the local Odd Fellows lodge built a large hall on the corner lot south of Fulks' general store. The **Odd Fellows Hall (contributing building)** was a two-story building designed by architect W. S. Ploger of Washington D.C. It was built of concrete block molded to resemble rusticated ashlar stone and dressed quoins and featured a stepped front-gable roof. In 1940, the corner lots were acquired by the First National Bank of Gaithersburg, which tried to market the properties as residential. Making this difficult was the fact that the lots faced a busy intersection and there was little buffer from the noise and dirt of the nearby railroad tracks. The bank soon appealed to the town for rezoning, and a measure was passed the following year approving the change.[109] In 1941, the town council officially declared the parcels a commercial zone. The Odd Fellows Hall, located at 105 Washington Grove Lane, was repurposed for various uses over the years, including apartments, a convenience store, and the post office. In 1973, Washington Grove's "commercial corner," as the area came to be called, was redeveloped. The old general store was demolished and replaced with a modern shopping center that was anchored on the south by the Odd Fellows Hall and on the north by a 7-Eleven convenience store.[110] To integrate the Odd Fellows Hall with the new construction, the building was faced with brick veneer and

[108] Fulks purchased the residential lot from the Washington Grove Camp Meeting Association in 1901. See Maryland Land Records, Deed Book TD 16, page 354.

[109] Edwards, *Washington Grove, 1937-1977*, 45.

[110] Edwards, *Washington Grove, 1937-1977*, 256-57.

given a faux Mansard roof, which projects forward from the façade and is supported by brick piers. The original concrete block remains visible along the secondary elevations. Two large, single-pane glass windows in aluminum frames are located in the ground-floor brick façade, flanking an aluminum and glass door. Paired six-over-six, double-hung, wood windows pierce the vinyl-sided mansard roof. Windows on the south façade are mainly six-over-six, double-hung, wood windows with wood shutters. A side entrance is located at the east end of the south façade.

The lots across from and diagonal to the Odd Fellows Hall were also developed during this period. Around 1910, Fulks opened a feed supply business on the property he owned that was adjacent to the railroad tracks (now 671-681 East Diamond Street). The operation included a feed mill (built circa 1910 from an old hay barn that stood on Fulks' farm), a feed store (no longer extant), an office (no longer extant), a rail siding, and a scale, which was embedded into the ground next to the store.[111] The property was sold to W. Lawson King in 1940, who razed the original feed store and office, built a new feed mill and silos in 1942, and made additional improvements through the early 1950s that expanded the building to the west. The property operated as a feed and farmer's supply store until 1989. Today, the building has a linear plan composed of several elements that reflect its history and use over time. At the eastern end of the complex is the former feed mill – a four-story, concrete block and corrugated metal structure with a gable roof. Next to the feed mill are four concrete silos that are reinforced with steel straps and sheltered by a gable roof. The middle section of the building contains elements of the circa 1910 feed mill. While the front façade was faced with cinderblock by King, original wood siding is visible on the back. The west end of the complex, built in 1945 with an addition in 1952, is concrete block with brick corbeling under the cornice and a flat roof.

In 1923, the Washington Grove Association sold a 1.5-acre parcel on the west side of Washington Grove Lane and north of the Fulks property to Melvin F. Dove.[112] The deed of sale stipulated that Dove agreed to pay an annual assessment tax to the association and to abide by its charter by-laws and regulations. One month after purchasing the lot, Dove subdivided it, selling the southern section, containing one half an acre, to Joseph A. Day.[113] Both 200 Washington Grove Lane (built by Dove) and Day's house at 128 Washington Grove Lane were likely constructed in the mid-1920s. **200 Washington Grove Lane (contributing building)** is a two story, foursquare house with a tall, hipped roof. The front façade features a generous hipped dormer and an elevated porch that extends across the entire façade. The porch has a cinderblock foundation and tapered wood posts that support a hipped roof. **128 Washington Grove Lane (contributing building)** is more modest, one-story bungalow. It has a side-gable roof and an integrated front porch.

[111] Gail Littlefield and Judy Christensen, draft Maryland Inventory of Historic Properties Form, "Gaithersburg Farmers' Supply, Wayne Feed, Sunshine Feed, Thomas I. Fulks Store," no date. Copy provided courtesy Gail Littlefield.

[112] Maryland Land Records, Deed Book 332, page 312.

[113] Maryland Land Records, Deed Book 332, page 315.

Early Municipal Period (1937-1945)

The charter for the Town of Washington Grove became effective on May 30, 1937, as the community was emerging from the Great Depression. This period witnessed a boomlet of home improvements and new construction that included, for example, a concentration of seven new houses along Washington Grove Lane. Homebuyers at the time demanded affordable, single-family homes that reflected modern consumer preferences. Nationally, Minimal Traditional dwellings, which offered simplified versions of prewar Colonial Revival styles, were built in great numbers, and this trend is reflected in Washington Grove. Concurrently, however, revival styles continued to be built in Washington Grove, reflecting the persistence and popularity of traditional housing.

In 1939, Washington Grove issued a building permit to David and Frances Grogan to build on a double lot on Oak Street. Their Minimal Traditional-style, Cape Cod house at **410 Oak Street (contributing building)** was completed in 1940 and is representative of the type of housing built in Washington Grove in the period before World War II and continuing after. It stood a compact one-and-a-half stories on a raised basement. The main block had a rectangular plan that was sheltered by a side-gable roof. On the rear slope of the roof was a shed dormer. The front entrance faced north toward Oak Street. A set of concrete steps led up to the door, which was sheltered by a gabled entry porch supported by turned posts. Today, much of the main block is lit by one-over-one, double-hung sash, vinyl windows. The exceptions are two divided-light, casement windows on the east elevation. A sunroom extends the house to the east. An addition on the south façade, built in 2010, features a gabled roof that repeats the slope of the main roof. The house is entirely clad with vinyl siding, and there is a brick, exterior chimney on the west façade. A one-and-a-half-story, three-car garage stands behind the house. It features a gabled dormer, as well as vinyl siding and vinyl windows.

201 Washington Grove Lane (contributing building) is another notable example of the Minimal Traditional style in Washington Grove. It was part of a cluster of new development that went up along Washington Grove Lane during the period when the town was actively selling undeveloped lots to increase municipal revenues. The compact, one-story house, which was built around 1940-41, has a rectangular plan under a side-gable roof with a moderate pitch. The exterior is clad with horizontal siding, and the front door is located in the north bay of the west façade facing Washington Grove Lane. It is approached from a raised porch with concrete steps and a shed roof that is supported on square posts. South of the door are three six-over-six, double-hung sash, wood windows with decorative shutters. A brick exterior chimney rises up the south facade. A carport has been added to the back of the house. It has a shed roof that is supported on brick piers. At the back of the lot is a small, concrete block outbuilding with a low pitched, gable roof and an integrated porch.

The Tudor Revival cottage at **402 Fourth Avenue (contributing building)**, known as "Hearthstone," was built for Dr. Maude S. Nuttall around 1942. It is a one-and-a-half-story house on a raised basement with stucco walls, decorative half-timbering, and a cross-gable, false thatched roof. The house has not been substantially modified and has a high degree of integrity. In the center of the front façade, which faces west, is a glazed and paneled

front door that is approached by a raised wood deck with a wood railing. A bracketed hood that has a gentle curve to its profile shelters the entrance. To either side of the door are pairs of eight-light windows, and a paired window also pierces the gable end over the door. Windows on the side and rear facades include casement windows and diamond paned windows. A raised brick porch extends from the south façade and wraps around to the back of the house to access a set of brick steps that lead to a back entrance. The roofline is pierced by a brick, exterior, end chimney on the north façade and shed-roof and gabled dormers.

The Woman's Club of Washington Grove had its first meeting in 1926, and the organization has been an integral part of Washington Grove life for nearly 100 years. Originally, members met in the clubhouse of the girls' athletic club, which was built in 1910 and stood in Woodward Park. In 1939, that building burned, and the town gave the Woman's Club permission to build a new clubhouse in Howard Park. The builder was Brawner Harding of Gaithersburg, who completed the job in 1940 for $1,551.[114] The **Woman's Clubhouse (contributing building)**, located a 316 Grove Avenue, is a one-story building with an integrated, full-width, screened porch, which is located under the gently curved, south slope of the building's side-gable roof. Three pairs of French doors and one glass-and-wood door open from the porch into the building. The porch has a flagstone floor (installed in 1997). Two small dormer windows are located on the south slope of the roof. Vinyl siding sheathes the building, and vinyl sash of various types fill the window openings. A single bay, gabled wing (built in 1995) extends from the west façade. On the interior, the main room features a hand-painted mural depicting scenes of Washington Grove and a tongue-and-groove fir ceiling. A smaller kitchen area is located off the main room. The building's form and materials reflect the residential architecture that surrounds it and integrate well into the setting of Howard Park. The Woman's Club remains active today, sponsoring many events at the clubhouse and throughout town. They include charitable and social events, such as the White Elephant Sale, lectures, and the Annual Flower Show, among others.

Post-World War II Period (1946-1969)

The period after World War II was a time of intense residential building and remodeling at Washington Grove. With many empty lots and many lots with dilapidated houses, the town was eager for new building stock that would enhance its appeal to homebuyers and increase its tax base. The houses constructed during the post-World War II period in Washington Grove followed national trends in residential building. They included merchant-builder houses and architect-designed residences. Although earlier residential styles continued to be popular, new styles and forms such as the ranch house made their appearance.

In the immediate postwar period, local builder Constantine Eisinger, of the Eisinger Mill and Lumber Company of Bethesda, Maryland, constructed two prefabricated houses in Washington Grove. The houses, at 104 and 106

[114] Horan, *A History of the Woman's Club of Washington Grove*, 21.

Pine Avenue, were built using prefabricated Cemesto wall panels.[115] Cemesto, an insulating board surfaced on both sides with cement and asbestos, was manufactured by the Celotex Company. **106 Pine Avenue (contributing building)** is a one-and-a-half-story, Minimal Traditional-style Cemesto house built circa 1946. The house, which can also be described as a Cape Cod, has a side-gable roof and gabled dormers. At the south end of the front façade, which faces east toward the avenue, is a paneled door, which is sheltered by a pedimented hood with cutout brackets. The hood covers a concrete stoop with iron railings. The front façade is fenestrated with six-over-six, double-hung sash, wood windows. The same windows also light the dormers. Behind the house at the back of the lot stands a small shed.

Because the deep, narrow lots that historically characterized the division of land in the Cottage Department were unsuitable for the low horizontal forms of ranch houses and other midcentury forms, many building lots in Washington Grove were consolidated and subdivided during this period into new configurations that could accommodate modern domestic forms as well as front driveways, carports, and other suburban amenities. In 1955, for example, two east-west oriented blocks on Chestnut Avenue were replatted to create two lots that fronted Center Street.[116] The one-story, brick veneer, ranch houses built on the lots in 1958 were nearly mirror images of each other. The incorporation of the carport in the main block of the house, with its opening on the front façade, as well as the placement of the driveway in the front yard, represented an important shift in residential planning and design at Washington Grove, where for decades automobiles were relegated to vehicular-only roads and garages stood at the back of building lots. This evolution in planning and development facilitated Washington Grove's transition from a fledgling municipality to a thriving suburb of Washington, D.C.

With the popularity of ranch houses, low rooflines, broad chimneys, picture windows, carports, and exterior patios became common features of postwar suburban communities, including Washington Grove. The house at **13 Center Street (contributing building)** exemplifies the qualities associated with the ranch form. Built in 1958, it is a one-story house with long, horizontal massing and a low-pitched, hipped roof that extends past the west façade to create a carport. The house is clad with multicolored brick veneer on its Center Street façade and siding on the side and rear façades. A projecting bay with a three-part picture window forms the focus of the front façade. Other windows are one-over-one, double-hung sash. A shallow roof overhang shelters the front entrance, which is to the left of the picture window. Just outside the door is a concrete stoop.

The house at **205 Grove Avenue (contributing building)**, built in 1964 by Dr. Richard and Anne Haskett, is a notable example of modern-era domestic architecture in Washington Grove. Dr. Haskett, a professor of English and political history at George Washington University, was a member of the town council and a founding

[115] Clare Lise Kelly, *Montgomery Modern: Modern Architecture in Montgomery County, Maryland, 1930-1979* (Silver Spring, MD: Maryland-National Capital Park and Planning Commission, 2015), page 219, footnote 10.

[116] Montgomery County, Circuit Court Land Records, Plat No. 4031, February 1955.

member of the planning commission. He was also an amateur architect, photographer, and an admirer of Frank Lloyd Wright.[117] Perhaps influenced by Organic architecture of the modern period, which strove to blend the built environment with nature, Haskett designed his house to face true north, at a roughly 45-degree angle to Grove Avenue, and sited it roughly at the midpoint of the lot, enveloped in trees. In this way, Haskett maximized views of nature and minimized views of neighboring houses. Otherwise, the two-story house exhibits many elements of Contemporary-style residential architecture of the period. The style emphasized the use of natural materials and the integration of outdoor views. Contemporary houses frequently featured continuous windows that contrasted with large areas of uninterrupted wall surface. These large expanses of glass helped to diminish the distinction between indoor and outdoor space. 205 Grove Avenue is a post-and-beam structure clad with lapped redwood siding. It has a low pitched, gable roof with deep eaves and exposed rafters. The front façade features double casement windows with transoms and fixed picture windows that are arranged in groups to create wide expanses of glazing on either side of the entrance. Typical of the Contemporary style, the front entrance is downplayed. In the case of the Haskett house, the entrance is nearly indiscernible from Grove Avenue. The side and back façades feature tripartite casement windows, some with transom lights. On the interior, 205 Grove Avenue has an open floor plan typical of modern era architecture. East of the house is a two-story garage with a rectangular plan under a low gable roof. It is also clad with weatherboard and features a second-story, wood deck on the south façade.

In 1961, the town filed a plat map with Montgomery County for the subdivision of the area roughly bound by Washington Grove Lane on the west, Chestnut Road on the east, and Center Street on the south. Development along the north end of Chestnut Avenue began that year and continued through the early 1960s. The lot at the far north end of the avenue measured 85 feet by 150 feet and was bound by McCauley Park on the north. (McCauley Street cuts through the park to connect with Washington Grove Lane.) In 1962, William and Mary Swyter built a one-story, side-gabled ranch house on the property. While the house had a Chestnut Avenue address, it was oriented with its front door facing north, toward McCauley Street. This was typical of the period, when, rather than facing east or west in compliance with the conventional placement of earlier building stock in the Cottage Department, ranch houses with their long, low massing, faced north or south. The Swyter house at **415 Chestnut Avenue (contributing building)** has not been substantially modified since its original construction. The house is faced with brick veneer, and it has a long roof ridge that runs parallel to the front façade and extends past the west façade to shelter a carport. The entrance is slightly recessed and framed by sidelights. A low stoop with metal railings accesses the door. Typical ranch house elements include a large picture window and a broad, low chimney. Windows include horizontally oriented, two-over-two, double-hung, wood sash.

The **Washington Grove United Methodist Church (contributing building)**, at 303 Chestnut Avenue, was constructed in 1955 in a sleek Modern style. Its notable A-frame design was the work of Bethesda-based architect John S. Samperton (1923-2014). Samperton was a Washington, D.C., native who graduated from

[117] "Richard C. Haskett Dies at 75," *Washington Post*, June 7, 1994.

Catholic University with a degree in architecture in 1949. He opened his own firm in 1952, and became one of Montgomery County's leading architects. Among his early projects were the North Chevy Chase Christian Church (1961) and the Little Falls Library (1959). In 1969, Samperton formed a partnership with architect Leon Chatelain, Jr. and engineer James A. Nolan, Jr. The firm, called Chatelain, Samperton and Nolan, specialized in institutional designs.[118] The Washington Grove United Methodist Church features a steeply gabled nave that is faced with stone and lit by a tall, multi-light window that reaches to the apex of the roof. The stone cladding turns the corner of the gable, then gives way to stuccoed masonry for the remainder of the side and rear facades. A wing, clad in vertical board siding and featuring a stone chimney, extends from the north side of the building. The main entrance to the church is located between the nave and the wing. Two entrances are also located on the rear (west) façade. Interior spaces include the nave, which can seat 150 congregants, and a choir loft. The wing has an office/study and a large meeting room with a fireplace. There is a fellowship hall and kitchen in the basement.

Current Period (1970-present)

Washington Grove's residential architecture underwent further developments in the last three decades of the twentieth century. There was a renewed interest in the preservation of older building stock, and new additions relied on historic forms and features to create compatible design. Construction included ranch houses, as well as revival styles, such as Colonial Revival and Neo-Victorian. Within the past twenty years, the New Traditional style has flourished in Washington Grove, reflecting national trends. The house at 340 Ridge Road, built in 2002, is an example of the New Traditional Colonial Revival style. While its massing is not typical of traditional Colonial Revival, the house incorporates certain historical elements that would have been found on earlier houses. The main entrance is flanked by sidelights and fluted pilasters and crowned by an entablature. Decorative features include moldings, some with keystones, above the front windows and the garage doors. Houses similar to 340 Ridge Road can be found along Daylily Lane, among other locations. In contrast with earlier periods during which residential construction emphasized simplicity of form and affordable construction, houses from the current period are more substantial, reflecting changing values and an improving regional economy.

[118] Kelly, *Montgomery Modern*, 192.

Contributing and Noncontributing Resources

The National Register recognizes five types of resources: buildings, districts, sites, structures, and objects. The following table identifies the contributing and noncontributing resources of the Washington Grove Historic District. Within the table, the buildings are organized alphabetically by street name and then numerically by house number. Resources under the remaining categories are organized alphabetically.

Generally, the Washington Grove Historic District has a high level of historic integrity. Integrity relates to the degree to which the characteristics that define a resource's significance are present. The seven aspects of historic integrity, as established by the National Register, include location, setting, design, material, workmanship, feeling, and association. Contributing resources add to the historic associations or historic architectural qualities for which a property is significant. Noncontributing resources were not present during the period of significance, do not relate to the documented significance of the property, or, due to alterations or other changes, they no longer possess historic integrity.

BUILDINGS				
Name/Address	Date	Style/Form	Resource Type	Contributing/ Noncontributing Status
407 Acorn Lane	ca. 1886-92	Carpenter Gothic	Dwelling	C
8300 Boundary Street	1991	New Traditional	Dwelling	NC
103 Brown Street	1920	Colonial Revival	Dwelling	C
201 Brown Street	1955	Cape Cod	Dwelling	C
313 Brown Street	ca. 1905-17	Gable Front	Dwelling	C
315 Brown Street	ca. 1905	Folk Victorian	Dwelling	C
317 Brown Street	ca. 1880-1900	Gable Front	Dwelling	C
319 Brown Street	1945	Ranch	Dwelling	C
401 Brown Street	1943	Minimal Traditional	Dwelling	C
404 Brown Street	1997	Colonial Revival	Dwelling	NC
405 Brown Street	1914	Gable Front	Dwelling	C
409 Brown Street	1909	Craftsman bungalow	Dwelling	C
410 Brown Street	1913	Colonial Revival	Dwelling	C
414 Brown Street	ca. 1913	Bungalow	Dwelling	C
10 Center Street	1959	Ranch	Dwelling	C
11 Center Street	1958	Ranch	Dwelling	C
12 Center Street	1956	Minimal Traditional	Dwelling	C
13 Center Street	1958	Ranch	Dwelling	C
101 Center Street	1965	Colonial Revival	Dwelling	C
102 Center Street	before 1900	Carpenter Gothic	Dwelling	C
312 Center Street	1955	N/A	Municipal/Maintenance	C
400 Center Street	1953	Ranch	Dwelling	NC; alterations
409 Center Street	1953-54	Cape Cod	Dwelling	C
410 Center Street	1949	Dutch Colonial Revival	Dwelling	C

413 Center Street	ca. 1954	Cape Cod	Dwelling	C
414 Center Street	1977	Ranch	Dwelling	NC
415 Center Street	ca. 1954	Cape Cod	Dwelling	C
416 Center Street	1977	Ranch	Dwelling	NC
417 Center Street	1965	Gable Front	Dwelling	C
201 Cherry Avenue	1991	New Traditional	Dwelling	NC
111 Chestnut Avenue	1958	Minimal Traditional	Dwelling	C
112 Chestnut Avenue	2009	New Traditional	Dwelling	NC
113 Chestnut Avenue	1958	Minimal Traditional	Dwelling	C
115 Chestnut Avenue	2009	New Traditional	Dwelling	NC
118 Chestnut Avenue	1964	Minimal Traditional	Dwelling	C
120 Chestnut Avenue	1911	Foursquare	Dwelling	C
121 Chestnut Avenue	1933	Dutch Colonial Revival	Dwelling	C
122 Chestnut Avenue	ca. 1955-59	Cape Cod	Dwelling	C
123 Chestnut Avenue	ca. 1910-35	Gable Front	Dwelling	C
124 Chestnut Avenue	1956	Cape Cod	Dwelling	C
125 Chestnut Avenue	1960-63	Ranch	Dwelling	C
127 Chestnut Avenue	ca. 1920-35	Craftsman bungalow	Dwelling	C
128 Chestnut Avenue	ca. 1920-35	Carpenter Gothic	Dwelling	C
201 Chestnut Avenue	1952-54	Ranch	Dwelling	C
202 Chestnut Avenue	1903	Carpenter Gothic	Dwelling	C
206 Chestnut Avenue	ca. 1935-40	Cape Cod	Dwelling	C
208 Chestnut Avenue	ca. 1938-45	Cross Gable	Dwelling	NC; alterations
302 Chestnut Avenue	ca. 1960-63	Ranch	Dwelling	NC; alterations
303 Chestnut Avenue	1955	Modern/A-frame	Church	C
304 Chestnut Avenue	1983	N/A	Dwelling	NC
306 Chestnut Avenue	1962	Minimal Traditional	Dwelling	C
400 Chestnut Avenue	1963-66	Ranch	Dwelling	C
405 Chestnut Avenue	1960-63	Contemporary	Dwelling	C
407 Chestnut Avenue	1962	Ranch	Dwelling	C
409 Chestnut Avenue	1998	Postmodern	Dwelling	NC
411 Chestnut Avenue	1961	Ranch	Dwelling	C
415 Chestnut Avenue	1962	Ranch	Dwelling	C
3 Daylily Lane	1990	New Traditional	Dwelling	NC
5 Daylily Lane	1990	New Traditional	Dwelling	NC
7 Daylily Lane	1990	New Traditional	Dwelling	NC
402 Fifth Avenue	by 1900	Cross gable	Dwelling	C
404 Fifth Avenue	by 1904	Carpenter Gothic	Dwelling	C
406 Fifth Avenue	ca. 1895	Carpenter Gothic	Dwelling	C
407 Fifth Avenue	by 1893	Carpenter Gothic	Dwelling	C
409 Fifth Avenue	ca. 1909	Carpenter Gothic	Dwelling	C
416 Fifth Avenue	1898	Carpenter Gothic	Dwelling	C
418 Fifth Avenue	ca. 1893	Carpenter Gothic	Dwelling	C
301 First Avenue	ca. 1880s	Carpenter Gothic	Dwelling	C
303 First Avenue	ca. 1880s	Carpenter Gothic	Dwelling	C

305 First Avenue	ca. 1880s	Carpenter Gothic	Dwelling	C
309 First Avenue	1960	Ranch	Dwelling	C
311 First Ave./311 Locust Ln.	ca. 1920-35	Gable front	Dwelling	C
402 Fourth Avenue	ca. 1942	Tudor Revival	Dwelling	C
404 Fourth Avenue	by 1895	Carpenter Gothic	Dwelling	C
408 Fourth Avenue	by 1891	Carpenter Gothic	Dwelling	C
410 Fourth Avenue	by 1894	Carpenter Gothic	Dwelling	C
412 Fourth Avenue	by 1888	Carpenter Gothic	Dwelling	C
414 Fourth Avenue	ca. 1895	Gable front	Dwelling	C
417 Fourth Avenue	ca. 1890-1920	Cross gable	Dwelling	C
419 Fourth Avenue	ca. 1885	Cross gable	Dwelling	NC; alterations
102 Grove Avenue	by 1935	Minimal Traditional	Dwelling	C
103 Grove Avenue	by 1885	Carpenter Gothic	Dwelling	C
105 Grove Avenue	1897	Carpenter Gothic	Dwelling	C
107 Grove Avenue	ca. 1875-90	Carpenter Gothic	Dwelling	C
108 Grove Avenue	1908	Craftsman	Dwelling	C
110 Grove Avenue	1902	Carpenter Gothic	Dwelling	C
111 Grove Avenue	ca. 1880-95	Carpenter Gothic	Dwelling	C
112 Grove Avenue	ca. 1887-90	Carpenter Gothic	Dwelling	C
113 Grove Avenue	ca. 1882-84	Carpenter Gothic	Dwelling	C
114 Grove Avenue	ca. 1900-30	Side gable	Dwelling	C
117 Grove Avenue	ca. 1888-90	Cross gable	Dwelling	C
118 Grove Avenue	ca. 1917-24	Foursquare	Dwelling	C
119 Grove Avenue	1956	Side gable	Dwelling	C
122 Grove Avenue	ca. 1883-85	Carpenter Gothic	Dwelling	C
123 Grove Avenue	ca. 1875-95	Carpenter Gothic	Dwelling	C
124 Grove Avenue	ca. 1881-84	Carpenter Gothic	Dwelling	C
125 Grove Avenue	ca. 1890-1900	Cross gable	Dwelling	C
127 Grove Avenue	ca. 1883-85	Carpenter Gothic	Dwelling	C
201 Grove Avenue	ca. 1882-85	Cross gable	Dwelling	C
202 Grove Avenue	ca. 1947-50	Minimal Traditional	Dwelling	C
203 Grove Avenue	ca. 1915	Bungalow	Dwelling	C
205 Grove Avenue	1964	Contemporary	Dwelling	C
206 Grove Avenue	ca. 1875-85	Carpenter Gothic	Dwelling	C
207 Grove Avenue	ca. 1905	Gable front	Dwelling	C
213 Grove Avenue	ca. 1885-91	Carpenter Gothic	Dwelling	C
215 Grove Avenue	ca. 1880-96	Carpenter Gothic	Dwelling	C
300 Grove Avenue	1901	Octagonal	Municipal/Town Hall	C
313 Grove Avenue	1878-79	Carpenter Gothic	Dwelling	C
315 Grove Avenue	by 1888	Carpenter Gothic	Dwelling	C
316 Grove Avenue	1940	Side gable	Clubhouse	C
319 Grove Avenue	ca. 1891	Carpenter Gothic	Dwelling	C
402 Grove Avenue	ca. 1875-90	Carpenter Gothic	Dwelling	C
404 Grove Avenue	ca. 1890-95	Cross gable	Dwelling	C
406 Grove Avenue	ca. 1890-1910	Gable front	Dwelling	C

411 Grove Avenue	ca. 1886-1900	Carpenter Gothic	Dwelling	C
412 Grove Avenue	ca. 1873-1900	N/A	Dwelling	NC; alterations
413 Grove Avenue	1984	Gable front	Dwelling	NC
415 Grove Avenue	by 1935	Cross gable	Dwelling	C
10 Maple Avenue	2000	Colonial Revival	Dwelling	NC
16 Maple Avenue	ca. 1905-17	Foursquare	Dwelling	C
108 Maple Avenue	1941	Minimal Traditional	Dwelling	C
109 Maple Avenue	1923	Craftsman bungalow	Dwelling	C
111 Maple Avenue	ca. 1910	Side gable	Dwelling	C
119 Maple Avenue	ca. 1885	Carpenter Gothic	Dwelling	C
127 Maple Avenue	1964	Split-level	Dwelling	C
205 Maple Avenue	ca. 1885-90	Carpenter Gothic	Dwelling	C
207 Maple Avenue	2005	Timber frame	Dwelling	NC
209 Maple Avenue	ca. 1953	Minimal Traditional	Dwelling	C
211 Maple Avenue	ca. 1953	Minimal Traditional	Dwelling	NC; alterations
301 Maple Avenue	1955	Ranch	Dwelling	C
104 Maple Road	1966	Split-level	Dwelling	C
115 Maple Road	1979	Ranch	Dwelling	NC
121 Maple Road	1979	Ranch	Dwelling	NC
201 Maple Road	ca. 1975-78	Ranch	Dwelling	NC
203 Maple Road	ca. 1975-78	Ranch	Dwelling	NC
100 McCauley Street	1955	Ranch	Dwelling	C
333 McCauley Street	1958	Ranch	Dwelling	NC; alterations
403 McCauley Street	1956	Ranch	Dwelling	C
500 McCauley Street	ca. 1885-1915	Cross gable	Dwelling	C
503 McCauley Street	1939; 1951	Ranch	Dwelling	C
410 Oak Street	1940	Cape Cod	Dwelling	C
411 Oak Street	1959	Side gable	Dwelling	C
418 Oak Street	ca. 1913-15	Cross gable	Dwelling	C
419 Oak Street	ca. 1909	Bungalow	Dwelling	C
104 Pine Avenue	ca. 1946	Minimal Traditional	Dwelling	C
106 Pine Avenue	ca. 1946	Minimal Traditional	Dwelling	C
107 Pine Avenue	1966	Colonial Revival	Dwelling	C
108 Pine Avenue	ca. 1950	Gable front	Dwelling	NC; alterations
17050 Railroad Street	1908	Pyramidal	Dwelling	C
3 Ridge Road	ca. 1910-25	Bungalow	Dwelling	C
102 Ridge Road	ca. 1885-90	Carpenter Gothic	Dwelling	C
106 Ridge Road	ca. 1954	Cape Cod	Dwelling	C
108 Ridge Road	1915	Side gable	Dwelling	C
110 Ridge Road	1912	Craftsman bungalow	Dwelling	C
112 Ridge Road	1912	Side gable	Dwelling	C
114 Ridge Road	1947	Gable front	Dwelling	C
116 Ridge Road	1948	Cape Cod	Dwelling	C
118 Ridge Road	1954	Ranch	Dwelling	C
202 Ridge Road	1991	New Traditional	Dwelling	NC

204 Ridge Road	ca. 1975-78	Ranch	Dwelling	NC
300 Ridge Road	1952	Minimal Traditional	Dwelling	C
302 Ridge Road	ca. 1880-95	I-house	Dwelling	C
306 Ridge Road	1900	Side gable	Dwelling	C
326 Ridge Road	1952	Minimal Traditional	Dwelling	C
330 Ridge Road	1951	Ranch	Dwelling	NC; alterations
334 Ridge Road	1955	Ranch	Dwelling	C
336 Ridge Road	2002	New Traditional	Dwelling	NC
338 Ridge Road	2002	New Traditional	Dwelling	NC
340 Ridge Road	2002	New Traditional	Dwelling	NC
342 Ridge Road	1952	Minimal Traditional	Dwelling	C
344 Ridge Road	2013	N/A	Dwelling	NC
346 Ridge Road	1953	Ranch	Dwelling	NC; alterations
348 Ridge Road	2004	New Traditional	Dwelling	NC
350 Ridge Road	2005	New Traditional	Dwelling	NC
352 Ridge Road	2005	Millennium Mansion	Dwelling	NC
354 Ridge Road	1950	Minimal Traditional	Dwelling	C
358 Ridge Road	1950	Minimal Traditional	Dwelling	NC; alterations
203 Second Avenue	2016	Gable front	Dwelling	NC
403 Sixth Avenue	by 1895	Carpenter Gothic	Dwelling	C
405 Sixth Avenue	by 1894	Carpenter Gothic	Dwelling	C
409 Sixth Avenue	1895	Gable front	Dwelling	C
1 The Circle	ca. 1878-85	Carpenter Gothic	Dwelling	C
2 The Circle	ca. 1878-79	Carpenter Gothic	Dwelling	C
6 The Circle	ca. 1879-80	Carpenter Gothic	Dwelling	C
8 The Circle	ca. 1878-90	Carpenter Gothic	Dwelling	C
9 The Circle	1989-90	Neo-Victorian	Dwelling	NC
12 The Circle	ca. 1880-90	Side gable	Dwelling	C
13 The Circle	ca. 1875-85	Carpenter Gothic	Dwelling	C
15 The Circle	ca. 1880-85	Carpenter Gothic	Dwelling	C
17 The Circle	ca. 1875-79	Carpenter Gothic	Dwelling	C
105 Washington Grove Lane/11 Brown Street	1920	N/A	Commercial	C
109 Washington Grove Lane	1973	N/A	Commercial	NC
111-13 Washington Grove Ln	1973	N/A	Commercial	NC
115 Washington Grove Lane	ca. 1930-35	Cape Cod	Dwelling	C
117 Washington Grove Lane	ca. 1955	Cape Cod	Dwelling	C
119 Washington Grove Lane	ca. 1935-40	Cape Cod	Dwelling	C
121 Washington Grove Lane	ca. 1947	Minimal Traditional	Dwelling	C
123 Washington Grove Lane	1947	Minimal Traditional	Dwelling	C
125 Washington Grove Lane	1947	Minimal Traditional	Dwelling	C
126 Washington Grove Lane	ca. 1901-1938	Foursquare	Dwelling	C
127 Washington Grove Lane	1947	Cape Cod	Dwelling	C
128 Washington Grove Lane	ca. 1925	Bungalow	Dwelling	C
129 Washington Grove Lane	1953	N/A	Dwelling	NC; alterations

200 Washington Grove Lane	ca. 1925	Foursquare	Dwelling	C
201 Washington Grove Lane	ca. 1940-41	Minimal Traditional	Dwelling	C
203 Washington Grove Lane	ca. 1940-42	Cape Cod	Dwelling	C
204 Washington Grove Lane	ca. 1915-30	Bungalow	Dwelling	C
205 Washington Grove Lane	ca. 1940	Cape Cod	Dwelling	C
207 Washington Grove Lane	1941	Minimal Traditional	Dwelling	C
208 Washington Grove Lane	ca. 1915-30	Craftsman bungalow	Dwelling	C
213 Washington Grove Lane	1938	Minimal Traditional	Dwelling	C
215 Washington Grove Lane	ca. 1913	Gable front	Dwelling	C
301 Washington Grove Lane	ca. 1935-40	Foursquare	Dwelling	C
303 Washington Grove Lane	ca. 1962	Ranch	Dwelling	C
305 Washington Grove Lane	1962	Ranch	Dwelling	C
411 Washington Grove Lane	ca. 1962	Ranch	Dwelling	C
413 Washington Grove Lane	1963	Ranch	Dwelling	NC; alterations
415 Washington Grove Lane	1963	Ranch	Dwelling	C
510 Washington Grove Lane	ca. 1910-20	Pyramidal	Dwelling	C
511 Washington Grove Lane	1958	Ranch	Dwelling	C
513 Washington Grove Lane	ca. 1958	Ranch	Dwelling	C
515 Washington Grove Lane	1990	Ranch	Dwelling	NC
517 Washington Grove Lane	1927	Bungalow	Dwelling	C

SITES		
Name	Key Date(s)	Contributing/ Noncontributing Status
Chapel Park	1886/1897	C
East Woods	1873/1964	C
Howard Park	1886/1897	C
Jackson Park	1897	C
Knott Park	1897	C
Maple Lake	1910/1927/1955	C
Maple Spring[119]	1873	C
McCauley Park	ca. 1940-1950	C
Morgan Park	1890	C
The Circle	1873	C
Wade Park	1897	C
Washington Grove Meadow Conservation Park	1873/2007	C
West Woods	1873/1964	C
Whetstone Spring[120]	1873	C
Woodward Park	1897/1925	C

[119] Although Maple Spring predates the establishment of the camp meeting, its significance related to Washington Grove begins in 1873.

[120] Although Whetstone Spring predates the establishment of the camp meeting, its significance related to Washington Grove begins in 1873.

STRUCTURES		
Name	Key Date(s)	Contributing/Noncontributing Status
Woodward Park fireplace	1935	C
Woodward Park gazebo	1974	NC

Historic Associated Features

The following list identifies the historic associated features that contribute to the significance of the Washington Grove Historic District. The term historic associated feature is used to enumerate small-scale and landscape features not individually countable according to National Register guidelines. They are organized according to the following categories of landscape characteristics: circulation, small-scale features, topographic features, and views and viewsheds.

Circulation

- Acorn Lane
- Boundary Street
- Brown Street
- Center Street
- Cherry Avenue
- Chestnut Avenue
- Chestnut Road
- Dorsey Street
- Fifth Avenue
- First Avenue
- Fourth Avenue
- Grove Avenue
- Grove Road
- Hickory Road
- Johnson Alley
- Maple Avenue
- Maple Road
- McCauley Street
- Miller Drive
- Oak Street
- Pine Avenue
- Pine Road
- Railroad Street
- Ridge Road
- The Circle path

Circulation (cont.)
- Third Avenue
- Second Avenue
- Sixth Avenue
- Washington Grove Lane

Small-Scale Features
- Brown Street stone perimeter wall
- Elements of the well water system
- Elements of the camp meeting-era stormwater and drainage system
- Spherical streetlights
- Historic fire hydrants
- Wood street signs

Topographic Features
- Political Hill

Views and Viewsheds
- Views from the Circle of the surrounding cottages and along each of the radial avenues
- Views from the radial avenues toward the Circle and encompassing the cottages along them
- Views in both directions along Railroad Street of the railroad corridor and Washington Grove station
- Views from Railroad Street of the Humpback Bridge and its approaches
- Views north from Railroad Street along Grove Avenue and Grove Road
- Views along Chestnut Avenue in both directions
- Views along Cherry Avenue in both directions
- Views along Grove Avenue in both directions
- Views from Grove Avenue encompassing McCathran Hall and the Woman's Club in Howard Park
- View of the Washington Grove railroad station from Grove Avenue
- Views along Maple Avenue in both directions and the broad, sweeping views from the avenue across Woodward Park
- Views north from Pine Avenue into Woodward Park
- Views from Grove Road encompassing Woodward Park
- Views along Brown Street in both directions
- Views along Center Street in both directions and views along Center Street encompassing McCathran Hall
- Views in both directions along McCauley Street
- Views along Oak Street in both directions
- Views in both directions along Railroad Street
- Views from Ridge Road encompassing the residential parcels of Washington Grove along the west side and the Washington Grove Meadow Conservation Park along the east side

Views and Viewsheds (cont.)

- Views along Washington Grove Lane in both directions encompassing the West Woods, the residential lots on both sides of the street, and the commercial and agricultural buildings along the railroad corridor
- Views within Chapel Park and across the park to nearby cottages and to Howard Park and its buildings
- Views within Howard Park of McCathran Hall and the Woman's Club and across the park to nearby cottages, to Chapel Park, and to the Washington Grove United Methodist Church
- Views from Morgan Park toward the Washington Grove station and views from the park along Grove Avenue, Grove Road, and Brown Street
- Views within and across the Washington Grove Meadow Conservation Park
- Views within and across Woodward Park encompassing the vegetation, the recreational features, and nearby cottages
- Views through and within the East Woods
- Views within the West Woods of Maple Lake and the springs
- Views across Maple Lake into the West Woods

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

- ☒ **A** Property is associated with events that have made a significant contribution to the broad pattern of our history.
- ☐ **B** Property associated with the lives of persons significant in our past.
- ☒ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- ☐ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply)
Property is:

- ☐ **A** owned by a religious institution or used for religious purposes.
- ☐ **B** removed from its original location.
- ☐ **C** a birthplace or grave.
- ☐ **D** a cemetery.
- ☐ **E** a reconstructed building, object, or structure.
- ☐ **F** a commemorative property.
- ☐ **G** less than 50 years of age or achieved significance within the past 50 years.

Area of Significance
(Enter categories from instructions)

Architecture
Community Planning and Development
Landscape Architecture
Social History

Period of Significance

1873-1969

Significant Dates

1873; 1877; 1886; 1897; 1901; 1902; 1905; 1910; 1920; 1937; 1940; 1963

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation

Architect/Builder

Day, Hezekiah (builder)
Eisinger, Constantine (builder)
Harding, Brawner (builder)
Harris, A. L. (architect)
Ploger, W.S. (architect)
Reber, George (builder)
Samperton, John S. (architect)
Scott, W. A. (builder)
Woods, Elliott (architect)

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets)

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets)

Previous documentation on files (NPS):

- ☐ preliminary determination of individual listing (36 CFR 67) has been requested
- ☒ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey #_____
- ☐ recorded by Historic American Engineering Record #_____

Primary location of additional data:

- ☒ State Historic Preservation Office
- ☐ Other State agency
- ☐ Federal agency
- ☒ Local government
- ☐ University
- ☐ Other

Name of repository:
Washington Grove Archives

Summary Statement of Significance

National Register Criterion A

Social History: The Washington Grove Historic District is significant at the state level under National Register Criterion A in the area of social history as an important example of a Methodist camp meeting founded at the height of the religious resort period of the American camp meeting movement and as a successful regional independent assembly Chautauqua. During the religious resort period, camp meetings were founded across the country and in Maryland as an alternative to the secular summer resorts that were gaining popularity among the middle and upper middle classes during the second half of the nineteenth century. Washington Grove represented the trend, drawing thousands from the Washington area to its annual outdoor revival while attracting a stable base of summer residents. Emblematic of the Chautauqua movement's long-running connection to American Methodism and camp meetings, Washington Grove established an independent assembly Chautauqua in 1902, which ushered in a new chapter of community growth and revitalization just as interest and support for camp meetings had begun to falter. The town's buildings, sites, and structures represent a continuity of the activities and traditions established in the camp meeting and Chautauqua periods that are firmly supported by residents today.

Community Planning and Development: The Washington Grove Historic District is significant at the local level under National Register Criterion A in the area of community planning and development for its association with late nineteenth/early twentieth-century suburban migration from Washington, D.C., to Montgomery County via the Metropolitan Branch of the Baltimore & Ohio Railroad. Planned as both an annual camp meeting site and a religious summer resort to serve Washington-area Methodists, Washington Grove evolved into a successful year-round community that influenced similar developments along the railroad corridor. Washington Grove is also locally significant in the area of community planning and development for its involvement in and influence on the suburbanization of Montgomery County during the post-World War II period. Washington Grove is an independent municipality whose town meeting tradition is a direct successor of the annual stockholders meeting of the Washington Grove Camp Meeting Association. It is one of only seven municipalities in Montgomery County with independent planning and zoning authority. In the face of unprecedented regional growth and overreaching development that threatened the social and physical fabric of established communities in the greater Washington, D.C., area, Washington Grove under home rule successfully promoted responsible growth and compatible new design while managing and protecting the physical manifestations of its camp meeting heritage.

National Register Criterion C

Architecture: The Washington Grove Historic District is significant at the local level under National Register Criterion C in the area of architecture. Washington Grove possesses a significant collection of residential buildings that embody the built tradition of the American camp meeting movement and reflect important

national trends in late nineteenth- and twentieth-century American domestic architecture. Of particular note is the high concentration of Carpenter Gothic cottages. These architecturally distinctive houses feature peaked, front-gable roofs and double doors that evoke the shape and massing of the canvas structures that initially made up the community and vividly express the Carpenter Gothic style using highly ornamental scrollsawn woodwork, bracketed pendants, decorative dressings over or around windows and doors, and turned or chamfered porch posts. Built using natural materials, the cottages reflect the rustic setting of Washington Grove and the importance of nature to the interpretation of the camp meeting as a place apart. Originally constructed as summer residences, these cottages were converted into year-round homes and adapted to modern living with each passing generation. The result is an architecture of accretions that gives Washington Grove's camp meeting cottages a highly eclectic and distinct character. The persistence of vernacular forms through the early twentieth century represents a continuity with the past, and the introduction of revivalist styles adds to the architectural diversity of the district. The new domestic forms and styles introduced in the modern era embody a local manifestation of national trends in residential design. In their simplicity of form, open plans, and affordability, these houses represent a continuity in design from the camp meeting era. Across the continuum of Washington Grove's residential buildings, there is an adherence to standard forms that have been altered through individual elaboration, renovations, and additions to meet the changing needs of homeowners.

Community Planning and Development: The Washington Grove Historic District is locally significant under National Register Criterion C as a notable expression of two important nineteenth-century trends in community planning and development. The spatial organization of the town combines a popular nineteenth-century camp meeting form – the wheel plan – with a residential grid emblematic of railroad and streetcar suburbs across the United States. Washington Grove's physical plan continues to evoke the historic delineations of the camp meeting era Tent Department, characterized by the Circle and the radiating avenues and interstitial alleys that surround it, and the Cottage Department, which features a system of alternating avenues for pedestrian use and roads for vehicular use. This circulation system served to reinforce the sylvan character of the landscape and improve the safety and appearance of the campgrounds, and it represents an early precursor of the Radburn scheme of community planning. In addition, the balance and combination of residential divisions, open spaces for assembly and recreation, and forested preserves has been a fundamental attribute of Washington Grove since its founding and remains intact today.

Landscape Architecture: The Washington Grove Historic District is locally significant under landscape architecture as a representation of the vernacular tradition of American camp meeting planning and design. Although the site is not the work of a professional designer, gardener, or horticulturalist, the spatial organization, vegetation, circulation networks, and other physical characteristics of the landscape embody the qualities and associations of late nineteen-century Methodist campgrounds. Washington Grove's first permanent shelter was its tree canopy, and before the construction of the tabernacle, a clearing in the woods was the setting for worship. The landscape provided a natural and healthy, inspirational and insular setting for religious activities and evolved through the twentieth century to support the residential, recreational, and social customs of a year-round community while maintaining its essential form and character.

Period of Significance

The period of significance for the Washington Grove Historic District spans the years 1873 to 1969. This period begins with the establishment of the Washington Grove Camp Meeting and ends in 1969 (50 years before the present). During this period, Washington Grove achieved its design significance in the areas of architecture, community planning and development, and landscape architecture as a town founded on camp meeting principles that evolved to incorporate a range of vernacular and stylistic design trends. This period encompasses the formation and development of Washington Grove as a religious camp meeting, its location as an independent Chautauqua assembly, municipal organization, and the events and activities that contribute to its significance within the context of post-World War II planning and development in Montgomery County.

Resource History and Historic Context

The Founding and Early Development of Washington Grove (1873-1901)

Origins and Early Development of Camp Meetings in the United States

Religious camp meetings have been an American phenomenon for over 200 years. While no standardized definition exists, a camp meeting is an outdoor preaching event at which participants sustain themselves and camp overnight, often in tents. Camp meetings are temporary gatherings, typically lasting a few days to a week at the end of the summer. Scholars have developed several theories as to the origin of the camp meeting, and there is still debate over the location and date of the first meeting. Historian Charles Johnson, in his classic work *The Frontier Camp Meeting*, advanced the concept that the camp meeting originated on the Kentucky frontier where populations were sparse and travel and communication were difficult. While preaching outdoors was common throughout the eighteenth century in rural and backwoods areas where churches, or even basic assembly structures, were not available, the element of overnight camping, often for several nights, was missing from these gatherings. Johnson asserted that camp meetings did not achieve universal popularity or standard form until 1800, the year Presbyterian minister James McGready organized several highly successful outdoor revivals in Logan County, Kentucky.[121] More recent scholarship suggests that the earliest camp meetings did not arise from circumstances created by the frontier and were organized in the Carolinas or Georgia during the last decade of the eighteenth century.[122] Many support the claim that the Rock Spring Camp Meeting near Denver, North Carolina, which dates to 1794, may have been the first camp meeting in the United States.[123]

[121] Charles Johnson, *The Frontier Camp Meeting* (Dallas, TX: Southern Methodist University Press, 1955), 32.

[122] Kenneth O. Brown, *Holy Ground: A Study of the American Camp Meeting* (New York, NY: Garland Publishing, Inc., 1992), vii.

[123] Brown, *Holy Ground*, 6.

Camp meetings, often held in clearings in the woods, allowed preachers to reach a wide audience and did not require much in terms of infrastructure or planning, as attendees were expected to provide their own food and shelter for the duration of the event.

The earliest camp meetings were the work of Presbyterians, Baptists, and Methodists. While the Methodist church never institutionalized the camp meeting, this form of religious revival was embraced as an important part of the practice and led to Methodist dominance in American Protestantism in the nineteenth century.[124] The most famous, some argue notorious, early camp meeting took place at Cane Ridge in Bourbon County, Kentucky, in 1801. It lasted nearly a week, attracted tens of thousands of participants, and received wide coverage in the press, launching the camp meeting movement onto the national stage. Preachers at Cane Ridge and other early camp meetings spread the doctrine of universal redemption, and audience members were known to manifest their salvation by shouting, falling down, "jerking," and dancing. The religious fervor of huge crowds often created a frenzied atmosphere of heightened emotions that resulted in disorderly conditions. Following the national trend, camp meetings emerged as an important practice for Methodists in the Washington area in the first half of the nineteenth century. Washington Grove historian Philip K. Edwards states that camp meetings for the Washington District of the Methodist Church occurred as early as 1815.[125]

By the 1830s, camp meetings had evolved into more sedate events, subject to rules of order, sometimes enforced by a civil officer. Attendees came for spiritual renewal and development. The revivals fostered a sense of religious kinship, and socialization and recreation became important facets of camp life. At some campgrounds, churches erected "society tents" to house church groups. Excessive socialization, however, described as the "pic-nic spirit," was criticized by many of the movement's detractors. Others, such as Reverend B. W. Gorham, author of a camp meeting manual published in 1854, embraced the extra-religious pleasures of camp meetings.[126] As historian John R. Stilgoe notes, "Much of the excitement of camp-meeting convocations derived from the pure pleasure of group activity. For families accustomed to week-long isolation and hard work, meetings offered a social release unlike that of raisings, bees, and funerals."[127] In his camp meeting manual, Gorham also promoted the religious campground as a place of good health, forecasting the next phase of camp meeting development wherein existing camps as well as new revival sites were promoted as religious

[124] Charles H. Lippy, "The Camp Meeting in Transition: The Character and Legacy of the Late Nineteenth Century," *Methodist History* 34, no. 1 (October 1995), 3.

[125] Edwards, *Washington Grove, 1873-1937,* 16-17. The basic units of organization of the Methodist Church are annual conferences and districts. The Washington District was one of several districts within the Baltimore Conference.

[126] Ellen Weiss, *City in the Woods: The Life and Design of an American Camp Meeting on Martha's Vineyard* (New York: Oxford University Press, 1987), 7.

[127] John R. Stilgoe, *Common Landscape of America, 1580-1845* (New Haven: Yale University Press, 1982), 233.

alternatives to secular summer resort communities. To Gorham, the "purity and constant freshness of atmosphere" was one of the many circumstances that rendered the campground "a healthful resort."[128]

Isolation was an important factor in selecting a camp meeting site because it offered an environment free from disruptions – a place apart from worldly temptations. Wesleyan Grove, founded on the island of Martha's Vineyard in 1836, was located in a grove of oaks close to Nantucket Sound on a gentle northwest-facing slope that faced away from the water "in an introspective fashion."[129] The camp meeting on Deal Island (initially Devil's Island and later Deil's Island), Maryland, in the Chesapeake Bay, was located in a dense stand of trees called Park's Grove.[130] Like Wesleyan Grove and Deal Island, many camp meetings had a forest setting, where man could be one with God and nature in a "sacred grove." The sylvan landscape, in its function as a setting for worship, became, in effect, a holy ground. At night, these forest settings, lit by firelight, were both mysterious and awe-inspiring, creating a sense of otherworldliness. Trees also served the practical purpose of providing shade, privacy, fuel, and building material. By midcentury, other factors in selecting a camp meeting site held greater weight. Gorham's 1854 manual emphasized finding a site with a bountiful supply of good water, adequate pasturage, a tree canopy for shade and shelter from the wind, easy access from principal thoroughfares, and a level topography, among other considerations.

The physical arrangement of the earliest camp meetings were not planned. In his book, *A Short History of the Methodists in the United States of America*, published in 1810, historian Jesse Lee describes a campground arranged in the shape of an "oblong square."[131] At the center of the camp in a clearing was the assembly area with a preacher's stand (pulpit) or sometimes two – one at either end of the assembly space. In its simplest form, the stand was a raised, wooden platform, although covered variants were common. Benches within the assembly area, if present, were hand-hewn and backless, arranged in rows, sometimes with a central aisle. Canvas tents or "board tents" were set up around the clearing in various configurations. Historian Charles Johnson has shown that three plans were widely used for early nineteenth-century frontier revivals – rectangular, circular, and open horseshoe.[132] An example of the latter was depicted by architect Benjamin Henry Latrobe (1764-1820) in his 1809 sketch of a camp meeting in Virginia. The spatial configuration of most campgrounds was the work of anonymous builders and planners. As historian Ellen Weiss has documented, the radial concentric plan at Wesleyan Grove is of particular interest because this plan type was little used in the

[128] Rev. B. W. Gorham, *Camp Meeting Manual, A Practical Book for the Camp Ground; in Two Parts* (Boston, MA: H. V. Degen, 1854), 64-65.

[129] Weiss, *City in the Woods*, 24-25.

[130] Paul Baker Touart, National Register of Historic Places, Registration Form, "Deal Island Historic District," 2006.

[131] Jesse Lee, *A Short History of the Methodists in the United States of America* (Baltimore, MD: Magill and Clime, 1810), 360.

[132] Johnson, *The Frontier Camp Meeting*, 42.

United States. Its derivative, the wheel plan, however, was featured at a number of campsites across the United States by the 1870s. Campsites arranged in a wheel plan featured a central gathering space and radiating paths or streets arranged like spokes around a hub. In addition to Washington Grove, the wheel plan could be found at campgrounds in Pitman Grove, New Jersey; Lancaster, Ohio; and Plainville, Connecticut.

The earliest permanent building constructed at many campgrounds was a tabernacle. These were typically large, open, timber-frame pavilions located in a clearing at the center of camp to shelter both the pulpit and seating area. While the roof provided shade and shelter from the rain, its open sides offered natural ventilation, unrestricted sightlines, and clear transmission of the speaker's voice. Wesleyan Grove had a canvas tabernacle until 1879, when it was replaced with a permanent iron structure that could seat thousands under its three-tiered roof. The tabernacle as a building form eliminated the distinction between interior and exterior space, recognizing the campground as divine space and encouraging man's communion with nature.

Canvas tents provided the earliest and simplest form of shelter at camp meetings. They were inexpensive, easy to transport, and quick to set up and take down. As noted above, board tents, which were simple frame structures clad with weatherboard, were also used for temporary accommodation. Indian Fields, an active Methodist campground in Dorchester County, South Carolina, features a ring of ninety-nine board tents around a central tabernacle.[133] Gorham objected to the use of board tents, calling them "shanties," and recommended cloth tents. He described the construction of a 12-foot-wide tent with a 9-foot ridgepole that provided enough space for a family of six to eight. For society tents, he recommended a tent measuring 20 by 30 feet. Most tents were modest constructions, reinforcing the idea of primitive simplicity. Some camp meeting sites, however, maintained a tradition of embellishing tents. Fly tarps were ornamented with scalloped and sometimes embroidered front edges, and tent walls were hung with flags, bunting, or decorations fashioned out of tree branches or other vegetation. Often the tents were built on low, wood platforms to separate the tent floor from the damp earth. At Wesleyan Grove, some families erected wood-sided tents with canvas tops – a shelter form that bridged the gap between all-canvas tents and frame cottages.[134]

When the canvas walls of individual tents were raised or pulled aside, interior spaces became semi-public, encouraging socialization. A print depicting the Sing Sing Camp Meeting in New York in 1838 illustrates this aspect of camp life and anticipates the proliferation of front porches as tents were replaced with cottages. The owners of tents that adjoined the assembly area or tabernacle could simply open their tent to participate in religious meetings and other revival activities. Tent walls could also be manipulated to regulate sun, shade, and the circulation of air.

[133] Caroline Dixon, National Register of Historic Places Nomination, "Indian Fields Methodist Camp Ground," July 28, 1972.

[134] Lester Walker, *Tiny, Tiny Houses or How to Get Away from It All* (Woodstock, NY: The Overlook Press, 1987), 47-48.

Beginning in the 1840s, when the religious fervor that characterized the Second Great Awakening began to diminish, the camp meeting movement fell into a period of relative dormancy that lasted through the Civil War. Starting in the mid-1860s, however, scores of camp meeting sites were established in the East and the Midwest.[135] This period of camp meeting development is known as the Religious Resort Period, because it parallels the resort/excursion phenomenon that extended from the Civil War to World War I, when middle-class city dwellers eager to escape urban conditions retreated to lake, ocean, and mountain destinations made accessible by new forms of transportation.[136] The summer resort phenomenon had its origins in and was advanced by the development of American suburbs in the nineteenth century.

Nineteenth-Century Suburbanization and the Emergence of Summer Resorts in the Washington Region

National trends in suburban development in the nineteenth century can be linked to the evolution of transportation systems and technologies that established both intra- and intercity connections and fostered residential growth outside the urban center. The earliest suburban communities were developed during the railroad era, when railroad companies, seeking new sources of revenue, built passenger stations along their routes to connect cities with small rural villages. The residential communities that developed around the stations became semirural enclaves where the upper and upper-middle classes built fashionable villas on large lots, finding reprieve from overcrowding and other issues afflicting America's rapidly industrializing cities. As historian Kenneth T. Jackson has documented, reformers such as educator Catherine Beecher (1800-1878), landscape gardener Andrew Jackson Downing (1815-1852), and architect and landscape gardener Calvert Vaux (1824-1895) were highly influential in shaping American attitudes toward family life, semirural living, and domestic architecture and in romanticizing the benefits of naturalistic settings.[137] Railroad commuting was well established in New York, Philadelphia, Boston, and other major urban centers before the Civil War. Horse-drawn streetcars, also known as horsecars, were developed in the early 1830s and offered another mode of transportation to the early commuter class.

Washington, D.C., lacked several key conditions that drove early suburban development in other cities across the United States. With a population in 1860 of a little over 60,000 – less than one-tenth the population of New York City at the time – the District had yet to confront many of the issues afflicting larger metropolitan areas. Manufacturing existed within a narrow range of foundries, breweries, and mills, and heavy industry was scant. The city's poor air quality was primarily due to its topography and local climate rather than a proliferation of smokestacks. In 1860, only one line of horsecars operated in Washington, D.C. These omnibuses did not run on

[135] Charles A. Parker, "The Camp Meeting on the Frontier and the Methodist Religious Resort in the East – Before 1900," *Methodist History* 18, no. 3 (April 1980), 183.

[136] Lampl and Kelly, "'A Harvest in the Open for Saving Souls,' The Camp Meetings of Montgomery County," 2004, 7.

[137] Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of America* (New York: Oxford University Press, 1985), 61-67.

rails, however, and offered a primitive form of transit given the generally poor condition of the city's streets.[138] After the Civil War, however, living conditions within the city began to change, creating greater impetus for suburban development. The population of Washington expanded as migrants relocated to the city from surrounding rural communities and from the South. By 1870, the population had increased to over 109,000 inhabitants. Washington was located in a topographic bowl, and its low-lying areas suffered from drainage and sewage problems that were exacerbated by the city's growing numbers. The spread of malaria and other diseases was also a concern. In 1871, Alexander "Boss" Shepherd began a comprehensive public works project that included tearing up the streets to lay sewers, leveling and paving the streets and avenues, removing abandoned buildings and other nuisances, and burying the long-abandoned Washington City Canal. The prospect of semirural living offered a compelling alternative to the urban upheaval that would soon overtake the District.

Thus, by the early 1870s, suburban communities began to emerge along the major railroad lines entering Washington. These included Seabrook and Hyattsville along the Washington Branch of the Baltimore and Ohio (B&O) Railroad, Huntington City (Bowie) along the Baltimore and Potomac Railroad, which opened in 1872 and was operated by the Pennsylvania Railroad, and Linden on the Metropolitan Branch of the B&O, which began operations in 1873. Linden, platted in 1873, was the first railroad suburb in Montgomery County.[139] The original plan of Linden identified approximately twenty lots on about 12 acres of former farmland.[140] Ten years later, New York Congressman Benjamin F. Gilbert purchased a 90-acre tract in Montgomery County about 6 miles outside the District, which he subdivided and platted as the suburb of Takoma Park. Gilbert capitalized on the existence of convenient and affordable commuter service on B&O's Metropolitan Branch, and Takoma Park quickly attracted buyers. To promote suburban development, the B&O offered discounted freight rates for lumber destined for sites on along the Metropolitan Branch.[141]

The first electric streetcar (or trolley) system began operations in Richmond, Virginia, in February 1888. The technology proved safe and reliable and was quickly adopted by cities across the country as a replacement for horse-drawn streetcars. Indeed, the first electric streetcar in the District – the Eckington and Soldiers' Home Railway – was chartered in June 1888 and operations began that October.[142] Suburban streetcar lines soon

[138] LeRoy O. King, Jr., *100 Years of Capital Traction: The Story of Streetcars in the Nation's Capital* (Dallas, TX: Taylor Publishing Company, 1972), 3.

[139] Cavicchi, *Places from the Past*, 39.

[140] Michael F. Dwyer, Maryland-National Capital Parks and Planning Commission, Maryland Historical Trust Nomination Form for the National Register of Historic Places, "Linden Historic District," June 3, 1975 (amended).

[141] Cavicchi, *Places from the Past*, 39.

[142] King, *100 Years of Capital Traction*, 17.

followed, providing connections to nascent residential developments such as Tenleytown, Glen Echo, and others. Streetcar suburbs attracted a wide range of socioeconomic groups from the working to the upper-middle class.

While the physical plan of most early railroad and streetcar suburbs conformed to a gridiron street system, practitioners such as Downing, Vaux, and landscape architect Frederick Law Olmstead, Sr. (1822-1903) were strong advocates for a more naturalistic approach influenced by the English Picturesque landscape tradition. One of the most influential planned railroad suburbs inspired by the Picturesque movement was Riverside, designed by Olmstead and Vaux in 1868-69. Located outside Chicago, Riverside featured public parks and gracefully curved and sunken roads that preserved and enhanced the natural features of the land.[143] Chevy Chase, a southern Montgomery County streetcar suburb that bordered the District, embraced the traits of picturesque suburban planning promoted by Olmsted.[144] The first section of Chevy Chase, platted in 1892, had an informal, sylvan character that featured curvilinear parkways and landscaped parklets.

Encouraged by the convenience of travel by commuter rail and streetcars, resort hotels and boarding houses proliferated in the countryside outside Washington, D.C., during the late nineteenth century. For those Washington residents who could not afford a permanent relocation to the suburbs, resort hotels offered the opportunity to spend their summers "in the country."[145] Summer vacationers could take lodging by the week or on a more long-term basis. The High View, a resort hotel in Boyds, Maryland, built in 1887, catered to families and vacationers fleeing the hot city during the summer months.[146] Often, suburban real estate speculators built hotels within their communities to encourage local development. In 1893, Gilbert opened the 160-room North Takoma Hotel in Takoma Park. The developers of Chevy Chase built a hotel within one year after the community's first residential subdivision was platted.

The Religious Resort Period of Camp Meeting Development

Given that they were often organized in locations that offered clean sources of water, fresh air, crisp breezes, and generally salubrious conditions, Methodist camp meetings were promoted as religious alternatives to secular summer resort communities in the years after the Civil War. The seaside resort of Ocean Grove, New Jersey, founded as a Methodist camp meeting in 1869, epitomized the trend. One hundred miles to the south of

[143] Charles W. Snell, National Park Service, National Register of Historic Places Nomination, "Riverside Historic District," February 10, 1970.

[144] Kimberly Prothro Williams, Elizabeth Jo Lampl, and William B. Bushong, National Register of Historic Places Registration Form, "Chevy Chase Historic District," 7:3, draft dated October 1998.

[145] Jane C. Sween, *Montgomery County: Two Centuries of Change* (Woodland Hills, CA: Windsor Publications, 1984), 95.

[146] Cavicchi, *Places from the Past*, 36.

Ocean Grove was the South Jersey Camp Meeting Association (established in 1875), which was located on a stop of the Cape May and Millville Railroad. Camps such as Ocean Grove and South Jersey attracted cottage owners, cottage and tent renters, and hotel guests, as well as daily excursionists.[147] The popularity of religious resorts is reflected in newspaper coverage of the period.

In Maryland, Methodists established camp meetings across the state, many of which became popular summer destinations. The Emory Grove Camp Meeting in Baltimore County was founded in 1868 on an elevated, wooded site along the route of the Western Maryland Railroad. Its popularity encouraged the nearby development of Glyndon (established in 1871) as a summer resort. The Emory Grove Camp Meeting is still active, hosting religious services and other events every summer. Today, the grounds consist of forty-seven cottages, a tabernacle, a hotel, which dates to 1887, and a temple built in 1909.[148] In Montgomery County, a group of former slaves and their descendants founded a camp meeting northeast of Gaithersburg. The gathering site was located in a grove of trees that had been used by African Americans living in the area for religious gatherings and praise services since the 1860s. By 1880, the ten-day, tent-style camp meeting, also called Emory Grove, was widely attended by people from Washington, D.C., Baltimore, and places farther afield who arrived by train and walked from the nearby Washington Grove railroad station to the camp grounds. Until access was restricted, part of their route from the station was through Washington Grove. Unlike many other camp meetings, Emory Grove's canvas tents were never replaced with cottages, reflecting the community's limited means. Camp meetings at Emory Grove continued into the post-World War II period, with crowds of 3,000 to 4,000 people attending in the 1950s. In 1967, the annual religious and community gathering was shut down by the local health department citing sanitation problems. By 2004, the only tangible sign of the campground was a small remnant grove of oak trees, located behind a baseball field in Montgomery County's Johnson's Park. Since that time, a historic marker has been erected.[149] In the tradition of Deal Island, Maryland, a camp meeting was established on Smith Island (Somerset County) in the Chesapeake Bay in 1887. Located in the community of Ewell, the camp meeting (incorporated as the Wilson Butler Camp Ground) was only accessible by boat. By the early twentieth century, the campground included thirty frame cottages and a large auditorium. After a fire in 1937, the camp meeting infrastructure was largely rebuilt, and annual camp meetings are still held in the historic tabernacle.[150]

[147] Parker, "The Camp Meeting on the Frontier and the Methodist Religious Resort in the East – Before 1900," 187.

[148] The Emory Grove Camp Meeting (Baltimore County) is located within the Glyndon Historic District. See Rodd L. Wheaton and Nancy Miller, National Register of Historic Places Inventory, Nomination Form, "Glyndon," 1973, and Emory Grove History, available at https://www.emorygrove.net/, accessed May 7, 2019.

[149] Lampl and Kelly, "'A Harvest in the Open for Saving Souls,' The Camp Meetings of Montgomery County," 2004, 35-61.

[150] Maryland Historical Trust, Maryland Inventory of Historic Properties, "Ewell Survey District, S-333."

At Methodist campgrounds that transitioned into summer resorts, tents, which were comfortable for temporary revivals but impractical for longer periods, were often quickly replaced with cottages. Although inherently distinct from tents due to their permanency and building material, camp meeting cottages carried over many of the key characteristics of the earlier form – the peaked shape, large front openings, uninsulated walls, and economical use of interior space.[151] The Gothic Revival in architecture and the writings and works of landscape gardener Andrew Jackson Downing and architect Alexander Jackson Davis (1803-1892) had a profound impact on the design of camp cottages. The style's religious symbolism made it ideally suited for the spiritual nature of Methodist camp meetings, and the scale, massing, and materials of Carpenter Gothic-style cottages formed a logical step in the transition from tents to permanent buildings. (See additional text below on Carpenter Gothic.) Typically, cottages were built on existing tent lots, limiting the dimensions of the building footprint. Porches, which simulated tent awnings, extended interior space into the public realm and provided an area for socialization. Front-gable roofs evoked tent forms and created an additional half story that allowed for extra light, ventilation, and, in some cases, a sleeping loft. Cottages could be utilitarian or fanciful, depending on the period in which they were built, local traditions, and the socio-economic standing of the owner.[152] While at some campgrounds special sections of the site were set aside for cottages and platted with larger lots, it would not have been unusual for new cottages to stand side by side with their canvas neighbors. Some camp meetings, such as Ocean Grove, have retained their tent tradition. Approximately 100 family tents surround the auditorium there.[153]

Camp meeting associations acted as the governing body for many campgrounds during this period. Wesleyan Grove was institutionalized in 1868 when the Martha's Vineyard Camp Meeting Association was incorporated by an act of state legislature. A board of trustees and various committees were formed to order life in the community.[154] The Northport Wesleyan Grove Camp Meeting Association, formed in 1873 on Maine's Penobscot Bay, was authorized to acquire land and develop a wharf, key factors in its development as a summer colony.[155] These associations passed laws that regulated public conduct, commerce, the use of recreational facilities, and other aspects of camp meeting life.

[151] Troy Messenger, *Holy Leisure: Recreation and Religion in God's Square Mile* (Minneapolis, MN: University of Minnesota Press, 1999), 49.

[152] Lampl and Kelly, "'A Harvest in the Open for Saving Souls,' The Camp Meetings of Montgomery County," 2004, 1.

[153] Walker, *Tiny, Tiny Houses*, 58-59.

[154] Weiss, *City in the Woods*, 34.

[155] Kirk F. Mohney, National Register of Historic Places Nomination, "Bayside Historic District," November 8, 1996.

Carpenter Gothic

In the early nineteenth century, Gothic Revival architecture emerged in the United States as a solution for Americans searching for an ideal ecclesiastical architecture. Many reasoned that because Christianity had flourished when Gothic architecture was in its prime in Europe, churches should be built in as close to the correct version of Gothic as possible.[156] The style was eagerly adopted for American church building, particularly in New England and the Mid-Atlantic states. American architects and builders drew inspiration from English writers such John Ruskin (1819-1900) and Augustus Pugin (1812-1852), both of whom argued for the Gothic style in moralistic terms. Ruskin and Pugin declared that Gothic architecture should not just have decorative features like tracery, but that medieval building techniques should also be revived. Gothic Revival became a popular style for residential architecture as the nineteenth century progressed.[157]

Among the most influential voices in translating Gothic architecture for American domestic use were architect Alexander Jackson Davis and landscape gardener Andrew Jackson Downing. Davis's enthusiasm for Gothic architecture developed early in his career, as he was drawn to romantic literature and sought to capture that aesthetic world in his designs. Working on church projects in the office of architect Ithiel Town (1784-1844) furthered Davis's enthusiasm for Gothic architecture.[158] In his own practice, he designed a number of houses in the style. Davis's design for a gatehouse at the Blithewood estate in Barrytown, New York, which appeared in his 1837 book *Rural Residences*, was, according to architectural historian William H. Pierson, the first house in American architecture to be designed and published as a "cottage."[159] The gatehouse had a steeply pitched, cross-gable roof and gables fitted with bargeboards featuring tracery-like patterns, finials, and pendants. Its nearly cruciform plan was the result of two intersecting blocks. This massing, writes Pierson, "rejected altogether the single rectangular block of the classical tradition in favor of the dynamic opposition of strongly directional units."[160]

Downing, meanwhile, as a premiere tastemaker of the mid-nineteenth century, helped to popularize Gothic cottages and villas. In his book *The Architecture of Country Houses,* published in 1850, Downing devoted a chapter to cottage designs and featured drawings by architects like Davis and others. The houses had steeply pitched gables, board-and-batten exteriors, porches, and decorative woodwork. Downing referred to the pointed

[156] David P. Handlin, *American Architecture* (London: Thames and Hudson, 1985), 87-88.

[157] Handlin, *American Architecture,* 87.

[158] William H. Pierson, Jr., *American Architects and Their Buildings, Volume 2: Technology and the Picturesque, Corporate and the Early Gothic Styles* (New York: Oxford University Press, 1978), 271.

[159] Pierson, *American Architects and Their Buildings,* 305.

[160] Pierson, *American Architects and Their Buildings,* 307.

gable as the most striking feature of such "rural Gothic" cottages.[161] A plate from his book for a "Symmetrical Cottage," illustrates a house with a steeply pitched front gable fitted with decorative bargeboards and a finial and pendant. Like Pugin and Ruskin, Downing and Davis recommended natural materials and the honest expression of those materials. Given its affordability compared to other materials, wood was a logical construction material. Further, new technologies like the steam-powered scroll saw and building methods such as balloon framing allowed houses to be built more quickly and economically.[162]

In his writings, Downing cautioned against excessive ornamentation such as "overwrought verge boards" and "fanciful and flowing ornaments of a card-board character."[163] However, as historians Alma deC. McArdle and Deirdre Bartlett McArdle have described, "…in many instances the simple gables and bargeboards of Downing's unpretentious cottages quickly became a veritable riot of decoration."[164] Carpenters made liberal, and at times fanciful, interpretations of the Downing/Davis cottages, partly because sourcebooks on Gothic architecture were not as widely available as those devoted to classical architecture. This interpretation of the Downing/Davis cottages by builders became known as Carpenter Gothic. The style often featured gable ends fitted with decorative bargeboards made of thin wood, the fragility of the ornament earned it the moniker "gingerbread."[165] The bargeboards regularly featured Gothic-like tracery, such as that found on Davis's Blithewood gatehouse. Carpenter Gothic embraced the new technology of the day, as scroll-sawn bargeboards and machine-turned knobs and spindles became common features.

Carpenter Gothic-style cottages found a receptive audience among Methodist camp meetings in the mid- to late nineteenth century, particularly as the physical presence of campgrounds transitioned from tents to permanent buildings. The style's religious symbolism made it ideally suited for the ethereal escape camp meeting organizers hoped to establish. Indeed, the cottages often resembled churches, with double-door entrances, steeple-like finials, and scroll-sawn bargeboards that evoked tracery.[166]

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[161] Andrew Jackson Downing, *A treatise on the theory and practice of Landscape Gardening* (London: Longman, Brown, Green, and Longmans, 1849), 402.

[162] James L. Garvin, *A Building History of Northern New England* (Hanover, NH: University Press of England, 2001), 23-24.

[163] Andrew Jackson Downing, *The Architecture of Country Houses* (New York: Dover, 1969), 85.

[164] McArdle and McArdle, *Carpenter Gothic: 19th Century Ornamented Houses of New England*, 21.

[165] Ibid.

[166] Lampl and Kelly, "'A Harvest in the Open for Saving Souls,' The Camp Meetings of Montgomery County," 2004, 99.

The Washington Grove Camp Meeting Association

During the post-Civil War period, Washington's Methodist community experienced a resurgence, led in part by Reverend B. Peyton Brown (1830-1896), the enthusiastic pastor of Foundry Church between 1866 and 1869 and again in 1876-79. By 1868, Foundry was actively joining with other area churches to plan for a series of regional camp meetings. After a succession of planning meetings, a revival was held that August at Haislip's Woods near Annapolis Junction on the Washington Branch of the B&O Railroad.[167] Local interest in camp meetings was intensifying at this time, and, three years later, Foundry helped organize another camp meeting a few miles from Annapolis Junction at Severn Circuit. Methodist leadership in Washington, however, desiring a campground that could be under their direct ownership and control, organized a committee to select a site for a permanent camp. The committee, which included Reverend Brown, William R. Woodward (an attorney), Flodoardo Howard (a doctor and pharmacist), and several others, likely carried out their search during the late winter and spring of 1873.[168] The site they decided on was a 267-acre tract in Montgomery County that comprised the corner of a farm owned by Elizabeth Magruder Cooke (1804-1886), the widow of Nathan Cooke Sr. (1803-1869). Elizabeth Cooke was described as a "consistent member and worker of the Methodist Church South."[169] Nathan Cooke was a successful Maryland farmer, landowner, and investor. Relying in large part on slave labor, he grew crops on his farm and raised sheep and swine.[170] The portion of Cooke's farm selected for the camp meeting site included two springs, wooded groves, and fields. It was ensconced in Montgomery County's agricultural landscape, yet conveniently located along the Metropolitan Branch, which commenced passenger and freight operations on May 25, 1873.

Reverend Brown and his committee presented their choice for the camp meeting site at a meeting that took place at Foundry Church on June 16, 1873. The site met all of the criteria for a suitable camp meeting location. The heavily wooded areas of the property offered privacy, protection from the elements, lumber for building and fuel, and provisions for camping. Its meadows offered open clearings for carts, wagons, horse pens, and mercantile stands. Moreover, it was easily accessible by rail from Washington yet far enough from the city to enhance the sense for participants that the camp meeting was "a place apart" from everyday demands and routines. These last two factors were particularly important to the organizers of Washington Grove, who planned for the camp meeting to become a popular summer resort in addition to a successful religious revival.

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[167] Homer L. Calkin, *Castings from the Foundry Mold: A History of Foundry Church, Washington, D.C., 1814-1964* (Nashville, TN: Parthenon Press, 1968): 107-108.

[168] Edwards, *Washington Grove, 1873-1937,* 30.

[169] John Bowie Ferneyhough, ed., *Year Book of the American Clan Gregor Society* (Richmond, VA: Curtiss-Neal, Inc., 1928), 25.

[170] Archives of Maryland, Biographical Series, Nathan Cooke Sr. (MSA SC 5496-035312), available at https://msa.maryland.gov/megafile/msa/speccol/sc5400/sc5496/035300/035312/html/035312bio.html.

The organizers took stock subscriptions at the June 16 meeting to raise capital for the acquisition of the property and initial improvements to the grounds. On July 3, 1873, the Washington Grove Camp Meeting Association of the District of Columbia and Maryland purchased the land and the railroad right-of-way from Cooke's widow for the sum of $6,636.25.[171] The following day was the Fourth of July, and the association held a promotional picnic on the grounds. A description of the event read, "Yesterday a large number of Methodists of the District spent the day at the new campground – about one thousand going out on the Metropolitan branch road. The parties separated into small picnic parties, and rambled through the woods, all being well pleased with the location."[172]

The first camp meeting at Washington Grove began on August 13, 1873, and lasted for ten days. Although the weather was poor, with days of torrential rain, the event was declared a success. On a plateau of high ground within a clearing in the woods was the preacher's stand and rows of wood benches. Initially, the tents at Washington Grove were arranged in a grid pattern, with their entrances facing the preacher's stand and assembly area. This arrangement has its origins in early nineteenth-century campgrounds, which, as previously noted, were typically laid out along one of three plans – rectangular, circular, or open horseshoe. By the second camp meeting in 1874, the initial rectangular grid plan had been altered to accommodate an octagonal central gathering space. A newspaper article dated July 6, 1874, describing an excursion to Washington Grove in advance of the ten-day camp meeting read, "Numbers who are contemplating a sojourn in the grove…inspected the newly-arranged grounds, and endeavored to located their proposed homes in the woods. The stakes show that the inner court has been changed in shape from a square to an octagon, with radiating avenues entering upon it from four opposite directions."[173] Eventually, the octagon evolved into a circle, and the camp meeting took on a wheel plan featuring a central gathering space, the "Sacred Circle," surrounded by tent sites and six radiating paths, also lined with tent lots. The radial paths were designated First Avenue through Sixth Avenue. As previously noted, this arrangement was a derivative of the radial concentric plan most notably used at the Wesleyan Grove camp meeting on Martha's Vineyard. Washington Grove is the only known example in Maryland of this layout. Washington Grove historian Philip K. Edwards postulates that the rectangular plan may have evolved into a wheel form due to the weather, writing that, "There must have [been] much moving

[171] Edwards, *Washington Grove, 1873-1937,* 35. Per research conducted and compiled by Gail Littlefield, Washington Grove Historic Preservation Commission, the Nathan Cooke farm was comprised of parts of several eighteenth-century land grants patented by tobacco planters. By 1829, Jesse Leach, a wealthy landowner, had accumulated the parts of the tracts that comprised most of Nathan Cooke's farm. Cooke acquired Jesse Leach's holdings at a public sale in 1847. The property surveyed at 512.5 acres and sold for $1,281.25. Cooke had acquired the rest from the heirs of Jeremiah Crabb, a Revolutionary War hero, in 1846. See Montgomery County Historical Society tax rolls for 1796 (page 72) and 1813 (page 3) and Montgomery County Land Records (Deed Book STS 1, page 522 and Deed Book STS 4, page 210).

[172] "At the New Camp Ground," *Evening Star*, July 5, 1873.

[173] "Pic-nics and Excursions," *Evening Star*, July 6, 1874.

about of boundaries as tents were placed where they were practical instead of in neat rows."[174] The site's topography may have also influenced the spatial configuration of the grounds. The founders of Washington Grove placed the preacher's stand and assembly area at a high point within the site (roughly 522 feet or 159 meters above sea level), and the principal pedestrian route into the grounds (Grove Avenue) followed along the crest of a ridgeline. Because the ridgeline curved slightly east around the assembly area, the wheel plan may have been a more natural fit for the shape of the land.

A flyer distributed by the Washington Grove Camp Meeting Association in advance of the first camp meeting offered three sizes of canvas tents for rent – 10 by 12 feet, 12 by 16 feet, and 14 by 20 feet.[175] These tents came with a fly and were erected on wood platforms. Participants could also provide their own tent, but were charged a fee to rent a lot. According to Edwards, tent lots measured 15 by 20 feet or 15 by 30 feet.[176] An article in the *Evening Star* newspaper from August 13, 1873, reported that tents were "mostly about 14 feet square," perhaps indicating that most attendees furnished their own tents rather than renting them from the association.[177] In addition to the tents used by individual families and by church groups, open air tents were used to shelter "boarding saloons" that provided meals for campers and for daily excursionists. Market stands sold straw, furniture, perishables, and other goods. In September 1873, one month after the official opening of the camp meeting, the *Evening Star* reported that "the railroad had erected a station house at the grounds."[178] (While nineteenth-century newspaper articles refer to this building as both a station house and as a depot, the term depot will be used to describe the building, which was a large frame structure with a gable roof that sheltered an open waiting area. The term station will be used to refer to the enclosed structure built across from the depot in 1906.) In 1877, the preacher's stand and assembly space were replaced with a permanent pavilion known as the tabernacle. It was open on all sides, and heavy timber posts and beams supported a wide hipped roof. Bracing at the top of the posts resembled tree branches.

The founders of Washington Grove intended from the start that it would also operate as a summer resort. A promotional pamphlet from July 1873 read, "After the land has been plotted, it is the intention of the Trustees to issue renewable leases to sites suitable for summer residences, for which its nearness to the railroad, its elevated position…its salubrity, and numerous other advantages, renders it more desirable to the public than any other

[174] Edwards, *Washington Grove, 1873-1937,* 44.

[175] Edwards, *Washington Grove, 1873-1937,* 39.

[176] Edwards, *Washington Grove, 1873-1937,* 42.

[177] "The Washington Grove Camp Meeting, Description of the New Grounds and Arrangements for the Meeting," *Evening Star*, August 13, 1873. The same figure was reported by the *Baltimore Sun*. See "The Washington Grove Camp Meeting," *Baltimore Sun*, August 15, 1873.

[178] *Evening Star*, September 17, 1873.

place in the vicinity of Washington."[179] In fact, newspaper reports reveal that Washington Grove was being used as a summer retreat rather than simply a temporary revival site by many from Washington as early as 1878.[180] These families set up house well before the camp meeting, making good use of the grounds and its amenities. Features such as Maple Spring were popular destinations for nature walks, picnics, and other passive recreational activities. While many resided in tents, Washington Grove had its first cottages by the summer of 1878. A newspaper account reported that they were painted white, "so as not to mar the beauty of the contrast made under the thick green foliage of the forest trees and the clear white of the tents."[181] The same article noted that the houses were "handsomely arranged with Venetian doors, and divided into rooms to suit the convenience of their families, and ornamented according to the taste of the inmates…." As was customary at Methodist camp meetings, the trees, tabernacle, and fire stands at Washington Grove were whitewashed.[182] This tradition encouraged a "beautiful and cleanly appearance" and allegedly protected the trees from insects and fungus.[183] Lamplight and moonlight reflected off the painted trunks, helping with nighttime visibility.

For those who resided at Washington Grove, whether for a week or two to attend the camp meeting or for the entire summer season, the association provided many of the civic amenities offered by contemporary suburban communities. The most viable and enduring nineteenth-century suburban developments offered a range of facilities such as hotels, schools, libraries, churches, club buildings, athletic fields, public parks, and sometimes small business districts.[184] The suburb of Kensington had the first public library (the Noyes Library) in the Washington, D.C., area, which opened in in 1893. Francis G. Newlands, the founder of Chevy Chase, induced buyers to his community by providing a post office/library, public schools, a hotel, a recreational lake, and a country club. While Washington Grove did not have a school or a library, there was a hotel, a market, and open spaces for games and organized sports. The hotel (variably called the Albany Hotel or Hotel Albany) served long-staying seasonal guests as well as day-trippers. It was built in 1881 and located within Howard Park. The hotel's design and construction were supervised by one of the Grove's founding trustees, Richard H. Willet, who operated large lumberyards in Washington, D.C., and Maryland.[185] In 1884, the Grove could also lay claim

[179] Edwards, *Washington Grove, 1873-1937,* 39.

[180] Edwards, *Washington Grove, 1873-1937,* 95.

[181] "God's First Temple," *Washington Post,* August 3, 1878.

[182] "The Camp Meeting Season," *Evening Star*, August 11, 1881.

[183] Ibid.

[184] Kimberly Prothro Williams, Elizabeth Jo Lampl, and William B. Bushong, National Register of Historic Places Registration Form, "Chevy Chase Historic District," 8:56, draft dated October 1998.

[185] "The Camp Meeting Season," *Washington Post,* May 7, 1881, and Edwards, *Washington Grove, 1873-1937,* 160.

to a barbershop and a dentist.[186] Starting in 1886, a seasonal post office operated out of the hotel; year-round postal service began in 1890.[187]

Although the site selected by the association possessed natural springs that sparkled with "life-invigorating properties," one of the first improvements to the landscape was to dig several wells and install pumps to draw the water.[188] The wells provided a reliable and convenient source of water for drinking and other daily needs. By 1886, there were at least seven pumps within or near the Tent Department. As residential development expanded to other parts of the Grove, additional wells were added. By the late nineteenth century, the list included the Allen (also known as Broadway) well, the Jackson Park well, the depot well, the Hotel Park well, the well in the superintendent's yard, the Dorsey well, the Wide well, the Platt well, the Benson well, and the Sixth Avenue well. In 1897, a water tank on a raised stand was erected in the hotel yard. Water from the hotel well was pumped into the tank and routed to a boiler in the kitchen, providing guests with hot water.[189] In the off-season, the pumps were removed from the wells and well covers were put in place. Over time, repairs included relining the wells with terra cotta pipe, partially filling them to prevent excess standing water, and redrilling.[190]

Washington Grove had a dedicated stop on the Metropolitan Branch, and the Humpback Bridge, built by the B&O in the 1870s, greatly facilitated local travel, trade, and communication by providing a safe above-grade crossing at a blind curve in the tracks. The subdivision of Oakmont on the west side of the tracks from Washington Grove was platted in 1888 by Henry Beard and James G. Craighead of Washington, D.C. Oakmont's developers hoped to take advantage of the popularity of the camp meeting and the convenience and proximity of the railroad to subdivide and sell the land for residential development. The initial plat for Oakmont included a park "dedicated for public recreation," that was located directly across from the Washington Grove railroad depot.[191] The parcel north of the park was owned at the time by the Washington Grove Camp Meeting Association. (This land was later sold.) The parcel to the south (today 17030 Oakmont Avenue) was improved in 1889 when Beard and Craighead built a two-and-a-half story, frame building on the lot, which operated as a

[186] "A City in the Woods: Religious Services as Washington Grove – The Guests of the Hotel," *Washington Post*, August 15, 1884.

[187] Edwards, *Washington Grove, 1873-1937*, 168-69.

[188] "Washington Grove, A Delightful Resort – the Grounds and Cottages – Opening of the Camp," *Washington Post*, August 5, 1883.

[189] President's Report, May 1897, WGA, Box D-1, File DA.0001.23.

[190] Grounds Committee, July 1890, WGA, Box H-4, File DA.00H4.06 and Grounds Committee, August 1897, WGA, Box H-4, File DA.00H4.19.

[191] Montgomery County, Circuit Court Land Records, Book JA 9, page 490, June 23, 1888.

general store.[192] In 1894, the Washington Grove post office moved into a section of the store, where it remained for over eighty years.[193] For the residents of Washington Grove, the market and the post office were an important part of camp meeting life. As much as wholly uncommercialized suburban retreats were idealized, in reality, local merchants offered convenience and practicality that improved everyday living.

Like many religious campgrounds, the transition from tents to permanent cottages at Washington Grove took place over a number of years. While the massing and form of Washington Grove's camp meeting-era cottages evoked the canvas structures that initially made up the community, development was strongly influenced by nineteenth-century trends in architecture and vernacular building. Nationally, the Carpenter Gothic style, which was advanced by builders as an American domestic interpretation of the Gothic Revival, was pervasive among Methodist campgrounds. At Washington Grove, this style was expressed using scroll-sawn bargeboards, bracketed pendants, decorative dressings over or around windows and doors, and turned or chamfered porch posts.[194]

As previously noted, the cottages at Washington Grove were initially built on tent lots, which constrained their size and massing. As a result, many cottages had a rectangular plan that measured 14 feet wide by 30 feet deep.[195] Frequently, cottages were expanded as more space was needed. A newspaper article from 1880 noted that while new cottages continued to be put up, "many of those already built have been enlarged by the addition of kitchens and dining rooms."[196] Since outdoor space within the building lots was limited, some families planted small gardens in front of their cottages.

While the names of many of the carpenters and builders who worked at Washington Grove are unknown, records indicate that one pioneer cottage builder was W. A. Scott.[197] Scott was an African American who was living in the area when Washington Grove was founded. In 1883, he was appointed superintendent of the grounds and was given year-round use of a one-and-a-half-story, frame house located near the corner of Center

[192] "Washington Grove Restaurant a Hub since 90-year Post Office Stint," *Montgomery County Gazette*, September 9, 2009, available online at http://www.gazette.net/stories/09092009/damanew231658_32546.shtml, accessed March 29, 2019.

[193] Edwards, *Washington Grove, 1873-1937*, 170.

[194] According to historian Clare Lise Kelly, Washington Grove is the only intact collection of Carpenter Gothic cottages in the state and one of the few in the country.

[195] These dimensions represent a unifying module that has guided the development of Washington Grove, helping to maintain the modest scale of its houses.

[196] "At Washington Grove, Sixteen Cottages Already Occupied – Improvements During the Year" *Washington Post*, July 3, 1880.

[197] Edwards, *Washington Grove, 1873-1937*, 135-136.

Street and Chestnut Road (the site of the current parsonage at 101 Center Street). Behind the superintendent's cottage were several outbuildings, fields, and pasturage.

Initially, the Washington Grove Camp Meeting Association issued stock at $20 a share. Around 1880, the association embraced the concept of "located stock," wherein ownership of stock ensured the investor one vote at stockholders' meetings and a tent or cottage site depending on the number of certificates she held. One share entitled the stockholder to one tent site. Once the tent site was selected, it was said to be "located." Five shares entitled the stockholder to one cottage site. Administration of this system was difficult, as most of the Grove had not yet been platted. As Edwards has noted, this quickly created a messy state of affairs that involved "leaseholders without stock, stockholders without lots, and lots without leases."[198] The association corrected the situation in 1882 when it adopted a new charter and bylaws (submitted to the Maryland legislature in 1883) that included a provision for 99-year leases.

Although Washington Grove's initial layout (comprising the Tent Department) derived from camp meeting traditions, its later development had a gridiron plan typical of many late nineteenth-century suburbs. Outside the Tent Department, the layout of the roads and the arrangement of lots within Washington Grove was primarily guided by two plans – the 1886 Lang plan and the 1897 Maddox plan. As previously mentioned, the association adopted an amended charter in 1882, which prompted an evaluation of its undeveloped lots and open spaces. Thus, around 1885, it hired surveyor and civil engineer J. C. Lang to survey and prepare a plan for the grounds. The plan, which was dated 1886, created new building lots along a system of alternating avenues (for pedestrian use) and roads (for vehicular use). This scheme reinforced the sylvan character of Washington Grove and had a beneficial impact on the health, safety, and appearance of the grounds. It can been seen as an early precursor of the Radburn scheme of community planning, which derived from Garden City principles and became popular in the late 1930s and 1940s as an alternative to standard suburban subdivisions that placed houses facing the street and sidewalks. The Radburn system utilized a circulation system that separated pedestrian and automobile traffic by grouping houses on a common green facing a network of pedestrian paths. Access roads and driveways were located at the back of the lots. In theory, this plan increased neighborhood safety by reducing traffic accidents.[199] The Lang plan also dedicated several blocks of land for public parks and set aside the undeveloped, wooded area in the northeast quadrant of the Grove, now known as the East Woods, as a "Laundry Reserve" and "Carriage Park."

The later plan, prepared by Montgomery County surveyor C. J. Maddox in 1897, carried over many of the concepts of the Lang plan, but took into account the entire property, with the exception of the West Woods. In the Cottage Department, the Maddox plan laid out generous building lots, measuring 50 by 150 feet or larger,

[198] Edwards, *Washington Grove, 1873-1937,* 111.

[199] Linda Flint McClelland, David L. Ames, and Sarah Dillard Pope, National Register of Historic Places Multiple Property Documentation Form, "Historic Residential Suburbs in the United States, 1830-1960," E: 20-21.

50-foot-wide avenues, and 25-foot-wide roads. The plan identified by name several small parks within the Tent Department, including Wade Park and Knott Park, and set aside three blocks within the Cottage Department as a public park named in honor of William R. Woodward, one of Washington Grove's founding trustees. The Maddox plan eliminated many of the irregular lots of the earlier plan and defined a gridiron system. The gridiron plan was an efficient and inexpensive way to subdivide and sell, or, in the case of Washington Grove, lease the land. In this way, the physical plan of Washington Grove reflected the organization of many railroad and streetcar suburbs across the United States. As Edwards has noted, "The Maddox subdivision plan is almost indistinguishable from the present town plan, a testimony to both its sensibility and its adaptability."[200]

The original, 267-acre tract of land purchased by the organizers of the Washington Grove camp meeting included nearly 47 acres on the west side of Laytonsville Road (now Washington Grove Lane). As the location of two springs (Whetstone Spring and Maple Spring), this wooded area was a vital source of water and an essential part of the camp meeting grounds. Separated by a roadway from the Tent and Cottage departments, the woods were never platted for building lots. In fact, the West Woods were not included in the 1897 Maddox survey. Instead, the woods were harvested for timber, and camp meeting attendees and summer residents used the logging trails for picnics and excursions. A contemporary description of the West Woods read, "Beyond the buildings rustic rambles lead to the mineral springs and many other beautiful shade spots, which lie outside the fence that surrounds the settlements. It is a model picnic ground, where every spot is shady, and a pump or spring lies at every turn…."[201]

By the end of the nineteenth century, Washington Grove was an established resort community with hundreds of residents that made it their home for the entire summer. It boasted a popular hotel, postal service, some gravel roads, a fine collection of summer cottages, and recreational facilities, including tennis courts. One newspaper account characterized it as "a veritable *urbe un rus*, a sylvan city…nature and modern improvements combined."[202] While annual camp meetings were still taking place, canvas tents had become a memory of the past.

As families began to extend their stays across the summer months, demand increased for a place for religious assemblies that would provide greater comfort in poor weather than the open tabernacle. In 1894, the market house that stood near the hotel in Howard Park was converted into an assembly building by creating large openings along its sides and building a platform at one end. It was used as a temporary chapel during inclement weather and later was dedicated as the "Young People's Hall."[203] A permanent place of worship, however, one

[200] Edwards, *Washington Grove, 1873-1937*, 127.

[201] "Opened by Leaguers: They Hold a Camp-Meeting at Washington Grove," *Washington Post*, August 21, 1895.

[202] "In the Old Fashioned Way," *Washington Post*, August 7, 1892.

[203] Grounds Committee, May 1894, WGA, Box H-4, File DA.00H4.010.

that was more suitable than a converted warehouse, remained a priority. To provide such a space, the association built an assembly hall (today known as McCathran Hall) at the south end of Howard Park near the hotel. It was designed by architect A. L. Harris of Washington, D.C.[204] Completed in 1901, the assembly hall was comprised of an octagonal hall that measured 20 feet to a side and an attached meeting room that measured 20 feet square. The windows were generously proportioned to bring ample light to the interior, and at the peak of the octagonal roof was a louvered cupola. In addition to church services, the building was used for Sunday school activities and for Chautauqua, which had its first season at Washington Grove in 1902.

Washington Grove in the Early Twentieth Century (1902-1937)

Suburbanization in the Progressive Era

Historians continue to debate the nature of progressivism and the Progressive Era, which lasted roughly from 1890 to 1920, but those who identified as progressives in the early twentieth century were generally committed to enacting economic and social reforms at local, state, and federal levels on behalf of the public interest. The depression of the 1890s, increased urbanization, the closing of the American frontier, discoveries by investigative journalists of governments corrupted by the influence of business interests, and the transformation of American society through immigration led Americans to believe that existing institutions could not meet the needs of a rapidly changing country. Progressives argued that the nineteenth-century faith in unrestrained individualism and an unregulated marketplace had created a nation controlled by greed and blind social forces that were destroying American society and ideals. Progressives broadly favored intervention into economic and social life to bring industrial change under control and alleviate its worst conditions.[205] A powerful faith in environmental determinism convinced reformers that improving the physical environment would "elevate" rural social life.[206] Society could be improved and government could be reformed to serve the public interest, progressives argued, by employing technocratic experts who could apply their knowledge to specific problems.

At the turn of the twentieth century, American families investing in the suburbs could expect to buy a detached home in a safe and sanitary environment that offered every modern convenience. Across the country and in the region there was massive public investment in roads, storm sewers, playgrounds, and other services.[207] As the new language of illness associated with great cities, industrialism, and technological advance entered into the American consciousness, reformers advocated for "permanent residence among the trees," writes historian John

[204] "Families in Summer Quarters," *Washington Evening Star*, June 18, 1901.

[205] John Whiteclay Chambers, *The Tyranny of Change: America in the Progressive Era, 1890-1920* (New Brunswick, NJ: Rutgers University Press, 2006), 136.

[206] Stilgoe, *Borderland*, 196.

[207] Jackson, *Crabgrass Frontier*, 131.

Stilgoe.[208] Utilities and essential services became a prerequisite for creating the best environment for suburban living.

The Impact of Infrastructure Improvements at Washington Grove

At Washington Grove, one of the most aggressively pursued undertakings of the Progressive Era was the issue of sanitation. Widespread public belief that disease was caused by dirt, stagnant water, and "miasmas" in the air coupled with the threat of periodic summer outbreaks of cholera, dyptheria, and other diseases led the association to take active measures to maintain a clean well water supply, drain the grounds, and dry out low, swampy areas and locations prone to recurring puddling and flooding. Concurrently, the association encouraged growth in undeveloped areas of the grounds, as cramped conditions within the Tent Department were equated with urban overcrowding and raised concerns over the spread of disease and the increased risk of fire. In 1886, the president of the association warned stockholders, "Living as we do – many of us – in closely built avenues, one careless and uncleanly family might cause serious trouble for all."[209] As a result of increased attention to these issues, the residents of Washington Grove began to reframe their relationship with the built environment. The preference for the shelter, shade, and enclosure of the forest setting was cast aside in favor of open spaces characterized by the circulation of fresh air and penetrating sunshine.

By 1885, the association had created a Committee on Grounds and Supplies, whose most pressing matter was perceived to be "the proper sanitation of the place."[210] The wells were frequently inspected and the water tested to ensure a clean supply. Subsequent work included digging ditches to channel surface water, filling sunken lots and poorly drained sections of the parks, and laying terra cotta sewer pipes to facilitate drainage. Clearing the drains and culverts was the responsibility of the superintendent of the grounds, and residents were encouraged to properly dispose of their waste water. The association hired a scavenger service to remove "night soil," and camp privies were located in the East Woods where the waste was treated with lime. One long-time scavenger was J. H. Nugent, who lived in Emory Grove.[211] The hotel's sewerage was deposited in a cesspool in the West Woods.[212]

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[208] Stilgoe, *Borderland*, 189-90.

[209] Edwards, *Washington Grove, 1873-1937*, 131.

[210] "Timeline: Sanitation, Health, Disease, Clean Water, Safety, Alcohol, Fire," prepared by Wendy Harris, Washington Grove Historic Preservation Commission.

[211] Ibid., 132.

[212] Edwards, *Washington Grove, 1873-1937*, 316.

By 1880, the Grove had installed an 18-inch drain pipe within the Circle to eliminate standing water around the tabernacle.[213] The pipe channeled water under Grove Road and into the East Woods. Early improvements such as these, however, were ultimately found insufficient. In 1905, a sewer was constructed by private means along the west side of Grove Avenue, but it only served a small number of residents. Finally, in 1912, the association installed a sewer under Grove Road with professional assistance from a sanitary engineer, and its success triggered additional study of the issue. The following year, the *Washington Post* reported, "At a recent meeting of the stockholders of Washington Grove, Md., new members were elected to the board of trustees on a progressive ticket, and last week the stockholders authorized…the installation of an electric street lighting system and an examination of a civil engineer of the present sewage system with a view to making a new system."[214] Washington Grove, however, would not have a modern water and sewer system until 1927. The design and construction of the sewer system, which would serve Gaithersburg as well as Washington Grove, was the responsibility of the Washington Suburban Sanitary Commission, which was created in 1916. Water and sewer lines were run under the avenues, the old sewers were disconnected, and a much-needed fire hydrant system was installed. It was largest engineering project at the Grove to date. Despite the convenience of the modern system, however, some residents were slow to install indoor plumbing and connections.[215] The Grove discontinued its scavenger service around 1930, and by 1938, all of the wells were filled and most of the pumps were pulled.[216]

Another essential service introduced in the Grove during this period was electricity, which was supplied by the Potomac Electric Power Company (PEPCO) and powered an electric street lighting system. The Grove's first streetlamps burned kerosene (coal oil) and were affixed to rough hewn wood posts. From around 1890 to 1895, gasoline lamps were used, but the cost became prohibitive. In 1896, to save money, the association reinstalled its kerosene lamps so that the oil could be used during the months of May, June, September, and October, when fewer people were living on the grounds.[217] Eventually, all of the gasoline lamps were sold at public auction. The Grove also had a gas lamps starting in 1891. A newspaper report noted, "In one of the cottages, that of Mr. Cissel, natural gas is employed, and he has connected his machine with two jets in the tabernacle with such satisfactory result that it has been determined to employ the gas next year."[218] Gas lamps would remain the primary fuel for streetlights until 1914, when they were replaced by the electric streetlights. The new system

[213] "At Washington Grove," *Washington Post*, July 3, 1880.

[214] "Washington Grove Elects," *Washington Post*, June 8, 1913.

[215] Edwards, *Washington Grove, 1873-1937*, 316-19.

[216] Edwards, *Washington Grove, 1873-1937*, 377.

[217] President's Report, May 1896, WGA, Box D-1, File DA.0001.22.

[218] "Inland Asbury Park," *Washington Post*, August 17, 1891.

used iron poles with elegant curved tops. Power was turned on that July to fifty-one customers, including the association, which lit the assembly hall and the Chautauqua auditorium.[219] The introduction of electric streetlights was seen as an important step toward a new era of development in Washington Grove.

Yet another major infrastructure project of this period involved Washington Grove's roads. By the 1920s, the condition of the Grove's streets and alleys became a critical issue. Increased automobile ownership meant more traffic that required tougher road surfaces. During the nineteenth century, improvements to the roads and paths within Washington Grove occurred as funds became available. However, urban families wishing to relocate to the suburbs had many options, and Washington Grove needed to compete. Thus, by 1928, the Grove had all of its roads paved with a thick base of cinders (donated by the B&O) that was then packed and oiled, which acted as a binder.[220] This vastly improved access and movement through the grounds.

Finally, reflecting national concerns shared by many American suburban families about "protecting the self and family from intrusion," improvements to the Grove's perimeter fence became a priority in the early twentieth century.[221] Since the mid-1870s, fences were used to mark boundaries and land use divisions, to provide privacy and protection to participants in the camp meeting, and to deter the use and distribution of alcohol. By 1892, a "handsome and substantial fence" had been erected around the entire grounds, replacing the first generation of fencing that had fallen into disrepair. For a time, African Americans were permitted to walk through Washington Grove, using Grove Avenue, to get to Emory Grove. However, later, with Jim Crow segregation and the doctrine of "separate but equal" confirmed by the U.S. Supreme Court in the Plessy v. Ferguson decision of 1896, the B&O trains and stations, including Washington Grove's, were segregated. Washington Grove's perimeter gates were closed to Emory Grove camp meeting attendees in 1897.[222] In 1910, the association enclosed the entire property with "good, strong wire fencing."[223] In addition to the perimeter fence, picket, split rail wood, and wire fencing was used around public parks and buildings, to demarcate and secure pastures owned by the association, and by homeowners to delineate property lots. In 1908, a wire fence was put up around the auditorium in Woodward Park. Historically, some cottage lots were fenced, although fences between or in front of cottages within the Tent Department were less common than fences within the Cottage Department, where lot sizes were generally larger. Hedges and porch blinds were also used by families to provide privacy and protection from intruders.

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[219] Edwards, *Washington Grove, 1873-1937*, 250.

[220] Edwards, *Washington Grove, 1873-1937*, 352.

[221] Stilgoe, *Borderland*, 196.

[222] Edwards, *Washington Grove, 1873-1937*, 137.

[223] Grounds Committee, May 1910, Box H-4, File DA.00H4.38.

Park Beautification and Recreational Amenities

This period also saw Grove residents shift their focus from the spiritual and restorative attributes of the environment to its aesthetic and recreational qualities. In suburban communities across the country, beautification efforts were seen as a moral necessity. Village improvement by beautification, Stilgoe writes, was "no whimsical pastime, but a vitally urgent effort at turning back city evil."[224] In many instances, these beautification efforts were undertaken by women's groups, as they were perceived to be an extension into the public realm of a female's role in the home. A growing number of American families were also privileged with increased leisure time, which came with it a growing acceptance of physical activity and sport. The benefit and value of recreation shaped the development of suburban landscapes, where "real nature was forgotten in the midst of manicured greens and all-weather tennis courts."[225]

Following the construction of the assembly hall in 1901, the tabernacle in the Circle had become obsolete. In 1905, the 28-year-old timber structure was demolished. After clearing away debris, draining the space, and filling and leveling the ground, the association took steps to "beautify" the grounds of what was then called the "Plaza." This included planting grass seed and laying drainage pipes.[226] It was also around this time that the Washington Conference of the Methodists' Ladies Guild established a tradition of park beautification projects in the Grove. The organization sponsored improvements to Knott Park, Jackson Park, Wade Park, and Morgan Park. The association carried out grounds improvements as well. In May 1913, the president boasted that 200 fruit and shade trees had been planted over the course of the year. Later, in 1920, the Grounds Committee reported that a "landscape gardener" by the name of Mr. Murphy had visited the Grove and submitted an estimate for furnishing and planting evergreens and shrubs. These would be planted following a design by Washington Grove resident Nettie Craig, a member of the Ladies Guild.[227]

In 1905, the Woodward Park was informally expanded west to Grove Road. That same year, the area bound by Oak Street on the north, Maple Avenue on the east, the building lots on Pine and Maple avenues on the south, and Grove Road on the west were set apart for recreational purposes and dedicated as an "Athletic Park."[228] This land was poorly drained and consisted of mainly thicket and bog before it was adapted for recreational use.[229] Concurrently, the eastern half of Oak Avenue and Maple Avenue were cleared and graded, and an

[224] Stilgoe, *Borderland*, 214.

[225] Jackson, *Crabgrass Frontier*, 99.

[226] Grounds Committee, June 1908, WGA, Box H-4, File DA.00H4.34.

[227] Grounds Committee, September 1920, WGA, Box H-4, File DA.00H4.73.

[228] Edwards, *Washington Grove, 1873-1937*, 195.

[229] Edwards, *Washington Grove, 1873-1937*, 120.

auditorium for Chautauqua was constructed in the park. (See additional text on Chautauqua below.) In addition to the auditorium, built structures in Woodward Park included a men's clubhouse (no longer extant), a girls' clubhouse (built in 1910), which was used by the Woman's Club before being destroyed by fire in 1939, and a stone fireplace, built in 1935. Woodward Park's tennis courts and athletic fields were popular with residents and the public. For a period beginning in 1903 and continuing through at least 1916, track and field events were held in the park every summer.[230] They attracted athletes from Maryland as well as from neighboring states.[231] Private tennis courts, laid out on empty building lots, also proliferated in this era. Edwards writes that at one time there were twenty or more active courts scattered across the grounds.[232]

In 1910, the association initiated a project to create an "artificial lake" in the West Woods that would be fed by Maple Spring. The lake (now known as Maple Lake) was used for recreation in the summer and to harvest ice in the winter.[233] However, since water sports were discouraged by the Methodists, the recreational function of the lake did not immediately flourish. Its use as an ice pond was also short lived. As a result, the lake fell into disuse for a number of years until the summer of 1927, when it was briefly revitalized.

Development of the Commercial Corner

As Washington Grove and the neighboring subdivision of Oakmont developed in the last decades of the nineteenth century, the surrounding area mainly supported family operated farms. Wheat and dairy farms located along the railroad benefitted the cheap and efficient means of transportation it offered. Laytonsville Pike (now Washington Grove Lane) was also an important part of the local transportation network, connecting Gaithersburg with Laytonville and points north. One local farm, which bordered Washington Grove to the west, was owned by Thomas I. Fulks, a prominent Gaithersburg farmer and businessman. South of Ridge Road was a 48-acre farm that was purchased by Washington Grove as part of the original land acquisition for the camp meeting but sold in 1890. These agricultural properties and others formed the setting of Washington Grove well into the twentieth century and contributed to its appeal to visitors and homeowners as "a place apart."

Although platted for residential development in the 1897 Maddox plan, the lots facing the corner of Washington Grove Road and Railroad Street (Lots 1 and 2 of Block 1) had been used for a nonresidential purposes since the camp meeting era. Thomas I. Fulks owned shares of the Washington Grove Camp Meeting Association and

[230] "Sports at the Grove," *Washington Post*, September 8, 1903, and "Hold Athletic Meet of Numerous Events," *Washington Post*, September 5, 1916.

[231] Board of Home Missions of the Presbyterian Church in the U.S.A, *A Rural Survey in Maryland* (New York: n.p., 1912), 47, 49.

[232] Edwards, *Washington Grove, 1873-1937,* 177.

[233] Grounds Committee, May 1910, WGA, Box H-4, File DA.00H4.38.

located them on the corner lots. In 1897, he was granted permission by the association to operate a general store on Lot 2. Given the Methodists' condemnation of "worldly habits," Fulks was prohibited from selling alcohol from his establishment, which he called the Washington Grove Store. Five years later, in 1902, Fulks, then president of Gaithersburg Milling and Manufacturing, purchased a 238-acre farm west of Washington Grove and across Washington Grove Lane from his store. The purchase of the farm was subject to a lease of part of the property that bordered on the railroad tracks to Henry C. Miller for the period 1900 to 1906. It is not known what type of business Miller conducted on the property, but when his lease expired, Fulks did not renew it. Around 1910, Fulks rented the general store to Marshall Walker and opened a feed supply business on the property adjacent to the railroad tracks that had formerly been leased to Miller. The operation included a feed mill (built circa 1910 from an old hay barn that stood on his farm), a feed store, and an office. In addition, the property featured a rail siding and a scale, which was embedded into the ground next to the store.[234] In 1919, the local Odd Fellows lodge purchased Lot 1 from Fulks, and the following year the organization built a large hall on the property for their meetings. The Odd Fellows Hall was a two-story building designed by architect W. S. Ploger of Washington D.C. It was built of concrete block molded to resemble rusticated ashlar stone and dressed quoins and featured a stepped front-gable roof.

In 1896, after the railroad freight siding was moved from the east side of the Humpback Bridge to the west side, the association sold the small triangle of land it owned between it and Railroad Avenue to John B. Diamond. Later, likely in the first decade of the twentieth century, it was acquired by the Washington Grove Manufacturing Company. Standard Oil purchased the property in 1914, and by 1933 it had been improved with a one-story brick building, adding another commercial presence to the corner of Washington Grove Lane and Railroad Street.

Decentralization and Residential Development

Taken together, concerns over health and sanitation, infrastructure improvements, the construction of the auditorium in Woodward Park, the beautification of the parks, and the development of recreational facilities had the effect of encouraging residential development outside of and away from the historically sacred precinct of the Circle and represented a decentralization of community life at the opening of the twentieth century.

In the first decade of the twentieth century, several avenues platted in the Maddox plan were cleared and graded, creating new building lots for development. While these newly opened areas were attractive to Washington Grove residents who wanted larger lots and more sanitary conditions, not everyone had the means or desire to build new homes. As such, this period witnessed a series of cottage relocations wherein residents moved existing cottages, often from the Tent Department, to new lots. In 1905, the cottage that stood next to 15

[234] Information on Fulks, the Washington Grove Store, and the feed mill complex comes from Gail Littlefield and Judy Christensen, draft Maryland Inventory of Historic Properties Form, "Gaithersburg Farmers' Supply, Wayne Feed, Sunshine Feed, Thomas I. Fulks Store," no date. Copy provided courtesy Gail Littlefield.

the Circle, was moved to the southeast corner of Oak and Maple. (Later, in the 1960s, this cottage was demolished.) The same year, a cottage that stood on a Circle lot that is now part of 402 Fifth Avenue was moved to 205 Maple Avenue. In 1906, a cottage in the yard of 413 Grove Avenue (the Teepe cottage) was moved to 105 Grove Avenue and renovated. Also in 1906, a cottage in the yard of 1 the Circle was relocated to 102 Center Street and renovated. In some instances, cottages were combined to create larger homes. The house at 102 Ridge Road, for example, is the result of two nineteenth-century cottages that were moved to Ridge Road in the second decade of the twentieth century and joined to form one residence. By and large, the repositioning of cottages created open pockets of space, relieved crowded conditions, and mitigated the threat of devastating house fires within the Tent Department while expanding the built environment of the Grove.

Shortly after the turn of the century, Frank R. Rynex became the first resident to build a year-round house in Washington Grove – a watershed moment marking the transition from religious summer resort to suburb. According to Edwards, Rynex, who had been living with his young family in a cottage on the Circle, purchased five shares of stock and "located" them on Chestnut Avenue. Records suggest Rynex was not alone in speculating on Chestnut Avenue. In 1903, the president of the association reported, "The lots on Chestnut Avenue are mostly taken and that avenue [is] fast building up…."[235] The Rynex house at 202 Chestnut Avenue, which was completed in 1903, is a one-and-a-half-story, Carpenter Gothic-style, frame house with a cross-shaped plan and a deep, wraparound, front porch. The Rynex family enjoyed leading a "country life" at Washington Grove, and soon other "pioneers" joined them in year round living. While some families built new houses, many more winterized existing cottages and built additions to give them more space.

New residential development within Washington Grove in the early twentieth century encompassed a diverse range of architectural forms and styles, reflecting the evolving preferences of middle-class American families. Some of the new houses had vernacular forms that echoed the Carpenter Gothic architecture of the camp meeting era. Early twentieth-century pattern books, however, offered American families a wide selection of houses at affordable prices and helped popularize Craftsman, Colonial Revival, and other styles at the local level.

Houses demonstrating the vernacular tradition included the cottage at 409 Fifth Avenue, built in 1909, which had a gable-front-and-wing plan with a shed-roof porch located within the L made by the two wings. 405 Brown Street, built in 1914, was a two-and-a-half-story, gable front house. It was clad with German lap wood siding. While the front porch extended across the entire front façade, it lacked the Carpenter Gothic decorative details that characterized the earlier era. A more compact version of the gable front form was built at 311 First Avenue. This one-story cottage was built between 1920 and 1935.

In communities across the nation during this period, the Craftsman style peaked in popularity. This style, influenced by England's late nineteenth-century Arts and Crafts movement, emphasized simple, informal floor

[235] President's Report, May 1903, WGA, Box D-1, File DA.0001.30.

plans and rustic detailing and appealed to progressive ideals that stressed simplicity and efficiency. Craftsman-style bungalows typically used natural materials, such as stone or wood shingles, and featured sheltering rooflines and inviting porches. The bungalow, as well as the larger foursquare form, were sold by catalogs that offered detailed architectural plans for a small fee, a process that helped to democratize home building. The house at 127 Chestnut, built around 1920-35, is a notable example of a Craftsman-style bungalow in Washington Grove.

Although not seen as frequently as vernacular or bungalow forms, Colonial Revival-style houses were also built in the Grove. The Colonial Revival was the most prominent residential style in the United States in the first half of the twentieth century. Colonial Revival homes in Washington Grove, as elsewhere, borrowed elements from Georgian and Federal buildings and typically featured pedimented entrances and entry porches, elaborate doorways and window treatments, plain or decorated cornices, pilasters, and roof balustrades. In form, the style emphasized symmetrically arranged, two-story massing under side-gabled or hipped roofs.

During the Great Depression, new construction nearly came to a standstill across the country and in Washington Grove. Locally, families put off improvements, and many of Washington Grove's cottages were leased to generate rental income or sat empty.[236] In 1933, the association found itself in debt and unable to pay the salary of the superintendent. Development slowly picked up, however, around mid-decade. In a show of confidence for the next stage of Washington Grove's development, the association adopted its first street numbering system in 1935.

Chautauqua Comes to Washington Grove

The Chautauqua Movement developed in the last quarter of the nineteenth century to provide programming and courses for cultural uplift and recreation. Those who established Chautauquas across the country largely based their program on their namesake, the original Chautauqua Institution in western New York. The Chautauqua Institution was founded by Methodist bishop John Heyl Vincent and business leader and philanthropist Lewis Miller as a summer school for Sunday school teachers. It was located at a Methodist camp meeting facility on New York's Chautauqua Lake. Vincent and Miller's institution added an education component to the Methodist camp meeting program, and, because of these origins, Chautauquas had a long-running connection to American Methodism and camp meetings.

Vincent and Miller's interest in Enlightenment educational ideals, as well as the success of the first summer Sunday school class in 1874, led them to introduce secular courses in arts and sciences. The expanded curriculum had as antecedents the popular educational movements of the antebellum period. Lyceums, athenaeums, mechanics' institutes, mail-order book clubs, and other public-focused education programs were well attended in the nineteenth century. In addition to educational courses, the Chautauqua Institution soon

[236] Edwards, *Washington Grove, 1873-1937*, 346.

offered musical performances and lectures on a variety of topics. Given the institution's natural surroundings on the lake, recreation in a healthful setting also became an important tenet of the Chautauqua ideal.[237]

In 1878, Vincent began the Chautauqua Literary and Scientific Circle (CLSC), a four-year, mail-order reading program that provided a full curriculum, complete with textbooks and exams.[238] Participants were required to read four to six substantial books per year in literature, history, sociology, and science. Students had the choice of either reading on their own or joining a local reading circle.[239] By 1900, around 50,000 people had completed the program.[240] At the end of the program, CLSC participants were awarded a diploma and encouraged to attend a ceremony known as "Recognition Day" at the New York Chautauqua, at an independent assembly, or at a village reading circle.[241] Students of Chautauqua summer school programs tended to be young adults interested in teaching careers. Much of the success in building the Chautauqua Movement can be attributed to women, who dominated CLSC membership, hosted fundraisers, and led efforts in small towns to incorporate Chautauqua assemblies.

Because Vincent and Miller were not interested in franchising Chautauqua, the movement it inspired was non-hierarchical.[242] What became the Chautauqua Movement manifested itself in two distinct forms: the independent assembly and the circuit Chautauqua. The independent assembly was intended to be in a permanent location and was modeled on the original Chautauqua Institution, with lecture and entertainment programs, academic programs, and recreation in a resort setting.[243] By the turn of the twentieth century, more than 100 towns hosted independent assemblies. At least twenty-two assemblies were formed on preexisting Methodist campgrounds.[244] In many cases, Chautauquas operated alongside regular camp meeting activities. The Mountain Chautauqua, for example, was founded in 1882 by a group of Methodists as part of the summer resort

[237] Andrew C. Rieser, *The Chautauqua Moment: Protestants, Progressives, and the Culture of Modern Liberalism* (New York: Columbia University Press, 2003), 101-03.

[238] Rieser, *The Chautauqua Moment,* 104.

[239] John C. Scott, "The Chautauqua Movement: A Revolution in Popular Higher Education," *The Journal of Higher Education* 70, no. 4 (July/August 1999), 396.

[240] Martha Vail, National Historic Landmark Nomination, "Colorado Chautauqua," June 15, 2005, 47.

[241] Theodore Morrison, *Chautauqua: A Center for Education, Religion, and the Arts in America* (Chicago: University of Chicago Press, 1974), 58.

[242] Martha Vail, National Historic Landmark Nomination, "Colorado Chautauqua," June 15, 2005, 47.

[243] Scott, "The Chautauqua Movement: A Revolution in Popular Higher Education," 394.

[244] Rieser, *The Chautauqua Moment,* 47.

community of Mountain Lake Park in Garrett County, Maryland. It was the first Chautauqua held in Maryland, and, during its heyday between the 1880s and World War I, the Chautauqua's educational and cultural activities attracted thousands to Mountain Lake Park. The annual summer program spurred the development of numerous cottages, hotels, and public buildings, many of which remain in excellent condition today.[245]

The circuit Chautauqua was a traveling production that featured a roster of entertainers and educators that visited towns across the United States for just a week or two at a time.[246] These tent shows were more entertainment focused than the independent assemblies. The first circuit Chautauqua was presented in summer 1904 in Marshalltown, Iowa.[247] The success of the circuit Chautauqua, however, came at the expense of the independent assemblies. Organizers of assemblies found it difficult to compete with the consumer-oriented tent shows. In response, many independent assemblies became more entertainment focused and less overtly religious. This shift drove away the Christian fundamentalists who contributed to much of the movement's early development.

The number of independent assemblies declined dramatically in the first decade of the twentieth century. They suffered from widespread budgetary problems, and Progressive Era politicians increasingly dedicated funding to establish libraries, parks, and lecture series – formally providing what Chautauqua offered in its programs and classes.[248] By 1911, only thirty-two assemblies remained.[249] The CLSC also declined in membership during this time, and, despite their initial popularity, circuit Chautauquas grew scarce by the late 1920s. Automobiles allowed Americans in small towns to travel to cities for entertainment and lectures, and radio brought year-round entertainment into homes.[250] The last circuit shows folded during the Great Depression.[251]

A chapter of the CLSC was formed in the Washington, D.C., area in 1883, and interest in forming a local Chautauqua emerged in the 1890s, leading to the founding of the National Chautauqua Assembly in Glen Echo, Maryland, in 1891. The location boasted a spectacular natural setting, rustic stone buildings, an 8,000 seat amphitheater, and electric railway service from Washington, D.C. The venture, however, was short lived. The

[245] Geoffrey B. Henry, Maryland Historical Trust, National Register of Historic Places Inventory, Nomination Form, "Mountain Lake Park," 1983.

[246] Martha Vail, National Historic Landmark Nomination, "Colorado Chautauqua," June 15, 2005, 46.

[247] James R. Schultz, *The Romance of Small-Town Chautauquas* (Columbia: University of Missouri Press, 2002), 8.

[248] Rieser, *The Chautauqua Moment,* 242-43.

[249] Scott, "The Chautauqua Movement: A Revolution in Popular Higher Education," 395.

[250] Schultz, *The Romance of Small-Town Chautauquas,* 147.

[251] Rieser, *The Chautauqua Moment,* 285.

Chautauqua closed before the beginning of its second season because of a malarial fever scare.[252] In 1901, Washington Grove Camp Meeting Association trustees, some of whom were behind the Chautauqua in Glen Echo, established an exploratory to study the feasibility of a Washington Grove Chautauqua. The committee, according to Washington Grove historian Philip Edwards, not only investigated its viability, but planned a complete season of Chautauqua programs, with camp and temperance meetings worked into the schedule. Chautauqua programming officially began at Washington Grove on July 4, 1902, to an enthusiastic reception. Approximately 100 events were planned for the first season, which ran through the month of September. Additionally, outdoor games and recreation were encouraged.[253] The Chautauqua concept was not entirely new to Washington Grove. Recitation, music, and reading had been a regular fixture of the association's hotel, and camp meeting speakers had engaged with social and political topics. Musical performances had also been common there since at least 1889.[254] Before Chautauqua, the Grove was relatively quiet for much of the year, until the camp meeting attracted guests by the thousands. The arrival of Chautauqua brought new energy to the Grove and meant that its streets were busy throughout the entire summer.

Like its counterparts across the country, Washington Grove's Chautauqua offered a diverse array of programming and classes, including scientific lectures, political speeches, Stereopticon picture shows, minstrel shows, self-improvement instruction, and recitations from Shakespeare.[255] The roster of performers and speakers included musicians, professors, and religious leaders. A 1906 program of the Washington Grove Chautauqua listed classes in physical culture, art, music, kindergarten, and self-expression.[256] At the end of the season, "Recognition Day" ceremonies were held for CLSC program graduates in the auditorium.[257]

After the successful first year, Chautauqua attendance remained steady at Washington Grove through the first decade of the twentieth century, bucking the trend of decline in the rest of the country. The Chautauqua Committee was skeptical of shifting towards more entertainment programming, as other independent assemblies had done. They argued to the association's board that educational features that were either historical or engaged with the latest political questions would be better received by their audience than the lighter fare that had become more common.[258] The religious component of the Chautauqua also continued.[259] In 1910, the

[252] "Chautauqua Era," National Park Service, available at https://www.nps.gov/glec/learn/historyculture/chautauqua-era.htm.

[253] "The Grove Chautauqua: Washington Grove, Maryland," promotional pamphlet, WGA, Box D-7.

[254] Edwards, *Washington Grove, 1873-1937*, 183.

[255] John H. Pentecost, National Register of Historic Places Registration Form, "Town of Washington Grove," April 1980, 8:8.

[256] "Summer Assemblies for 1906," *The Chautauquan* XLIII (March-August 1906), 479.

[257] "Washington Grove, MD," *Washington Post*, August 12, 1906.

[258] Report to the Board of Trustees, Washington Grove Camp Meeting Association, January 6, 1908, WGA, Box D-7.

Chautauqua Committee reported a deficit for the first time, and committee members feared that public interest had waned. It recommended introducing lighter fare, while still avoiding entertainment that ventured toward vaudeville.[260] It is not clear, however, whether this recommendation was implemented or when Chautauqua programming officially ended at the Grove. Camp meeting attendance also began to decline during this period.

Chautauqua organizers aimed to create an exotic fantasyland of healthful recreation and learning for their guests. A variety of strategies, many borrowed from Methodist camp meeting sites, were employed to relocate guests to a "'natural' landscape to evince a recuperative state of mind."[261] Additionally, elaborate gates, sometimes decorated with classical or biblical design elements, often welcomed guests, further suggesting that one had arrived at a sacred space.[262] Washington Grove embraced the escapist concept as well. A promotional pamphlet from 1902 declared, "[the Grove] affords a delightful place for those who desire to escape the oppressive heat of summer and to get out into the woods and fields alongside the quieting and uplifting influence of nature."[263]

Chautauqua assemblies' built presence varied. Spaces for cultural programming, educational instruction, and recreational purposes ranged from a single building to a resort campus. The signature building and principal focal point of many Chautauqua assemblies was the auditorium, or amphitheater.[264] These structures were typically large, frame buildings with simple massing, usually in the form of a rectangle, circle, or polygon. The level of exterior decoration varied, but many were austere. Indeed, some were essentially wooden shells that kept out inclement weather. One assembly admitted its auditorium "makes no claims to architectural beauty."[265] Popular cladding materials for auditoriums included wood siding or shingles. Other signature features were clerestory windows for natural light and ventilation and generous window and door openings that let in cross breezes. Creating a space that was readily open to the elements was also meant to emulate the outdoor assembly areas and open-air tabernacles of Methodist camp meetings.[266] Dissolving the divisions between exterior and

[259] Report to the Officers of the Washington Grove Association, November 1, 1909, WGA, Box D-7.

[260] Report to the Board of Trustees, September 15, 1910, WGA, Box D-7.

[261] Rieser, *The Chautauqua Moment,* 70-71.

[262] Ibid.

[263] "The Grove Chautauqua: Washington Grove, Maryland," promotional pamphlet, WGA, Box D-7.

[264] Paul M. Pearson, "The Chautauqua Movement," *The Annals of the American Academy of Political and Social Science* 40 (March 1912), 211.

[265] "Eighth Annual Session of the Cumberland Valley Sabbath School Assembly" (Carlisle, PA, 1892), Cumberland County Historical Society, 5. Quoted in Rieser, 77.

[266] Martha Vail, National Historic Landmark Nomination, "Colorado Chautauqua," June 15, 2005, 25.

interior was usually accomplished by either wall openings filled with sliding doors or leaving the walls entirely open. Auditorium interiors usually consisted of a single volume with seating and a stage. The stage was usually at one end of the building, even in those that were circular or polygonal.

In its first three years, the Washington Grove Chautauqua was held in both the camp meeting-era tabernacle and in the assembly hall. As described earlier, the hall was built as a year-round place of worship for Washington Grove residents.[267] However, several points raise the possibility that it might also have been planned to shelter Chautauqua guests. First, the assembly hall was formally dedicated on the opening day of Washington Grove's inaugural Chautauqua season, July 4, 1902.[268] Second, newspaper articles from the period describe its anticipated use for Chautauqua assemblies. The *Evening Star* reported in May 1901, "A new assembly auditorium is to be built, octagonal in shape and inclosed [sic] on all sides, and capable of seating several hundred people. The contracts for the building will be given out next week. As soon as completed a program of summer Chautauqua schools will be arranged…."[269] Similarly, the *Washington Post* reported in June 1901, "In this building will be held the Chautauqua assembly meetings, lectures, and concerts."[270] Lastly, its polygonal form and materials were in keeping with trends in Chautauqua auditorium design. Although the building only had one principal entry point, the windows were generously proportioned to bring ample light and ventilation to the interior. A newspaper article published in May 1902, describing the dual secular and religious functions of the assembly hall read, "The past year…many improvements have been made upon the grounds and cottages, the principal one being the erection of a handsome and commodious octagonal building, known as the Assembly Hall, for the social and literary as well as religious gatherings of the community."[271]

Washington Grove leaders soon realized, however, that the assembly hall and tabernacle were both insufficient for the number of Chautauqua events at the Grove and the size of its audiences. To provide better accommodation, the association built an auditorium specifically for Chautauqua activities in 1905. The builder was Hezekiah Day. It was located within Woodward Park, north of Oak Street. The building soon became the epicenter of public life in Washington Grove, hosting Chautauqua programming, camp meetings, and fraternal and political meetings.[272] This had the effect of shifting the focus away from the camp meeting-era Circle and provided yet another impetus for relocating cottages from the Tent Department.

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[267] Edwards, *Washington Grove, 1873-1937*, 162-65.

[268] Edwards, *Washington Grove, 1873-1937*, 185, and "Washington Grove Meeting," *Washington Post*, May 25, 1902.

[269] "Holds Annual Meeting," *Washington Evening Star*, May 31, 1901.

[270] "Washington Grove Camp," *Washington Post*, June 1, 1901.

[271] "Washington Grove Meeting," *Washington Post*, May 25, 1902.

[272] Edwards, *Washington Grove, 1873-1937*, 195-203.

The Washington Grove auditorium had a generous rectangular plan under a gable-on-hip roof with hipped dormers. Wood siding clad the lower level of the frame building, while the upper level's gable ends and dormers were covered with wood shingles. The lower level was fenestrated at the front and sides with large openings, each fitted with double sliding doors with divided-light glazing. When the doors were opened the building became an open-air pavilion. Divided-light, pivot windows and dormers provided light and ventilation. The roof was supported by triangular trusses supported by iron posts. Interior surfaces were left unfinished, revealing the building's frame structure. At the back of the building was a stage flanked by men's and women's dressing rooms. The auditorium could be used as a theater or an arena, depending on the seating arrangement.[273]

The Conservation Movement and its Impact on Washington Grove

By the late nineteenth century, industrial forces were rapidly consuming American natural resources in the name of progress. Additionally, the U.S. Census Bureau announced in 1890 that the western frontier, previously thought of as limitless, had closed. While economic growth had expanded opportunity, many Americans began to worry that unbounded expansion had reached its limits. They argued that conserving natural resources would be needed for society's survival.[274] The designation of Yellowstone National Park in 1872 had marked an important departure in national policy. Whereas previous policy had been dedicated to transferring lands in the public domain to private use, the designation of Yellowstone demonstrated that the federal government was concerned with the management of public land.[275] Still, such federal interventions were rare, and the timber, mining, and railroad companies, who had powerful sway in Congress, fought hard against efforts at land reclamation.[276]

The term "conservation" was first proposed by U.S. Forest Service chief Gifford Pinchot (1865-1946) in 1907 to describe the goals of like-minded progressives who sought regulation of the use of nature. While the word had been previously understood in a general sense as protecting something for the future, Pinchot applied conservation explicitly to environmental concerns.[277] Pinchot helped define the conservation movement's

[273] Edwards, *Washington Grove, 1873-1937*, 197.

[274] Chambers, *Tyranny of Change*, 182.

[275] Leroy G. Dorsey, *Theodore Roosevelt, Conservation, and the 1908 Governors' Conference* (College Station: Texas A & M University Press, 2016), 36.

[276] Michael B. Smith, "The Value of a Tree: Public Debates of John Muir and Gifford Pinchot," *The Historian* 60, no. 4 (Summer 1998): 771.

[277] Mark V. Barrow, Jr., "From Crisis to Consensus to Schism: Revisiting the Progressive Conservation Movement," *Journal of the Gilded Age and Progressive Era* 17, no. 2 (April 2018): 416.

mission as advocating for the efficient, scientific management of natural resources by trained professionals.[278] This message of professional management fit comfortably within the Progressive Era mindset of government-by-experts.[279] Pinchot, who presided over the U.S. Forest Service from 1898 to 1910, was instrumental in the adoption of sustainable-yield forestry practices in the United States.[280]

One of the conservation movement's most prominent supporters was President Theodore Roosevelt (1858-1919). A known outdoors enthusiast, Roosevelt signaled early on in his administration that the conservation of forest and water resources would be a priority. Although he at times adopted moralistic rhetoric to describe the cause, Roosevelt ultimately shared Pinchot's utilitarian view of conservation for economic benefit. He declared in his first State of the Union in 1901, "The fundamental idea of forestry is the perpetuation of the forests by use. Forest protection is not an end in itself; it is a means to increase and sustain the resources of our country and the industries which depend upon them."[281] Nevertheless, as president, Roosevelt took unprecedented steps to protect the environment. The U.S. Forest Service was established in 1905. Over the course of eight years, Roosevelt's administration created five national parks, four big game preserves, fifty-one bird refuges, nearly twenty national monuments, and 150 national forests.[282]

The principle counterpoint to Pinchot and Roosevelt's approach within the conservation movement was provided by naturalist John Muir (1838-1914). Situated firmly in the tradition of Henry David Thoreau, Muir argued that wilderness and natural resources should be protected not to serve economic ends, but as a sanctuary for spiritual renewal and an escape from modern society. Muir's approach, however, failed to gain traction the way that Pinchot and Roosevelt's ideas had. The utilitarian approach became synonymous with conservation, a term coined by Pinchot, after all, and its goals were institutionalized by Theodore Roosevelt's presidency.[283]

The movement's influence extended to Washington Grove, where residents came to understand their woods in more managerial and economic terms. They began to see their trees as a harvestable crop. Washington Grove established a Forestry Committee in 1913 to oversee its hundreds of acres of woods and to advise on forestry

[278] Smith, "The Value of a Tree: Public Debates of John Muir and Gifford Pinchot," 757.

[279] Smith, "The Value of a Tree: Public Debates of John Muir and Gifford Pinchot," 770-71.

[280] Smith, "The Value of a Tree: Public Debates of John Muir and Gifford Pinchot," 762-63.

[281] *The State of the Union Messages of the Presidents, 1790-1966*, vol. 2, ed. Fred L. Israel (New York: Chelsea House, 1967), 2026.

[282] Dorsey, *Theodore Roosevelt, Conservation, and the 1908 Governors' Conference*, 14.

[283] Smith, "The Value of a Tree: Public Debates of John Muir and Gifford Pinchot," 760.

management.[284] One of Pinchot's protégés was Fred W. Besley (1872-1960), Maryland's first state forester, who visited Washington Grove and toured its woodlands in July of 1913. Besley's inspection of the Grove's forests was part of a statewide cooperative forest improvement program.[285] Trees that were mature or past maturity, Besley wrote, required an "improvement cutting," which would bring revenue to the owner and improve the condition of young growth.[286] After dividing the Grove into sections, the forester provided recommendations for cutting, reforestation, and other custodial practices. The present-day West Woods were found to be the best source of firewood, while reforestation was recommended for Morgan Park, which was located along the southern edge of Washington Grove. A "plan of operation" was crafted based on Besley's recommendations, and the Forestry Committee recommended a balance between the need for firewood and the "injudicius [*sic*] felling of trees."[287] Assistants trained in scientific forestry were tasked with selecting and marking trees for cutting based on species, maturity, and marketability.[288] The Grove generally followed this approach to maintaining its forested landscapes throughout the next half-century.[289] Besley continued to be involved with Washington Grove in the following decades.[290]

In her study on women's contributions to the early twentieth-century conservation movement, historian Carolyn Merchant writes, "Propelled by a growing consciousness of the panacea of bucolic scenery and wilderness, coupled with the need for reform of the squalor of the cities, women burst vividly into the public arena in the early twentieth century as a force in the progressive conservation crusade."[291] Indeed, women took a leading

[284] Document titled "Forestry Committee," November 15, 1982, WGA, and Wendy Harris, News Dispatches from Other Centuries, "Portrait of a Founding Mother: Amelia Elmore Huntley, Part Three," 2017, available at http://washingtongrovemd.org/town-history/featured-from-the-town-archives_0217.

[285] Fred W. Besley to Washington Grove Association, 1915, WGA, Box L-4.

[286] Maryland State Board of Forestry, "Plan of Co-Operation Between Woodland Owners and the State Forester," Forestry Leaflet No. 18, WGA, Box L-7.

[287] Secretary of Washington Grove Association to Fred W. Besley, September 23, 1913, WGA, Box L-7; and Report of the Forestry Committee, August 1, 1913, WGA, Box L-7.

[288] "Timber Marking Agreement," 1945, WGA, Box L-7.

[289] Wendy Harris, News Dispatches from Other Centuries, "Our Woods and Walkways: Are They Historic? (Part Two)," 2017, available at https://washingtongrovemd.org/town-bulletins/town-bulletin-may-2017; Wendy Harris, News Dispatches from Other Centuries, "Our Woods and Walkways: Are They Historic? (Part One)," 2017, available at https://washingtongrovemd.org/town-bulletins/town-bulletin-april-2017/.

[290] "Examination of Trees at Washington Grove," leaflet by F.W. Besley, State Forester, July 29, 1924, WGA, Box L-7.

[291] Carolyn Merchant, "Women of the Progressive Conservation Movement: 1900-1916," *Environmental Review* 8, no. 1 (Spring 1984): 58.

role in many Progressive Era causes. In Washington Grove, the mantle of conservation was carried by Amelia Elmore Huntley. In 1913, Huntley was the first woman to serve on the board of trustees of the Washington Grove Association. As a member of the Forestry Committee, she was instrumental in bringing Besley to the Grove.[292]

Early Steps Towards Incorporation

Of equal importance to the physical improvements and decentralization that transpired in the first decades of the twentieth century were the social and cultural changes affecting Washington Grove and its residents. During this period, the annual summer camp meeting lost its prominence among Washington Grove's attractions, which included Chautauqua programs, an annual track meet and other athletic events, and a kindergarten. In fact, "camp meeting" had been dropped from the association's name since 1906. Physical vestiges of early camp meeting life, including the tabernacle, the hotel, and the market house, were simply dismantled as they became deteriorated and obsolete. As interest and support for camp meetings faltered, the first open discussion of ending the gatherings came in 1922. After five decades, the tradition finally came to an end at Washington Grove around 1929.[293]

By the late 1920s, a group of stockholders, led by former president Major Samuel H. Walker and several family members, began to question the Washington Grove Association's system of government and property ownership. As a result, in 1929, a committee was formed to investigate the matter of stockholders' rights and land titles. The committee's recommendations, delivered in August of that year, recommended a) that each property holder was to be issued a fee simple deed, not subject to the bylaws of the association, b) that the government be changed to a municipal corporation, and c) that the association be dissolved.[294] The deeds would be subject to three covenants – houses had to conform to setback lines and cost no less than $1,000, property could not be used for commercial activities, and property could not be sold, leased, or otherwise transferred to "anyone of a race whose death rate is of a higher percentage than that of the white or Caucasian race."[295] While the covenant setting a minimum cost on dwellings was set forth to ensure that the community maintained a consistent character, the racially restrictive covenant was intended to prohibit African Americans and other minorities from obtaining property in Washington Grove. The use of deed restrictions to qualify prospective owners and residents based on factors such as race, ethnicity, and religion were used across the United States at

[292] Wendy Harris, News Dispatches from Other Centuries, "Portrait of a Founding Mother: Amelia Elmore Huntley, Part Three"; Wendy Harris, News Dispatches from Other Centuries, "Our Woods and Walkways: Are They Historic? (Part Two)."

[293] Edwards, *Washington Grove, 1873-1937*, 306.

[294] Edwards, *Washington Grove, 1873-1937*, 335-36

[295] Edwards, *Washington Grove, 1873-1937*, 336.

the time. They would be challenged in courts by midcentury.[296] The committee's recommendations received wide support, and work continued toward planning a new government.

Washington Grove's initiative to seek incorporation followed national trends. Starting in the early twentieth century, many camp meeting associations across the country began to transition into independent municipalities or transferred their assets to other local government entities. Although Washington Grove's initial effort lost considerable momentum during the economic collapse of the Great Depression, the initiative was resumed in the mid-1930s. Finally, in 1937, the stockholders voted in favor of incorporation. The charter for the Town of Washington Grove became effective on May 30 of that year.[297]

The Early Municipal Period (1937-1945)

New Government and New Initiatives

As a municipal corporation under state law, the Town of Washington Grove possessed the legislative and administrative power to write its own charter, make its own ordinances, and levy taxes for much needed infrastructure improvements and modernization projects. Washington Grove's original charter "was similar in form to other town charters, but with special provisions respecting the Town Meeting tradition, which had grown out of the annual Stockholders Meetings during Association days," writes Washington Grove historian Philip Edwards.[298] At the first Town Meeting on July 10, 1937, Roy McCathran was elected mayor, a position he would hold for the next twenty years. Among the immediate concerns facing the new mayor and town council were the roads and walkways, the maintenance of public buildings, the town's financial health, and residential growth. Volunteer committees were established to focus on specific issues and topics.

One of the first major initiatives of the new mayor and town council involved the public wells, which had supplied water to Washington Grove residents for over fifty years. Since the installation of water and sewer lines in 1927, however, the public wells had become obsolete. By 1938, all of the wells were closed, and most of the pumps were pulled.[299] Road improvements were another priority. In 1939, the first of the Grove's roads were paved with asphalt, and changes were made to the circulation system within the Tent Department to allow for the passage of automobiles. (The pedestrian-only avenues remained unpaved.) Following the road improvement project, a local stonemason was hired to build stone culverts to route stormwater under the new

[296] Linda Flint McClelland, David L. Ames, and Sarah Dillard Pope, National Register of Historic Places Multiple Property Documentation Form, "Historic Residential Suburbs in the United States, 1830-1960," E: 12.

[297] Edwards, *Washington Grove, 1873-1937*, 370.

[298] Edwards, *Washington Grove, 1937-1977,* 141.

[299] Edwards, *Washington Grove, 1937-1977,* 15.

pavement.[300] Street signs and other traffic signs were posted along the roads and avenues. The street signs were wood and consisted of boards painted brown with white lettering and mounted to wood posts. The signs reflected the town's rustic and quaint character and had the added benefit of being inexpensive. This model of street signs would be replicated with few changes until the 1980s. In 1939, the Woman's Club building in Woodward Park burned, and the town decided that a new building could be constructed on the site of the old hotel in Howard Park. The builder was Brawner Harding of Gaithersburg. The clubhouse was completed in 1940 for $1,551.[301] The same year, the town made improvements to the assembly hall, including the construction of an addition on the north side of the meeting room.

Commercial Corner

The general store and Odd Fellows Hall that stood on the lots facing the corner of Washington Grove Road and Railroad Street were the last victims of the Depression, when, in 1940, they were seized by the First National Bank of Gaithersburg.[302] The bank tried to market the properties as residential, but several factors made this difficult – the buildings across the street were commercial/industrial and included a large feed mill complex, the lots faced a busy intersection, and there was little buffer between the lots and the nearby railroad tracks. The bank soon appealed to the town for rezoning, and a measure was passed in 1941 approving the change and officially declaring Lots 1 and 2 in Block 1 a commercial zone, with restrictions against alcohol and gaming. By the late 1960s, the area, which came to be known as the commercial corner, would become the center of a long-fought battle that would test the town's civic identity.

Thomas I. Fulks died in 1935, and the next year his farm and feed supply business were purchased by W. Lawson King. King sold the farm property in 1940, but retained the feed supply business, which he improved and incrementally expanded. King razed the feed store and built a new feed mill at the eastern end of the property in 1942. Then, in 1945, he added a farmer's supply store at the western end of the site. King's new four-story feed mill was built of cinderblock and corrugated metal. Four silos, constructed of concrete reinforced with steel straps, stood east of the mill. The supply store was a cinderblock building with an L-shaped plan. In 1952, he built an addition to the supply store, extending the complex to the west. King eventually leased the feed supply operation to Sunshine Feeds, which was succeeded by Wayne Feeds and finally Gaithersburg Farmers' Supply, which closed in 1989.[303] While many of the feed stores that served

[300] Edwards, *Washington Grove, 1937-1977,* 33.

[301] Horan, *A History of the Woman's Club of Washington Grove*, 21.

[302] Edwards, *Washington Grove, 1937-1977,* 45.

[303] Gail Littlefield and Judy Christensen, draft Maryland Inventory of Historic Properties Form, "Gaithersburg Farmers' Supply, Wayne Feed, Sunshine Feed, Thomas I. Fulks Store," no date. Copy provided courtesy Gail Littlefield.

Montgomery County communities have vanished, Gaithersburg Farmers' Supply still stands as an important physical remnant of the regional agricultural economy that persisted into the mid-twentieth century.

In December 1944, the Standard Oil property across Railroad Street from the Odd Fellows Hall was sold to Oscar L. Evans, who established an ice cream factory in the brick building on the lot. By 1948, Evans sold the property, along with his machines and equipment, to Burtis Slaybaugh and Kenneth Reck.[304] Their company, Rex, Inc., soon had a small retail operation that was popular with Washington Grove residents. Building on their success, the partners built an annex and opened a restaurant.

Residential Development

Mayor McCathran and the citizens of Washington Grove were eager to put the deprivations of the Depression behind them. While the early municipal period saw a gradual decrease in the abandonment of properties and lots being listed for tax sale, deferred home maintenance that had started in the Depression continued to cause concern.[305] In 1941, for example, two adjacent houses on Fourth Avenue that had not been occupied for several years were found to be "an actual and definitive menace to the health of the community" and nearly condemned.[306] (The houses were ultimately preserved and, in the 1960s, were combined to become what is now 404 Fourth Avenue.) According to oral tradition, some houses in the Grove still retained canvas elements through the 1940s.[307]

In an effort to increase municipal revenues and attract families to the community, the town began to sell off platted but unoccupied lots. As a result, Washington Grove experienced a boomlet of home improvements and new construction. Nationally, Minimal Traditional dwellings, which offered simplified versions of prewar Colonial Revival styles, were built in great numbers during this period, and this trend is reflected in Washington Grove. The Minimal Traditional style was developed largely out of necessity. During the Great Depression, banks collapsed, mortgages piled up, and many Americans lost their means to purchase new homes, bringing the housing construction industry to a virtual standstill. The Federal Housing Administration (FHA) was established in 1934 under the New Deal programs of President Franklin Roosevelt to set standards for construction and insure loans banks made for home building. The FHA also produced their own technical bulletins on house design that proved influential. In fact, a number of these house plans were published in journals and pattern books in the 1930s and 1940s, promoting an economical take on the traditional house.[308]

[304] Montgomery County Land Records, Deed Book 1136, page 312.

[305] Edwards, *Washington Grove, 1937-1977,* 37-38.

[306] Irving McCathran to Kate M. Purdum and Mary E. Murphy, May 21, 1941, Clare Kelly House History files, WGA.

[307] Washington Grove Round Table Discussion, August 31, 2018, recording available in WGA.

[308] Virginia Savage McAlester, *A Field Guide to American Houses*, second edition (New York: Alfred A. Knopf, 2013), 589.

The FHA's technical bulletin in 1940 was called *Principles for Planning Small Houses*, which laid out a number of recommendations for an economical, efficient home. Many of the basic forms and variations of what became the Minimal Traditional style were illustrated in the pamphlet. The FHA recommended simple compositions within limited variation in form. Unnecessary gables, dormers, and breaks in the roofline were to be avoided. Instead of adding ornamentation, character and variation could be achieved through the spacing and grouping of windows, use of materials, and design of minor details.[309] "Porches, bay windows, and platform steps," the bulletin states, "are useful as a means of making small houses more livable without adding greatly to their costs."[310] Efficient floor plans that maximized available space were advised, as higher building costs increased the difficulty in qualifying for FHA loan insurance.[311]

During World War II, the relocation of workers for proximity to defense-related factories created an immediately pressing need for small houses that could be built quickly. Builder-developers constructed nearly 2.3 million homes, most in the Minimal Traditional style, for war and defense purposes between 1940 and 1945.[312] Such small houses were also a response to the wartime reduction in the supply of building materials.[313] When World War II ended in 1945, the Minimal Traditional house again proved to be the solution to a pressing national need. Housing accommodation had to be provided for the 10 million returning soldiers and their families. Approximately 5.1 million new homes, many in the Minimal Traditional style, were built between 1946 and 1949.[314] Because these houses continued to be promoted by the FHA, developers could get faster approval of loans for construction to start. Much of the postwar construction in emerging suburban communities like Levittown, New York, consisted of mass-produced Minimal Traditional-style houses.[315] The World War II Cottage is a variation on the Minimal Traditional style. These houses were typically a single story, simple in form, and covered by a hipped roof.[316]

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[309] U.S. Federal Housing Administration, *Principles for Planning Small Houses* (Washington, D.C.: Government Printing Office, 1940), 37-40.

[310] U.S. Federal Housing Administration, *Principles for Planning Small Houses*, 39.

[311] McAlester, *A Field Guide to American Houses,* 589.

[312] Joseph B. Mason, *History of Housing in the U.S., 1930-1980* (Houston, TX: Gulf Publishing Company, 1982), 31-44.

[313] Clifford Edward Clark, Jr., *The American Family Home, 1800-1960* (Chapel Hill: University of North Carolina Press, 1986), 193.

[314] Mason, *History of Housing in the U.S., 1930-1980,* 48-49.

[315] McAlester, *A Field Guide to American Houses,* 589.

[316] "WWII Era Cottage," Docomomo WEWA, available at http://docomomo-wewa.org/styles_detail.php?id=41, accessed December 6, 2018.

Many Minimal Traditional-style houses were built in Washington Grove during this period and after World War II. Examples can be found on Washington Grove Lane, Ridge Road, and Pine Street. Examples of World War II Cottages are located at 108 Maple Avenue and 401 Brown Street. The latter, built in 1943, has a rectangular form under a moderately pitched, hip roof. These houses are representative of an important period of Washington Grove's development, when the new municipal government supported residential growth that responded to the needs of American families. In their simplicity of form and affordability, these houses represented a continuity in design from the camp meeting era.

Post-World War II Period (1946-1969)

Post-World War II Suburbanization

The decades that followed World War II witnessed a transformation in American life brought by suburbanization. Americans returning from the war in large numbers left crowded, dense cities for detached houses with generous lawns. A strong economy, low inflation, and federal subsidies made conditions ripe for Americans to own their own homes. Such subsidies, including mortgage insurance by the FHA and a similar Veterans Administration mortgage program, underwrote a vast new construction program.[317] The Bureau of Labor Statistics conducted a survey of homebuilding in 1946-47 that revealed that suburbs accounted for 62 percent of construction in the metropolitan regions studied.

Following the national trend, Washington, D.C., suburbs in Maryland and Virginia grew exponentially after the war. In 1953, for the first time, less than half of the metropolitan region's population lived in the city proper.[318] In the postwar era, Washington suburbs extended to areas considered remote in the nineteenth century. By the early 1950s, Montgomery County, in particular, emerged as the "bedroom of Washington," in the words of the president of the county council.[319] The county's population nearly doubled between 1946 and 1950 and more than doubled between 1950 and 1960. New transportation options, particularly after the creation of the Interstate Highway System in 1956, facilitated the commuter lifestyle. By the mid-1950s, Washington was

[317] Jackson, *Crabgrass Frontier*, 233.

[318] Zachary Schrag, *The Great Society Subway: A History of the Washington Metro* (Baltimore: Johns Hopkins University Press, 2006), 17.

[319] Stella B. Werner testimony, U.S. House of Representatives, *District of Columbia, Maryland, and Virginia Mass Transit Compact: Hearings before House Committee on the Judiciary, Subcommittee No. 3, on H.J. Res. 402*, 86th Cong., 1st sess., 1959.

connected to Montgomery County cities via Interstate 270, a new highway that supplanted the old U.S. Route 240.[320] Additionally, a bypass was built around Rockville in 1951 and the Capital Beltway opened in 1964.

The Washington suburbs were unique in that most of their residents were new to the region. County and city residents returning from the war accounted for only a small percentage of the incoming population. Many of the new Montgomery County suburbanites were professional-managerial workers, who supported the kind of professional, technocratic planning bodies leading postwar suburban development.[321] New county residents not only commuted into Washington, but also took advantage of expanding opportunity in Montgomery County itself. As the Cold War between the United States and the Soviet Union intensified, the Truman and Eisenhower administrations oversaw a decentralization of the federal government. A government concentrated in a central city, officials reasoned, made it more vulnerable to nuclear attack.[322] Federal agencies moved to the suburbs beginning in the 1950s. The Atomic Energy Commission was established in Germantown in 1955, and the National Bureau of Standards moved to Gaithersburg in 1960. Industry also expanded in the county. IBM, for instance, opened a systems development center in Bethesda and established its division headquarters in Rockville. Interstate 270, in particular, became a major corridor for industrial growth.

Locally, the major planning institution was the Montgomery County Council, while the Montgomery County Planning Board served as their primary advisers.[323] County residents took an active role in planning discussions and organized their own advocacy groups. Most influential among these was the Montgomery County Citizens Planning Association (MCCPA), which began in 1950, but achieved its current name in 1958.[324] Regional-level planning was carried out by the Maryland National Capital Park and Planning Commission, which coordinated among Washington, D.C., and Montgomery and Prince George's counties. The expansion of the Washington metropolitan area had a major impact on Montgomery County. Rural areas were rezoned for high-density residential, commercial, and light industrial uses, despite an inadequate distribution of schools, hospitals, recreational areas, and basic amenities, such as grocery stores.

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[320] Richard K. MacMaster and Ray Eldon Hiebert, *A Grateful Remembrance: The Story of Montgomery County, Maryland, 1776-1976* (Rockville, MD: Montgomery County Government, 1976), 351.

[321] Isabelle Gournay and Mary Corbin Sies, "Modern Movement in Maryland," Context Essay (University of Maryland, 2002), 39.

[322] MacMaster and Hiebert, *A Grateful Remembrance: The Story of Montgomery County, Maryland, 1776-1976*, 351.

[323] Lucile Harrigan and Alexander von Hoffman, "Forty Years of Fighting Sprawl: Montgomery County, Maryland, and Growth Control Planning in the Metropolitan Region of Washington, D.C." (Joint Center for Housing Studies, Harvard University, October 2002), 1.

[324] Schrag, *The Great Society Subway*, 225.

As a result of postwar growth, Americans across the country were becoming alarmed at how development was disrupting the natural world and the social and physical fabric of towns and cities. Unchecked development and reports from scientists on the impact of human beings on nature inspired the modern environmental movement that took shape in the early 1960s. Whereas the conservation movement of the early twentieth century had focused on the efficient management of natural resources, the environmental movement pressed for a broader, more aggressive agenda that emphasized environmental quality and ecology.[325] The environmentalists of the 1960s, for instance, argued that a forest should be seen as an "environment for home, work, and play rather than as a source of commodities."[326] Protection of natural resources was prioritized in the policies of President Lyndon Johnson's Great Society. In response to growing public concern, Congress passed a host of environmental protections, including the Wilderness Act (1964), the Land and Water Conservation Fund Act (1964), the Clean Air Act (1967), the Wild and Scenic Rivers Act (1968), the National Trails System Act (1968), and the National Environmental Policy Act (1969).

In the years following World War II, many older buildings and neighborhoods were threatened by suburban development, federally funded urban renewal programs, highway building, the construction of office buildings, and other factors. In response, preservationists formed a quasi-public advocacy group that would become the National Trust for Historic Preservation, which was chartered by Congress in 1949.[327] That year, the construction of the Whitehurst Freeway in Georgetown – an elevated highway along the waterfront designed to reroute high-density traffic from Georgetown's small, crowded streets and connect to a renovated K Street – sparked protests by District residents who claimed that the bypass freeway was incompatible with the character of its neighborhood. Prompted by the freeway's construction and an increase in the alteration of the city's historic fabric, the Old Georgetown Act was passed in 1950 designating Georgetown as an historic district. Encouraged by the National Trust and state officials, in 1966, President Lyndon B. Johnson signed the National Historic Preservation Act into law. The act expanded the National Register of Historic Places, authorized state funds for surveys and preservation planning, and created the Advisory Council on Historic Preservation. In time, the preservation movement expanded to include historic places important to communities, not just nationally significant properties.

Regional Trends in Postwar Residential Architecture

In response to the burgeoning postwar economy, growing population, and urban housing shortages, the Washington, D.C., of the late 1940s began to spread far into the surrounding counties of Maryland and Virginia.

[325] Samuel P. Hays, "The Environmental Movement," *Journal of Forest History* 25, no. 4 (October 1981): 219.

[326] Hays, "The Environmental Movement," 219.

[327] Robert E. Stipe, *A Richer Heritage: Historic Preservation in the Twenty-First Century* (Chapel Hill: The University of North Carolina Press, 2003), 9.

Federal housing policies established in the early 1950s were predominantly suburban in focus. In Washington, nearly two-thirds of the mortgage guarantees were located outside of city limits.[328] Suburban living was a desirable alternative for much of Washington's middle class who were contending with crowded urban conditions and rising rental costs. Relocation was accessible to many families through the help of federal housing and loan programs. Following the onset of the Servicemen's Readjustment Act (GI Bill), many families had enough money leave the city for single-family homes in the suburbs.

Locally, mass-produced residential developments appeared in Virginia and Maryland to accommodate the region's growing number of new residents. Among the first postwar subdivisions in Montgomery County was Veirs Mill Village in Rockville. Started in 1947, the development included 1,105 identical Cape Cod houses on a 328-acre tract of former farmland.[329] Several pioneering communities, such as Hollin Hills in Alexandria, Virginia, were developed as showcases of modern living. The enclave was a collaboration between the developer Robert Davenport and architect Charles Goodman (1902-1992). In planning roadways and siting houses, the developer and architect prioritized the preservation of the wooded, rolling character of the natural landscape. Houses were oriented to optimize views and maintain privacy. Typical building materials included recycled brick, stained vertical wood siding, and floor-to-ceiling window units.

The ranch house was the most popular American housing form during the postwar period.[330] Historian Kenneth Jackson writes that Americans were drawn to ranch houses because their departure from traditional residential architecture presented "newness."[331] A survey conducted by the *Saturday Evening Post* in 1945 reported that only 14 percent of Americans were interested in renting or living in a "used" house.[332] Whatever the reason for its popularity, the ranch house soon became seen as an integral part of the suburban ideal in the United States.

The "newness" of the ranch house was partly derived from its embrace of modern architecture. Modernists saw older housing models as inflexible and unsuitable for modern life. The modern houses designed by the movement's foremost intellectual leaders, including Mies van der Rohe and Le Corbusier, were reduced to pure form, emphasizing lines, planes, and geometries. Technological advances were celebrated in the choice of building materials, including steel, reinforced and precast concrete, and large expanses of plate glass. Most

[328] Jackson, *Crabgrass Frontier*, 212-213.

[329] Kelly, *Montgomery Modern*, 42.

[330] Thomas C. Hubka, "The American Ranch House: Traditional Design Method in Modern Popular Culture," *Traditional Dwellings and Settlements Review* 7, no. 1 (Fall 1995): 34.

[331] Jackson, *Crabgrass Frontier*, 240.

[332] *Urban Housing Survey: The Saturday Evening Post, Ladies' Home Journal, Country Gentleman* (Philadelphia: Curtis Publishing Company, 1945).

ranch houses were never as austere as the typical modernist house, but some of the movement's general principles became part of standard ranch design. Ranch house architecture, particularly in the earlier models, embraced modernism's simplicity – a single roof covered the entire structure, a clear form was expressed by the rectangular massing, and ornament was minimized. The openness of the interior plan, with public rooms that seamlessly flowed into one another, was also a hallmark of modernist design. Ranch houses also embraced technology, in both their mass-produced construction and interior space devoted to the latest appliances.

One of the most radical innovations of the ranch form was the space devoted to the automobile. Although garages and carports had been built throughout the twentieth century, they were often either detached from the house, integrated into the basement, or connected to the house, but located on a side elevation. It was in the ranch house that space for automobiles (either garages or carports) became a primary feature of the building's footprint and took a prominent spot at the front of the house. Soon, even the path from the front door to the sidewalk, an enduring landscape feature of American lawns, was bent toward the garage and driveway.[333]

A variation on the ranch form was the split-level, which emerged in the 1950s and continued its popularity into the 1970s. Used to denote a form and not a formal style, the split-level generally consisted of separate, staggered levels separated by a partial flight of stairs. The bi-level split consists of two floors of living space and an intermediate-level landing between them. The tri-level split consists of a two-story mass intercepted at mid-height by another mass.[334]

Postwar Growth in Washington Grove and Home Rule

The period after World War II was a time of intense residential building and remodeling at Washington Grove. With many empty lots and many lots with dilapidated houses, the town was eager for new development that would enhance its appeal to homebuyers and increase its tax base. Long-time residents and newcomers alike worked to revitalize the town by renovating older cottages and building new houses that reflected modern tastes and demands. Home Rule in Maryland gave Washington Grove the power to exercise its own planning and zoning regulations. Finally, the town's plans to fill itself out could be realized.

Washington Grove attracted individuals seeking a closeness to nature and a connection to the past, a combination not available in many postwar planned communities often characterized by standardized houses set in denuded landscapes. Classified ads for new and older homes for sale in Washington Grove appealed to "tree lovers" and emphasized the Grove's reputation as a "town within a forest" that was "convenient to

[333] Hubka, "The American Ranch House: Traditional Design Method in Modern Popular Culture," 35-37.

[334] McAlester, *A Field Guide to American Houses*, 613.

transportation, yet out of the hubbub."[335] New residents included government officials, professionals, and scholars who worked in Washington, D.C., or in nearby federal facilities.[336]

The houses constructed during the post-World War II period in Washington Grove followed national trends in residential building. Although earlier styles continued to be built, new styles and forms such as the ranch house made their appearance. Architecture of the period emphasized clean lines, functional plans, modern materials and building techniques, and the integration of interior and exterior space. Stylistically, some homes featured traditional detailing, while others demonstrated the influence of modernism. The use of prefabricated materials, developed for wartime mobilization but adapted for postwar building, was also evident. Houses were constructed by merchant-builders using standardized plans, sometimes in pairs or groups, or custom designed by architects.[337]

As the town made decisions about new areas for residential growth, blocks of land became available for development. Lots were also sold by individuals.[338] One area of new residential development was the eastern end of Center Street between Maple Avenue and Ridge Road. In 1949, a Dutch Colonial Revival-style house was constructed at 410 Center Street, and six new homes followed within the next half dozen years. 409 Center Street, built circa 1953-54, was a Cape Cod cottage with Colonial Revival detailing. 301 Maple Avenue, which faces south toward Center Street, was a one-story ranch house built in 1955. It had a low pitched, gable roof with a broad, brick center chimney. Later, Contemporary-style additions were added to the west and east facades. The houses built on the north side of Center Street, such as the Cape Cod cottage at 409 Center, were located within the historic "Laundry Reserve," which had been platted for residential development in the late nineteenth century but had, up until then, remained undeveloped. (Two early fire hydrants in the East Woods remain today as evidence of the residential growth once projected for the land.) During the postwar period, a number of ranch and Minimal Traditional-style houses were also built along the eastern extension of Ridge Road.

The deep, narrow lots that historically characterized the division of land in the Cottage Department were not planned for the low horizontal massing of modern domestic forms. In some cases, such as the pair of ranch houses at 201 and 203 Maple Road, the houses were oriented perpendicular to the roadway, rather than facing it. Other times, building lots were consolidated and subdivided into new configurations that could better accommodate modern forms. In 1955, for example, Lots 6 and 7 of Block 3 were replatted to create two lots

[335] Classified Ads, *Washington Post*, March 15, 1959, and May 30, 1959.

[336] *Washington Post*, July 21, 1958.

[337] Notes on Washington Grove Architectural Significance, 1937-69, courtesy Clare Lise Kelly, November 4, 2018.

[338] Notes on Washington Grove Architectural Significance, 1937-69, courtesy Clare Lise Kelly, November 4, 2018.

that fronted Center Street.[339] The one-story, brick veneer, ranch houses built on the lots in 1958 were nearly mirror images of each other (11 and 13 Center Street). The incorporation of the garage in the main block of the house, with its opening on the front façade, as well as the placement of the driveway in the front yard, represents an important shift in residential planning and design at Washington Grove, where for decades automobiles were relegated to vehicular-only roads and garages stood at the back of buildings lots.

To support new residential development, the town carried out road improvements. Miller Drive was put in and the northern end of Hickory Road was graded and paved with gravel, among other projects.[340] By 1945, the Humpback Bridge crossing the B&O Railroad tracks had become dilapidated. In response to complaints from Washington Grove residents, the railroad replaced the nineteenth-century structure with a new bridge in the same location. The new bridge was a three span, timber bridge with a humpback shape.[341] In the early 1950s, the town began the process of widening its 25-foot-wide vehicular roads to make them safer and allow for on-street parking. When public land was involved, the process was straightforward, but other roads, such as Chestnut, proved more difficult due to preexisting structures and fence lines.

The town also turned its attention to its public buildings and facilities. In 1951, a gabled porch was added to the front façade of the assembly hall to shelter the entrance and create a place to hang the original bell used to summon participants to camp meeting services. (The bell originally hung from a tree, then was moved to the belfry of the tabernacle.) A few years later, in 1955, when Washington Grove United Methodist Church was completed, the assembly hall was repurposed as municipal offices. (The building was officially dedicated as the town hall in 1973.) New public facilities from this period include the town maintenance building, which was constructed in Woodward Park in 1955.

Due to a combination of factors, Maple Lake, the swimming pond in the West Woods, was not maintained during most of the 1930s and 1940s. By 1953, however, the town had chartered a Lake Committee to guide the restoration and revitalization of the site. The redesigned lake, inaugurated in 1955, featured an island and a dock. Later improvements included a bridge to the island (1962) and a perimeter fence (1973). During the winter months, the lake was used for ice skating.

The passage of Home Rule in Maryland in 1954 gave counties and towns the power to modify their own charters – the basic laws that described their powers, procedures, and services. An amendment to Home Rule, passed in 1955, gave municipalities power over planning and zoning, and Washington Grove established a

[339] Montgomery County, Circuit Court Land Records, Plat No. 4031, February 1955.

[340] Town Council Meeting Minutes, 1946, WGA, Box D-4, File DT.00D4.06.

[341] AD Marble & Company, Maryland Historical Trust Determination of Eligibility Form, "Washington Grove Humpback Bridge (M: 21-220)," 2009, and Town of Washington Grove Historic Preservation Commission, 2014 Montgomery County Historic Preservation Awards Nomination Form, "Washington Grove Hump Back Bridge," 2014.

Planning Commission in 1957. The commission drafted ordinances prohibiting multi-family dwellings and prepared a zoning map that included two residential zones, a forest reserve, and a local commercial zone. The town adopted its first Code of Ordinances under home rule in 1964, which included sections on zoning, building, and land use. Through the 1950s and 1960s, the Planning Commission worked with the town council to identify and sell miscellaneous parcels of land owned by the town, condemn blighted properties, and guide new development. Throughout this period, the town leveraged its independent planning and zoning authority to carefully preserve and protect the architectural resources and natural features that characterized its early history while promoting responsible growth and compatible new design.

The Auditorium Controversy

In the decades after Chautauqua activities ceased at Washington Grove, the auditorium was used to show movies and stage theatrical performances, as a meeting place for social clubs, for dances, and as a gymnasium for indoor sports, such as basketball and shuffleboard.[342]

In 1948, a group of Grove residents formed a theatrical troupe called the Banbury Players that staged three one-act plays in the auditorium over the course of the year. Eager to try a short professional season the following year, the group, then known as the Washington Grove Summer Theatre, proposed a four-week season to the town council. The council approved the proposal, on condition that "the organization shall be responsible for retaining control over the use of the Auditorium." Following further discussions with town council about how the group could comply with this condition, a spokesman for the troupe reported that "the group was anxious to carry out the established segregation policy of the town …although no definitive plan for enforcing a policy of exclusion had been formed." After several months of wrangling with the town council and wordsmithing the proviso in the theater permission, the Washington Grove Summer Theatre withdrew its proposal, stating that it "could not and would not attempt a policy of segregation by exclusion of negroes from attendance." The matter was dropped.[343]

Another proposal to the town council for a theater in 1962 dealt the final blow to the auditorium. This time, the proposal came from a Washington theater producer who proposed to upgrade the auditorium, which had become a burden to maintain and was a target for vandalism, and use it for theater productions for twelve weeks over the summer. The town was evenly split over the issue. On one side, some residents desired the availability of theater and other artistic pursuits in Washington Grove and saw it as a way to save the auditorium. Others saw it as a commercial venture which would bring unwanted traffic into town and tie up the auditorium. The theater proposal was put to vote at the annual town meeting of 1962, where it lost by a single vote.[344] Although

[342] Edwards, *Washington Grove, 1937-1977*, 18.

[343] Edwards, *Washington Grove, 1937-1977*, 75-84. Such a policy would be prohibited with the passage of the 1964 Civil Rights Act.

[344] Edwards, *Washington Grove, 1937-1977*, 175-78.

many Grove residents supported petitions to save the auditorium, without viable options for its use, the building was demolished in 1963. Soon after the building was razed, its site was redeveloped as part of a new Woodward Park "recreation center" with playground equipment and a multi-purpose, all-weather court. In addition, an all-weather tennis court was built north of the existing clay tennis courts.

Community Activism

In the postwar period, Washington Grove became known as a community of activists skeptical of unchecked development, supportive of environmental causes, and protective of its historic resources and the way of life they represented.

The residents of Washington Grove encouraged strategic regional growth and emerged in the postwar period as strong opponents of rezoning and highway construction. In 1957, Washington Grove's mayor, George A. Pughe, wrote a letter to U.S. Senator Alan Bible, Chairman of the Joint Congressional Committee on Metropolitan Area Planning, to encourage greater cooperation among regional planning agencies. He wrote, "We recognize that the transition of the adjacent areas must take place as the metropolitan area expands. We do not resist growth. But we do believe that as a community we should have an opportunity to participate in the planning and decisions regarding adjacent areas that will directly affect our own community."[345] When the Montgomery County Planning Board proposed rezoning 11 acres of Oakmont Avenue from rural residential to light industrial, the town opposed the plan, fearing that it could lead to rezoning a larger portion of the area just outside its borders. A proposal in 1959 for the western quadrant of nearby Redland, a town south of Washington Grove, to be redeveloped with 25,000 new housing units similarly provoked opposition. The town also fought the rezoning and development of 388 acres along Snouffer's School Road, which lay to the town's north – a plan that included the construction of the Montgomery County Airpark and an adjacent light industrial park.[346] Although opposition to development and rezoning continued, the town lacked the clout to halt the plans. Such changes largely erased the pastoral settings that existed in the area well into the 1960s. As the result of a development-friendly county council in power from 1962 to 1966, thousands of acres of Montgomery County were rezoned for higher-density use.[347] When a high-rise complex was proposed west of the West Woods in 1965, the town staunchly opposed the plans. Although the full scope of the proposal was not implemented, some new apartment buildings were constructed.[348]

[345] Letter from Mayor George A. Pughe to Senator Alan Bible, November 19, 1957, WGA, Box H-2.

[346] Edwards, *Washington Grove, 1937-1977*, 146-49.

[347] MacMaster and Hiebert, *A Grateful Remembrance: The Story of Montgomery County, Maryland, 1776-1976*, 360.

[348] Edwards, *Washington Grove, 1937-1977*, 200.

Washington Grove residents in the 1960s and 1970s were forceful advocates for the protection of the town's natural resources. As early as 1962, residents, including Mayor Don McCathran, suggested formally dedicating the town's West Woods as a wildlife preserve to protect it from future development.[349] The shift from thinking of the woods as a *reserve* to a *preserve* reflected the conclusion that their value would not be determined from timber sales.[350] The West Woods were officially designated a forest preserve in 1964. Despite this, in 1971, a state forester studied the East and West Woods and determined that mature tulip poplars in the West Woods could sell for $2,000. The town's Forestry Committee agreed only to cut dead trees. When it was discovered that live trees had also been marked for cutting, a groundswell of opposition developed. Protests from angry residents at a town council meeting stopped the timber harvest and ultimately led to the resignation of Mayor Al Christie. The incident led to the establishment of a Forestry Policy Committee, which authored studies that led to a forestry policy section included in the town's Master Plan.[351] The town's forests were recognized not only for their aesthetic and recreational value, but as protection from noise and a buffer against nearby development.[352]

Current Period (1970-present)

The idealistic traditions of camp meetings continue to motivate the town's residents to preserve Washington Grove's culture and setting through active participation in town and community planning issues.

Preservation Efforts

In the late 1970s, Washington Grove's Planning Commission initiated two important efforts to protect the town's natural and cultural resources. First, in March 1977, the commission prepared a report to the mayor and town council recommending that the entire town be nominated for designation as an "area of critical state concern." Recent state legislation aimed at promoting balanced growth gave authorization to the Maryland Department of State Planning to work with local jurisdictions to identify areas that were of such significance that future use or development was of concern to the entire state.[353] The Planning Commission's report cited threats by adjacent development and the possibility of state or county condemnation for rights-of-way through the town's woods. While the commission's report did not result in designation by the state, a separate effort to nominate the town to the National Register of Historic Places succeeded. The commission identified several

[349] Edwards, *Washington Grove, 1937-1977*, 192.

[350] Wendy Harris, News Dispatches from Other Centuries, "Our Woods and Walkways: Are They Historic? (Part Two)."

[351] Edwards, *Washington Grove, 1937-1977*, 221-22.

[352] "Report to the Washington Grove Town Council from the Forestry Committee," January 9, 1973, WGA, Box L-7.

[353] Memorandum, "Areas of Critical State Concern," 1977, WGA, Box L-7.

areas of significance to address in the nomination: town planning and design; cultural history, with emphasis on the camp meeting, Chautauqua, and recreational clubs; and architecture.[354] Fieldwork began in the spring of 1978, and the Town of Washington Grove was officially listed on the National Register of Historic Places as a historic district in 1980.

The 1980 National Register designation has been of great value to the town. When McCathran Hall was in disrepair and needed additional space for municipal government functions, Washington Grove's National Register status enabled it to obtain in 1991 a $100,000 grant from the state conditioned upon a perpetual preservation easement on the building's exterior and surroundings. The Washington Grove Historic Preservation Commission, established in 2001, uses the National Register documentation to guide and inform decisions and policies, helping to protect the historic integrity of the district. The National Register designation has also been essential in the town's preservation battles over increased development pressure.

Over the years, town officials and residents have successfully capitalized on the Washington Grove's historic status to preserve and protect its historic resources, spaces, and viewshed corridors and protect against overreaching development. When development was proposed for the open land east of Ridge Road, which was part of the original tract purchased for the camp meeting and has been historically associated with Washington Grove's agricultural setting, the Maryland-National Capital Park and Planning Commission required the developer to negotiate with the town to agree on a plan that would both preserve the town's historic context and meet their development goals. When the state proposed a design for the Intercounty Connector expressway within sight of the town, the visual and acoustical impacts of the design alternatives on the historic district were required to be examined and mitigated. Though the construction of the expressway did go forward, berms and plantings were required to minimize the impacts. In 2013, Washington Grove was listed on Preservation Maryland's "Endangered Maryland" list of the state's most threatened historic resources. Proposed zoning changes and incompatible high-density development along the town's borders that threatened the historic district's integrity were cited as the justification.

The 2014 Humpback Bridge rehabilitation project is a successful example of a positive collaboration between the town and CSX Transportation to preserve the historic railroad structure. CSX Transportation's 2009 National Gateway project required that the historic bridge be modified to allow sufficient clearance for two stacked rail containers. Town activists' held discussions with CSX about options to obtain the extra 20 inches of clearance while preserving the historic features of the bridge. Initially, it appeared that there was no solution short of demolition. CSX, however, developed a successful engineering and preservation solution that used single spans of rolled steel beams with an arched shape that provided the required clearance while retaining the bridge's distinctive humpback shape.

[354] Planning Commission Meeting Minutes, January 25, 1978, courtesy Wendy Harris, Washington Grove Historic Preservation Commission.

Conflict over the Commercial Corner

One of the defining events of Washington Grove's current past was its successful lawsuit against The Southland Corporation, an international conglomerate and parent company of the 7-Eleven chain of convenience stores. In 1971, Bobby Lee, then owner of the old general store and the Odd Fellows Hall comprising the town's commercial corner, requested a permit to redevelop the lots. His plan proposed demolishing the old general store and replacing it with a modern shopping center that would be anchored on the south by the Odd Fellows Hall and on the north by a 7-Eleven convenience store.[355] The plans were approved, and the project was completed in 1973.[356] To integrate the Odd Fellows Hall with the new construction, the front façade of molded concrete block building was faced with brick veneer and given a faux Mansard roof. The 7-Eleven was a one-story, brick veneer building with large, plate-glass windows fronting Washington Grove Lane. Its low-pitched, cross-gable roof was embellished with Colonial Revival elements, including a roof balustrade and weathervane.[357] Among the new tenants of the shopping center was the U.S. Post Office, which relocated from Hershey's on Oakmont Avenue to the Odd Fellows Hall.

As one of the only convenience stores in the area, the 7-Eleven offered lottery tickets, pinball machines, video games, and movie rentals, attracting heavy foot and automobile traffic from all directions, but primarily along Washington Grove Lane and through the town's adjacent streets and avenues. This brought complaints of litter, petty crime, and car break-ins. Young African Americans walking from nearby Emory Grove, which had been recently subjected to an urban renewal demolition project, bore the brunt of the accusations. By 1975, the store was operating twenty-four hours a day, and the commercial corner had become an epicenter for "noise, loitering, vandalism, and other illegal activities."[358] As the years passed, the issue became more acute and battles over town control escalated. The 7-Eleven was declared a public nuisance, and the issue was frequently and passionately discussed at town meetings, special meetings, and conferences between town officials, the police, and neighboring communities. Citizens committees were formed to document the frequency and severity of problems with litter, loitering, noise, and crime and to establish a legal defense fund to cover anticipated legal fees. Finally, the town took action in 1983 when it added an article to its ordinances that regulated commercial activity, required business licenses, limited business hours, and required deposits on beverage containers. This, in effect, declared certain previously valid uses of the commercial corner to be non-conforming, resulting in a two-year legal battle with Southland. This was a formidable task for the small municipality and its cadre of activists and was viewed by many as a "David vs. Goliath" confrontation.

[355] Edwards, *Washington Grove, 1937-1977*, 256.

[356] "The Commercial Corner: Assessment and Recommendations," Report by the Planning Commission to the Mayor and Council of the Town of Washington Grove, March 14, 1983, WGA.

[357] The balustrade and weathervane were lost in a recent roof repair.

[358] Edwards, *Washington Grove, 1937-1977*, 301.

Washington Grove's annual budget was less than $150,000, and Southland was an international corporation that had recorded $1 billion in sales in 1971.[359] The town faced years of legal battles and potential ruin. The case was proceeding to trial, when, in 1985, a settlement was reached in the town's favor. Southland agreed to immediately reduce its hours of operation and to relocate within five years. In turn, the town agreed to issue a business license to Southland and agreed not to enforce its beverage container deposit requirement.[360] The settlement left the 1983 ordinance amendment intact, demonstrating the town's ability to respond effectively to conditions that threatened the community life, welfare, and safety of its residents.[361] A key player in the settlement was Grove resident Barbara Hawk, who joined the town council in 1979 and was elected the first female mayor in 1983. Hawk was a fearless advocate for Washington Grove during its long and bitter battle to protect the town's character and safety and was a key player in the successful settlement of the Southland dispute.

Town Growth

Over the past thirty years, more or less, the annexation of land into the town's corporate limits has been used as a tool to control and coordinate with Montgomery County and adjacent jurisdictions the physical development of areas near the town's boundaries. In 1987, the town annexed a 1-acre parcel of land along Washington Grove Lane known as "Stewart's Addition," which was laid out as Daylily Lane and subdivided into four residential lots. In 1994, the town acquired 2.88 acres of land east of Ridge Road, which was laid out as an extension of Brown Street and subdivided. Between 1992 and 2000, roughly 16.5 acres of land along Ridge Road were annexed by the town in order to "protect within the Washington Grove community the historic rustic rural nature of the road and the character of these properties."[362] In 2007, the town annexed a 2-acre parcel at 17050 Railroad Street adjacent to Aitchison Crossing. This is the location of a two-story, concrete-block house built in 1908 and contemporary to many cottages built in Washington Grove. The town's development plan for the parcel allows for the addition of three additional houses that would face a pedestrian extension of Maple Avenue and requires compatible porches and detached garages. The town also annexed individual houses along Ridge Road and Washington Grove Lane as they became interested. Most recently, the town acquired a 12-acre

[359] Handbook of Texas Online, Rajni Madan, "Southland Corporation," accessed August 6, 2018, available at https://tshaonline.org/handbook/online/articles/dhs02.

[360] Press Release, July 8, 1985, WGA, Box Q-8.

[361] While the Odd Fellows Hall is identified as a contributing building of the historic district due to its age and architectural significance, the other buildings of the shopping center (109 Washington Grove Lane and 111-113 Washington Grove Lane), including the former 7-Eleven, are identified as noncontributing because they do not date to the period of significance and their historic significance relates to events that took place within the last fifty years. Consideration should be given to re-evaluating these resources when additional time has passed.

[362] Washington Grove Planning Commission, "2009 Master Plan, Town of Washington Grove, Maryland," 2009, 10.

meadow along Ridge Road that historically comprised part of a farm that once was part of the original Washington Grove camp meeting site. The meadow's open space and small-scale features reinforce interpretation of the Washington Grove within the context of Montgomery County's agricultural heritage and preserve the rural, open vistas that historically formed its setting. For these reasons, in 2002, the Maryland-National Capital Park and Planning Commission designated the meadow a Heritage Resource within its Legacy Open Space Functional Master Plan.

Washington Grove's 2009 Master Plan highlights the need to preserve the town's historic character and focuses on threats to its borders "in the form of ever encroaching urbanization" and internal threats "in the form of diminished communal contribution and physical integrity."[363] An example of the latter threat involved the historic street signs. In 2017, it was proposed that the town replace its deteriorating historic wood street signs with modern metal ones for better visibility by emergency vehicles and for ease of maintenance. The town council considered testimony from residents about their appreciation for the unique sense of place the historic street signs represented and from the Historic Preservation Commission about the history, significance, and potential rehabilitated of the street signs. A town resident came forward and organized a group of volunteers to rehabilitate or replace in-kind the deteriorated signs, but using reflective paint for the lettering. The historic street sign rehabilitation project was a successful demonstration of the town's volunteer "communal contribution" heritage.[364]

Cultural Traditions[365]

The tradition of community service has been a vital component of life in Washington Grove since its early days. The governance of the camp meeting association relied on the active participation of religious and lay leaders which evolved into a town meeting form of government wherein residents serve as elected officials and volunteers in the municipal government. The town government relies on committees whose success is dependent on the time, expertise, and dedication of its active citizenry. Many of these committees are based on the cultural traditions that have defined the community's sense of place since its inception.

Historically and today, Washington Grove is a place defined by the presence of trees. By the end of the 1880s, the camp meeting association had formed a Grounds Committee that advocated for planting new trees and preserving existing specimens. In 1913, a Forestry Committee was founded to promote the responsible management of the association's woodlands. In the 1960s, the Forestry Committee was instrumental in having the East Woods and West Woods designated as forest preserves, and a town nursery was established in

[363] Washington Grove Planning Commission, "Town of Washington Grove, Maryland, 2009 Master Plan," 2009, 5.

[364] Information provided by Gail Littlefield, Washington Grove Historic Preservation Commission, April 2019.

[365] Adapted from text provided by Clare Lise Kelly, dated April 2, 2019.

southeast section of Woodward Park. In 2007, the nursery was redefined as an arboretum. These initiatives and actions demonstrate the continued tradition of preserving and protecting the tree canopy that has long defined the setting of Washington Grove.

The Recreation Committee maintains the tradition of hosting both active and passive forms of recreation within the town's open spaces and forests. Early residents and visitors participated in nature walks, and tennis was popular in Washington Grove by the 1890s. Starting in 1903, the camp meeting association hosted track and field events in Woodward Park every summer that were highly popular with residents and the public alike. Today, the Recreation Committee organizes athletic events every Labor Day weekend that culminate in an awards ceremony. Maple Lake continues to be a popular summer gathering place, offering recreational swimming and swimming lessons.

The town has a full calendar of cultural, educational, and social events that have roots in the Chautauqua tradition. Many take place in McCathran Hall, preserving the tradition of using the building for church services, Sunday school activities, and Chautauqua. Today, in addition to serving as the Town Hall, the building is the site of a film series, concerts, lectures, choir performances, a day camp for children, dance lessons, and other activities.

The Woman's Club of Washington Grove had its first meeting in 1926, and the organization has been an integral part of Washington Grove life for nearly 100 years. After their first clubhouse burned, the organization was given permission to build a new clubhouse in Howard Park, completed in 1940. The club continues to have active membership and hosts an annual potluck supper for all town residents.

Music is integral to the Methodist denomination. During the camp meeting era, residents celebrated with hymns, and musical events were a key feature of Chautauqua. A community band was organized in 1902, and the first public dance was held in 1920. Today, the town organizes an annual Music Weekend with evening concerts and a potluck breakfast with live music at the bandstand. Music and dance events are held in McCathran Hall regularly.

The Washington Grove United Methodist Church was organized in 1910. The congregation originally met in McCathran Hall until a new church was built on Chestnut Avenue in 1955. The church carries on the tradition of religious community gathering in Washington Grove. While a small proportion of town residents are members of the church today, the congregation has continued to bring town residents, members and non-members, together. Church events are attended and supported by individuals and families who live in Washington Grove. Examples include the Christmas service with candle-lighting and hymn singing and the Easter sunrise service at the Ridge Road meadow.

Lastly, the tradition of rail travel continues to define life in Washington Grove. With its dedicated stop at Washington Grove, the B&O carried excursionists and residents as well as building materials and supplies to

the camp meeting. The railroad was instrumental in the transition of Washington Grove from a seasonal resort to a thriving suburban enclave. Residents today continue to commute to jobs in Washington, D.C., taking the train to Union Station.

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10. Geographical Data

Acreage of Property Approximately 225 acres

Latitude and Longitude Coordinates

See continuation sheet.

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet)

See continuation sheet.

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet)

See continuation sheet.

11. Form Prepared By

name/title Daria Gasparini and Mike Mitchell, Architectural Historians
Organization Robinson & Associates, Inc. date February 10, 2020
street & number 725 15th Street, NW, Suite 600 telephone (202) 234-2333
city or town Washington state DC zip code 20005

Additional Documentation

Submit the following items with the completed form:

Maps

A USGS map (7.5 minute series) indicating the property's location.

A latitude and longitude map with coordinates indicating the property's location.

A map of the historic district showing contributing and noncontributing buildings.

Photographs

Representative photographs of the property.

Additional Items
(Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of SHPO or FPO)

name
street & number telephone
city or town state zip code

Latitude and Longitude Coordinates

A. 39.146773, -77.178570
B. 39.147610, -77.175318
C. 39.143612, -77.173890
D. 39.144399, -77.172820
E. 39.143408, -77.171762
F. 39.143012, -77.167928
G. 39.142591, -77.167679
H. 39.139897, -77.169943
I. 39.139211, -77.168732
J. 39.139419, -77.167946
K. 39.139028, -77.166035
L. 39.137908, -77.165993
M. 39.138216, -77.167905
N. 39.137979, -77.169748
O. 39.139159, -77.170726
P. 39.137955, -77.171697
Q. 39.137192, -77.170122
R. 39.135192, -77.172209
S. 39.135901, -77.173567
T. 39.135407, -77.174053
U. 39.135004, -77.173803
V. 39.135231, -77.174699
W. 39.134446, -77.175831
X. 39.139080, -77.179963
Y. 39.139768, -77.179347
Z. 39.140081, -77.180068

Verbal Boundary Description

The boundary of the Washington Grove Historic District is indicated on the attached maps, which are drawn to scale.

Boundary Justification

The Washington Grove Historic District is roughly bound by Railroad Street on the south, Washington Grove Lane and the western limits of the town's West Woods on the west, Boundary Street and the northern limits of the East Woods on the north, and Ridge Road and the eastern edge of the Washington Grove Meadow Conservation Park on the east. These boundaries take into account legal limits, the distribution of resources, and the cultural features that define the physical extent and location of the historic district and encompass the residential, commercial, municipal, and religious resources and historic associated landscape features that contribute to its significance. The historic district encompasses approximately 225 acres and includes nearly all

Boundary Justification (cont.)

of the land within the town's municipal boundaries, as well as two areas (the Washington Grove Meadow Conservation Park and a cluster of three residential buildings on the west side of Washington Grove Lane) that are outside the town limits but relate directly to the distinctive historical themes and development that characterize Washington Grove. The 12-acre Washington Grove Meadow Conservation Park is located along the east side of Ridge Road. The park features a native meadow habitat with forested edges and natural surface trails. While the land was part of the original tract acquired by Washington Grove, it was never platted for residential development. Instead, it was used as farmland, and, for decades, this parcel contributed to Washington Grove's rural character and reinforced its image as "a place apart." Today, the park preserves the rural, open vistas and spatial organization of the agricultural fields that historically formed the setting of Washington Grove and is a contributing site within the historic district. The three early twentieth-century houses on the west side of Washington Grove Lane (126, 128, and 200 Washington Grove Lane) were developed on lots that were historically part of the original land acquisition for Washington Grove. Although they are no longer located within the town limits, the houses retain integrity and contribute to the residential setting and architectural character of the historic district. The eastern boundary of the historic district extends to embrace a concentration of residential properties along the eastern extension of Ridge Street that demonstrate the character of Washington Grove's growth during the post-World War II era. This segment of Ridge Street retains integrity despite the subdivision of several properties to create "flag lots." The recent houses built on these lots do not contribute to the significance of the district, but they are set back from the street, minimizing their impact on the character of the streetscape. Three areas within the town limits, but at its edges, are excluded from the historic district because they feature clusters of noncontributing resources and/or lack integrity. These include 2.88 acres at the eastern end of Brown Street (500-507 Brown Street), 1.58 acres along the eastern side of Ridge Road (211-217 Ridge Road), and the small park along the south side of Railroad Street known as Railroad Park.

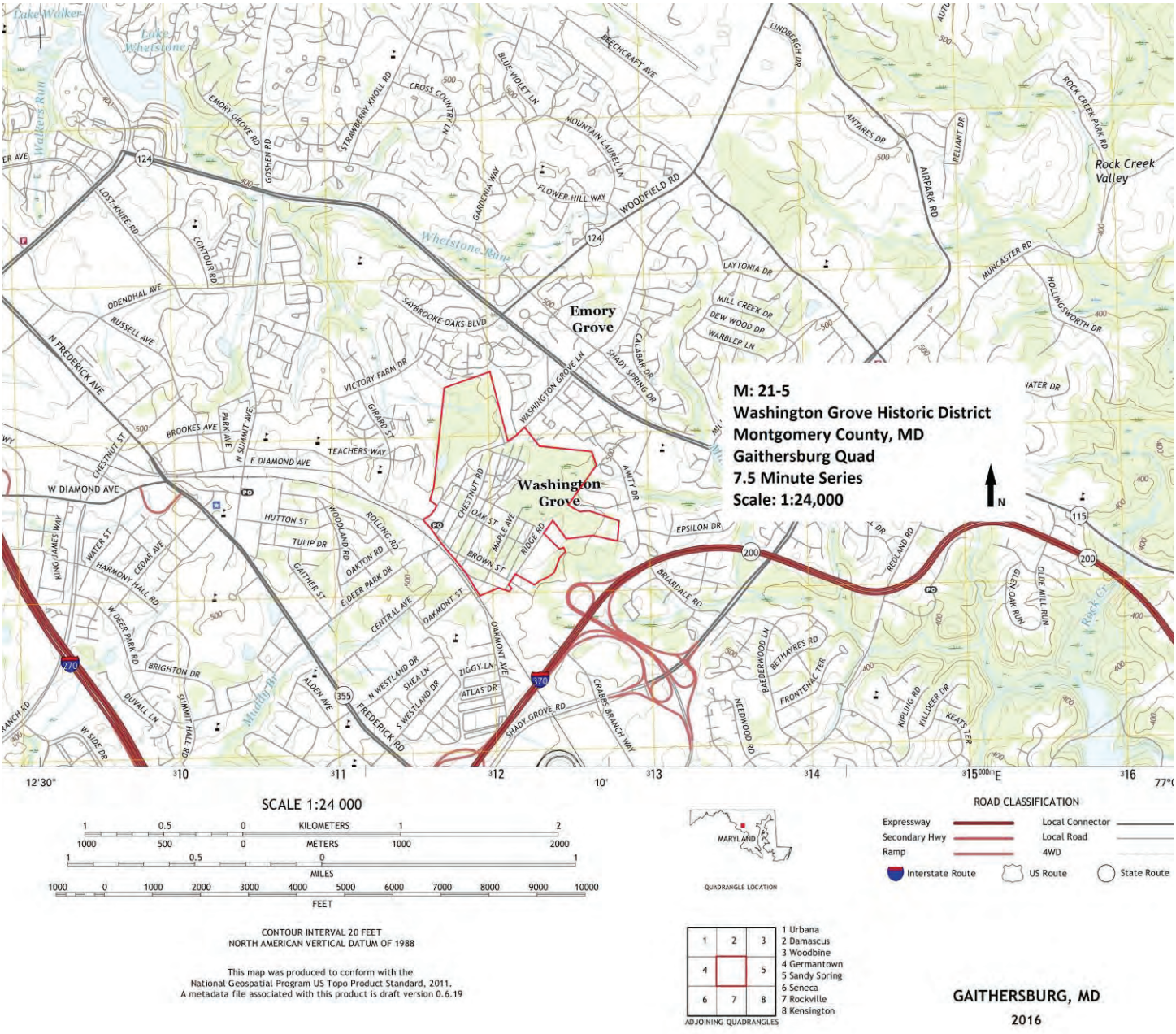
United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Washington Grove Historic District (M: 21-5)
Name of Property

Montgomery County, Maryland
County and State

Section MAPS



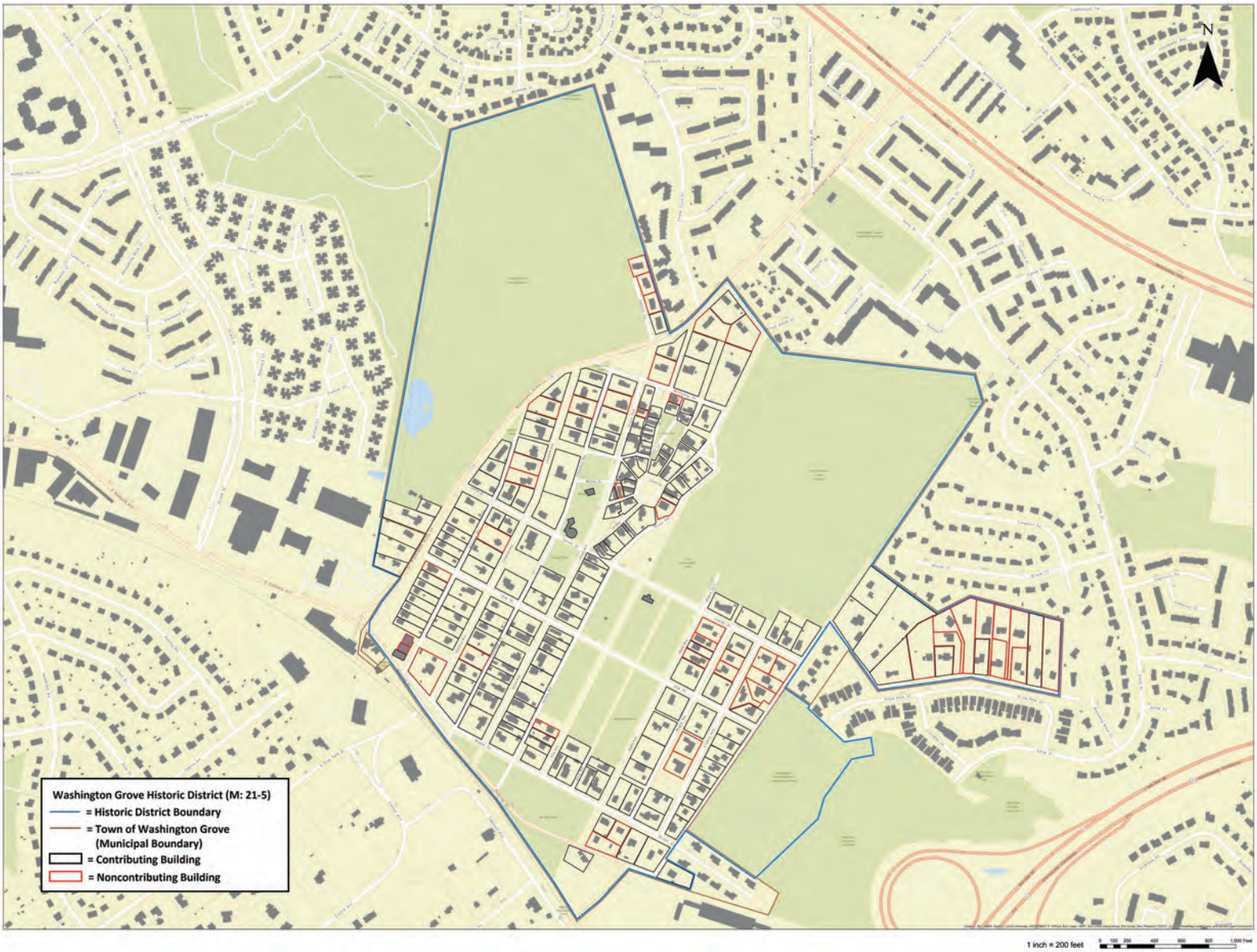
United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Washington Grove Historic District (M: 21-5)
Name of Property

Montgomery County, Maryland
County and State

Section MAPS


N
Washington Grove Historic District (M: 21-5)
= Historic District Boundary
= Town of Washington Grove (Municipal Boundary)
= Contributing Building
= Noncontributing Building
1 inch = 200 feet

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Washington Grove Historic District (M: 21-5)
Name of Property

Montgomery Country, Maryland
County and State

Section HISTORIC MAPS AND IMAGES Page 1

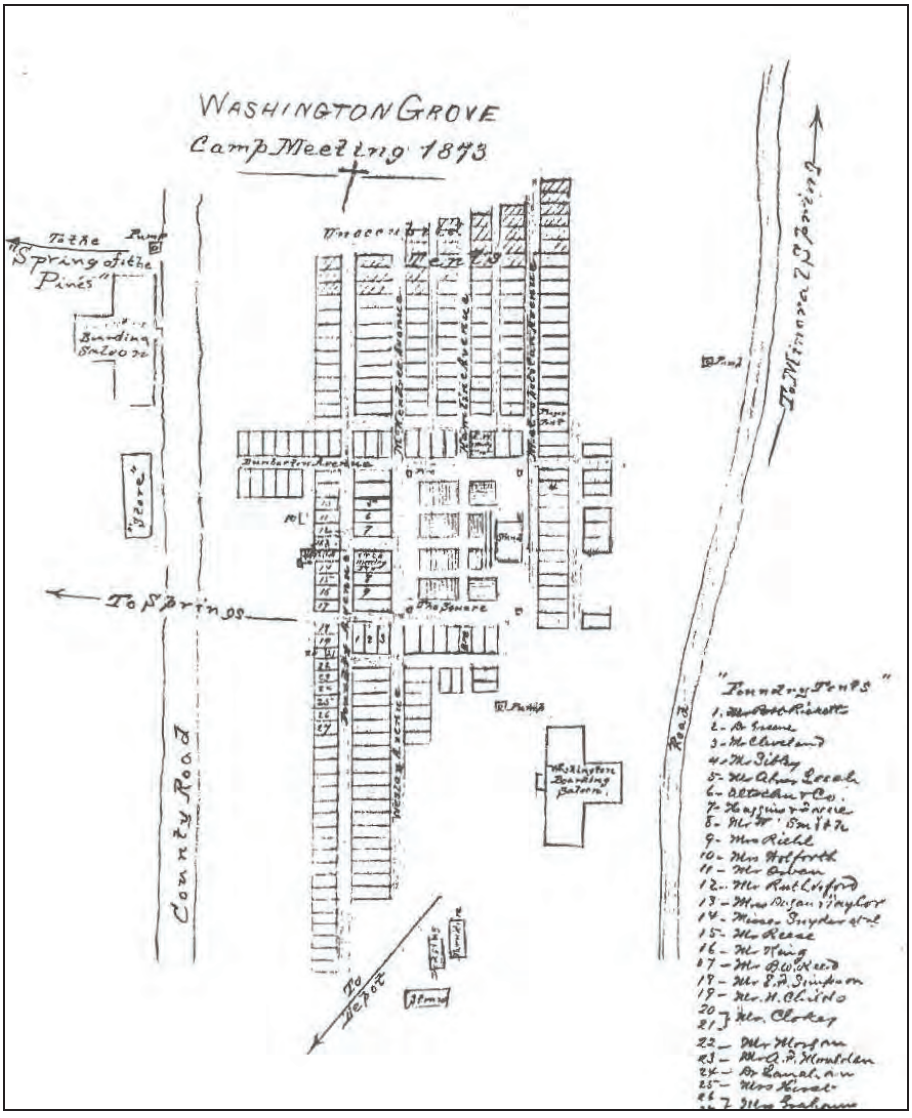


Figure 1: Sketch map by James L. Ewins of the first camp meeting in 1873. [Reproduced from Edwards, *Washington Grove, 1873-1937*, original copy in Washington Grove Archives, "Sketch Map by James L. Ewins, Camp Meeting in 1873" (1873), MA.000Z3.02.]

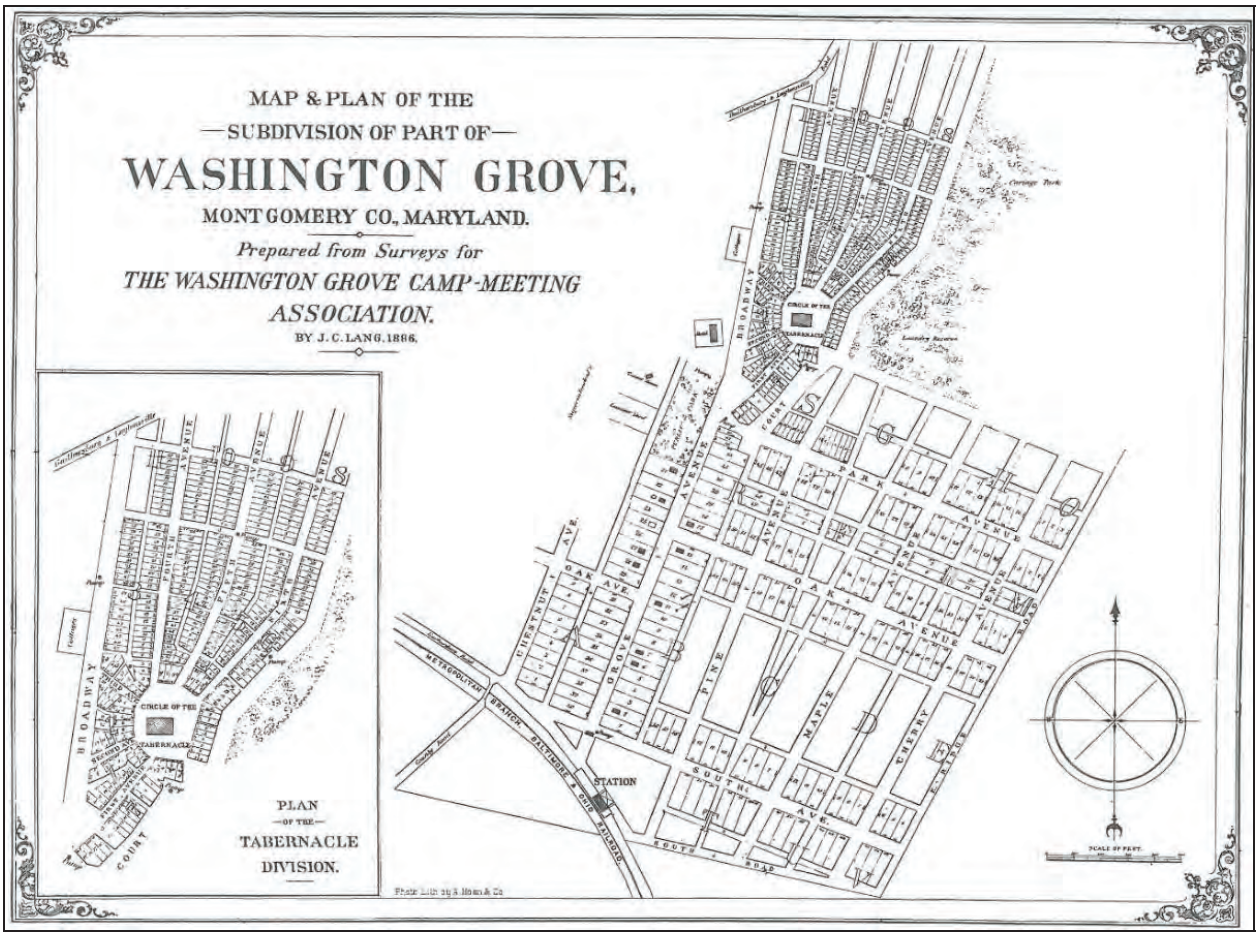


Figure 2: Map and plan of Washington Grove from surveys by J. C. Lang, 1886. [Reproduced from Edwards, *Washington Grove, 1873-1937*, original copy in Washington Grove Archives, "Plan of Subdivision Part of Washington Grove, Surveys by J. C. Lang, Tabernacle Division" (1886), MA.00Z3.04.]

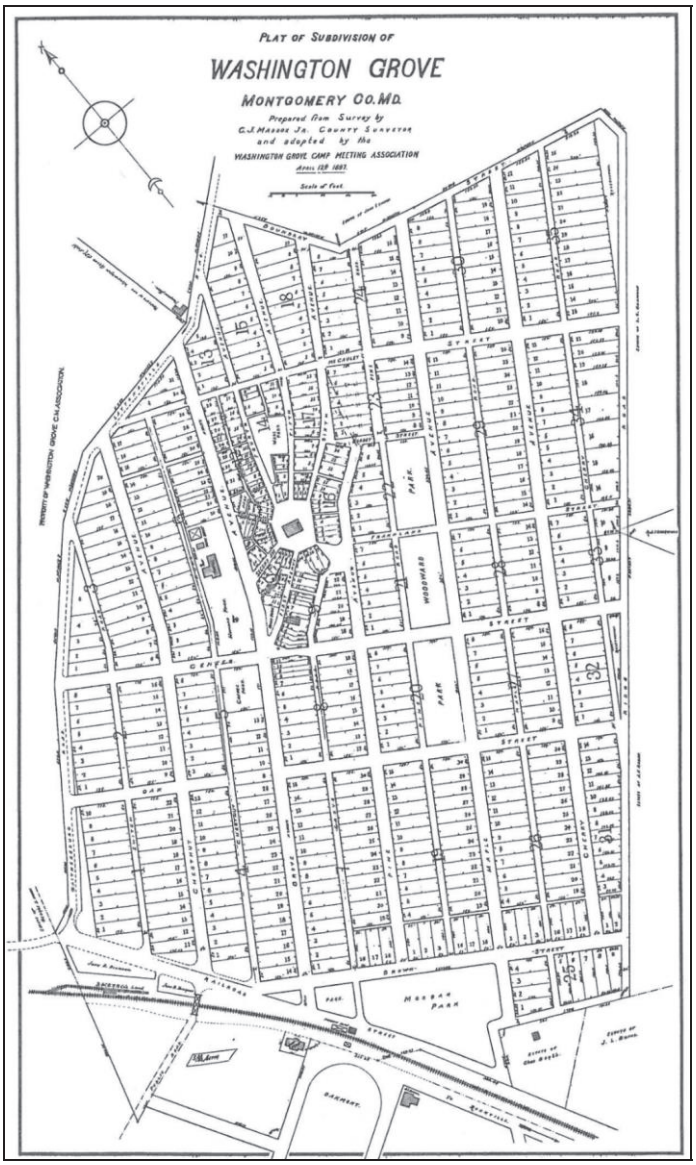


Figure 3: Plan of Washington Grove from survey by C. J. Maddox, 1897. [Reproduced from Edwards, *Washington Grove, 1873-1937*, original in Washington Grove Archives, "Plan of Subdivision with Tabernacle, Maddox Surveyor" (1897), MA.00Z3.08.]

Figure 4: View, circa 1910, of Railroad Street and the Humpback Bridge from the Washington Grove station. Note the fence (on right) that surrounded the Washington Grove camp meeting for many years. [Washington Grove Archives]

Figure 5: View of the tabernacle at Washington Grove, built in 1877. This structure was demolished in 1905 when the Washington Grove Camp Meeting Association built an auditorium for Chautauqua in Woodward Park. [Washington Grove Archives]

Figure 6: View of the Circle and surrounding Carpenter Gothic cottages in 1898. [Washington Grove Archives]

Figure 7: Early view of Grove Avenue, no date. [Washington Grove Archives]

Figure 8: Undated view of Washington Grove showing two forms of early cottage construction and design. [Washington Grove Archives]

Figure 9: Exterior view of the Washington Grove assembly hall (today McCathran Hall). Built in 1901, it initially was used for religious services. [Washington Grove Archives]

Figure 10: Exterior view of Washington Grove auditorium, built in 1905 for Chautauqua assemblies and razed in 1963. [Washington Grove Archives]

Index to Photographs

The photographs included in the nomination are organized starting with a select number of images that depict the primary views that contribute to the resource and represent important spatial elements of the Washington Grove Historic District. Following these is a series of photographs of some of the historic associated features that contribute to the district's setting. Finally, there are a select number of photographs of contributing buildings (arranged in roughly chronological order) and representative streetscapes.

The following information applies to all photographs that accompany this documentation:

Maryland Inventory of Historic Properties (MIHP) Number: M: 21-5
Name of Property: Washington Grove Historic District
Location: Montgomery County, Maryland
Photographer: Robinson & Associates, Inc.
Date taken: 2018
Location of original digital files: Washington Grove Archive

MD_ MontgomeryCounty_WashingtonGroveHD_0001.tif
View looking south down Grove Avenue

MD_ MontgomeryCounty_WashingtonGroveHD_0002.tif
Oak Street looking southeast across Woodward Park

MD_ MontgomeryCounty_WashingtonGroveHD_0003.tif
First Avenue looking northeast toward the Circle

MD_ MontgomeryCounty_WashingtonGroveHD_0004.tif
View looking south across the Circle

MD_ MontgomeryCounty_WashingtonGroveHD_0005.tif
Washington Grove Lane looking southwest

MD_ MontgomeryCounty_WashingtonGroveHD_0006.tif
View looking west from the south end of Hickory Road at its intersection with Railroad Street

MD_ MontgomeryCounty_WashingtonGroveHD_0007.tif
Looking south across the Washington Grove Meadow Conservation Park

MD_ MontgomeryCounty_WashingtonGroveHD_0008.tif
View from the eastern edge of the Washington Grove Meadow Conservation Park looking west toward the cottages in Washington Grove

MD_MontgomeryCounty_WashingtonGroveHD_0009.tif
The Circle, looking south

MD_ MontgomeryCounty_WashingtonGroveHD_0010.tif
Wade Park, looking northeast

MD_ MontgomeryCounty_WashingtonGroveHD_0011.tif
Maple Avenue, looking north

MD_ MontgomeryCounty_WashingtonGroveHD_0012.tif
Morgan Park and the Grove Road entrance to Washington Grove

MD_ MontgomeryCounty_WashingtonGroveHD_0013.tif
Center Street, looking west

MD_ MontgomeryCounty_WashingtonGroveHD_0014.tif
Chapel Park, looking south

MD_ MontgomeryCounty_WashingtonGroveHD_0015.tif
Woodward Park

MD_ MontgomeryCounty_WashingtonGroveHD_0016.tif
East Woods

MD_ MontgomeryCounty_WashingtonGroveHD_0017.tif
West Woods

MD_ MontgomeryCounty_WashingtonGroveHD_0018.tif
Street sign, corner of Brown Street and Grove Avenue

MD_ MontgomeryCounty_WashingtonGroveHD_0019.tif
15 the Circle, looking east

MD_ MontgomeryCounty_WashingtonGroveHD_0020.tif
1 the Circle, looking south

MD_ MontgomeryCounty_WashingtonGroveHD_0021.tif
313 Grove Avenue, looking northeast

MD_ MontgomeryCounty_WashingtonGroveHD_0022.tif
416 Fifth Avenue, looking northwest

MD_ MontgomeryCounty_WashingtonGroveHD_0023.tif
112 Grove Avenue, looking northwest

MD_ MontgomeryCounty_WashingtonGroveHD_0024.tif
119 Maple Avenue, looking southeast

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Washington Grove Historic District (M:21-5)
Name of Property

Montgomery County, Maryland
County and State

Section PHOTOS Page 26

MD_ MontgomeryCounty_WashingtonGroveHD_0025.tif
300 Grove Avenue (McCathran Hall), looking northwest

MD_ MontgomeryCounty_WashingtonGroveHD_0026.tif
409 Fifth Avenue, looking southeast

MD_ MontgomeryCounty_WashingtonGroveHD_0027.tif
109 Maple Avenue, looking southeast

MD_ MontgomeryCounty_WashingtonGroveHD_0028.tif
108 Grove Avenue, looking northeast

MD_ MontgomeryCounty_WashingtonGroveHD_0029.tif
103 Brown Street, looking northeast

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Washington Grove Historic District (M:21-5)
Name of Property

Montgomery County, Maryland
County and State

Section PHOTOS Page 31

MD_ MontgomeryCounty_WashingtonGroveHD_0030.tif
105 Washington Grove Lane (Odd Fellows Hall), looking east

410 Oak Street, looking south

MD_ MontgomeryCounty_WashingtonGroveHD_0032.tif
201 Washington Grove Lane, looking southeast

MD_ MontgomeryCounty_WashingtonGroveHD_0033.tif
402 Fourth Avenue, looking east

MD_ MontgomeryCounty_WashingtonGroveHD_0034.tif
316 Grove Avenue (Women's Clubhouse), looking northwest

MD_ MontgomeryCounty_WashingtonGroveHD_0035.tif
106 Pine Avenue, looking northwest

MD_ MontgomeryCounty_WashingtonGroveHD_0036.tif
13 Center Street, looking north

MD_ MontgomeryCounty_WashingtonGroveHD_0037.tif
205 Grove Avenue, looking southeast

MD_ MontgomeryCounty_WashingtonGroveHD_0038.tif
415 Chestnut Street, looking southeast

MD_ MontgomeryCounty_WashingtonGroveHD_0039.tif
313 Chestnut Avenue (Washington Grove United Methodist Church), looking west

MD_ MontgomeryCounty_WashingtonGroveHD_0040.tif
First Avenue streetscape, looking northeast from Center Street

MD_ MontgomeryCounty_WashingtonGroveHD_0041.tif
Grove Avenue streetscape, looking southeast

16. List of Figures

16.1 Forest Conservation Areas and Parks
16.2 Soils Map
16.3 Environmental Features
16.4 Zoning
16.5 Land Use

FIGURE 16.1

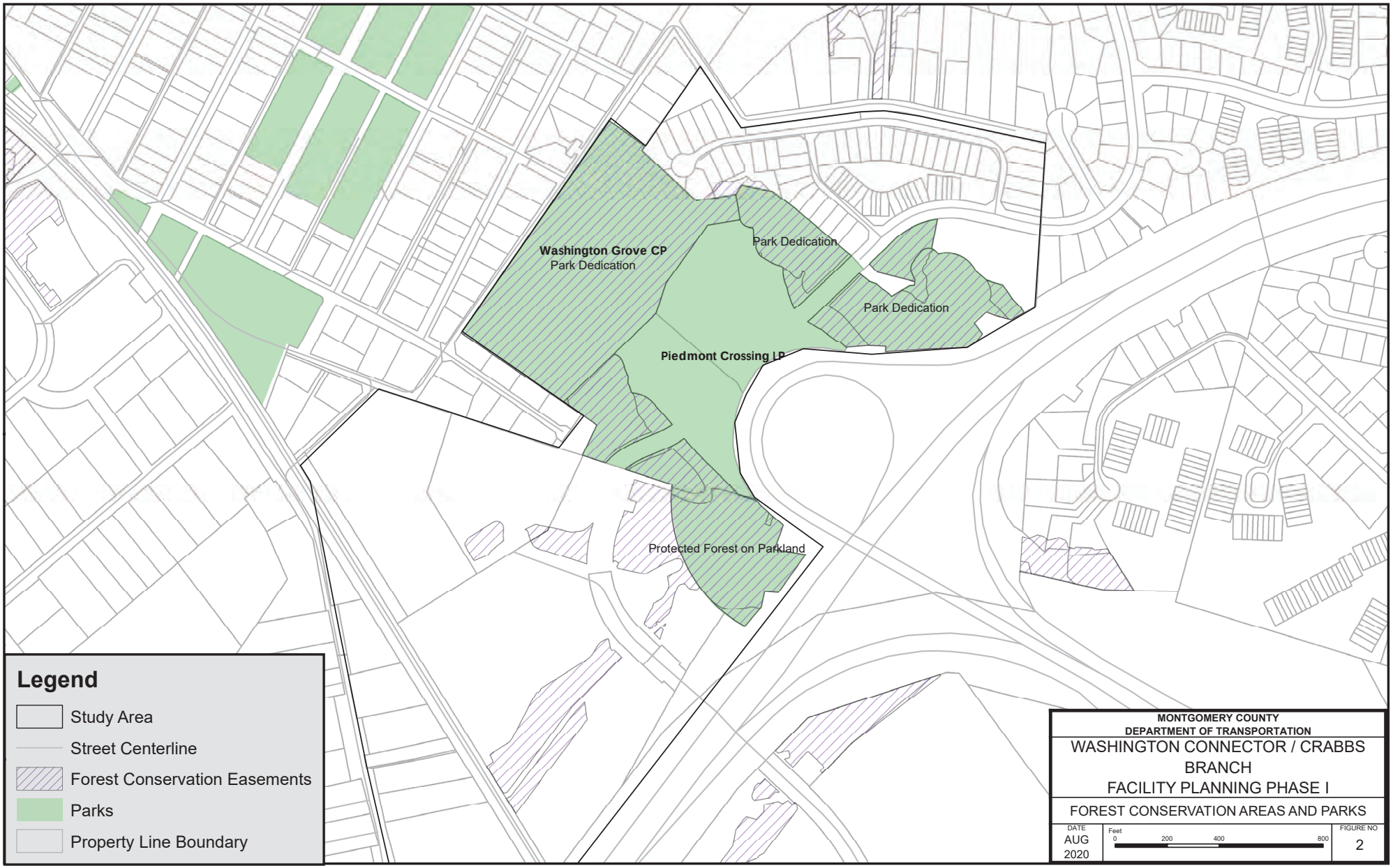

Washington Grove CP
Park Dedication
Park Dedication
Park Dedication
Piedmont Crossing LP
Protected Forest on Parkland
Legend
Study Area
Street Centerline
Forest Conservation Easements
Parks
Property Line Boundary
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONNECTOR / CRABBS BRANCH
FACILITY PLANNING PHASE I
FOREST CONSERVATION AREAS AND PARKS
DATE
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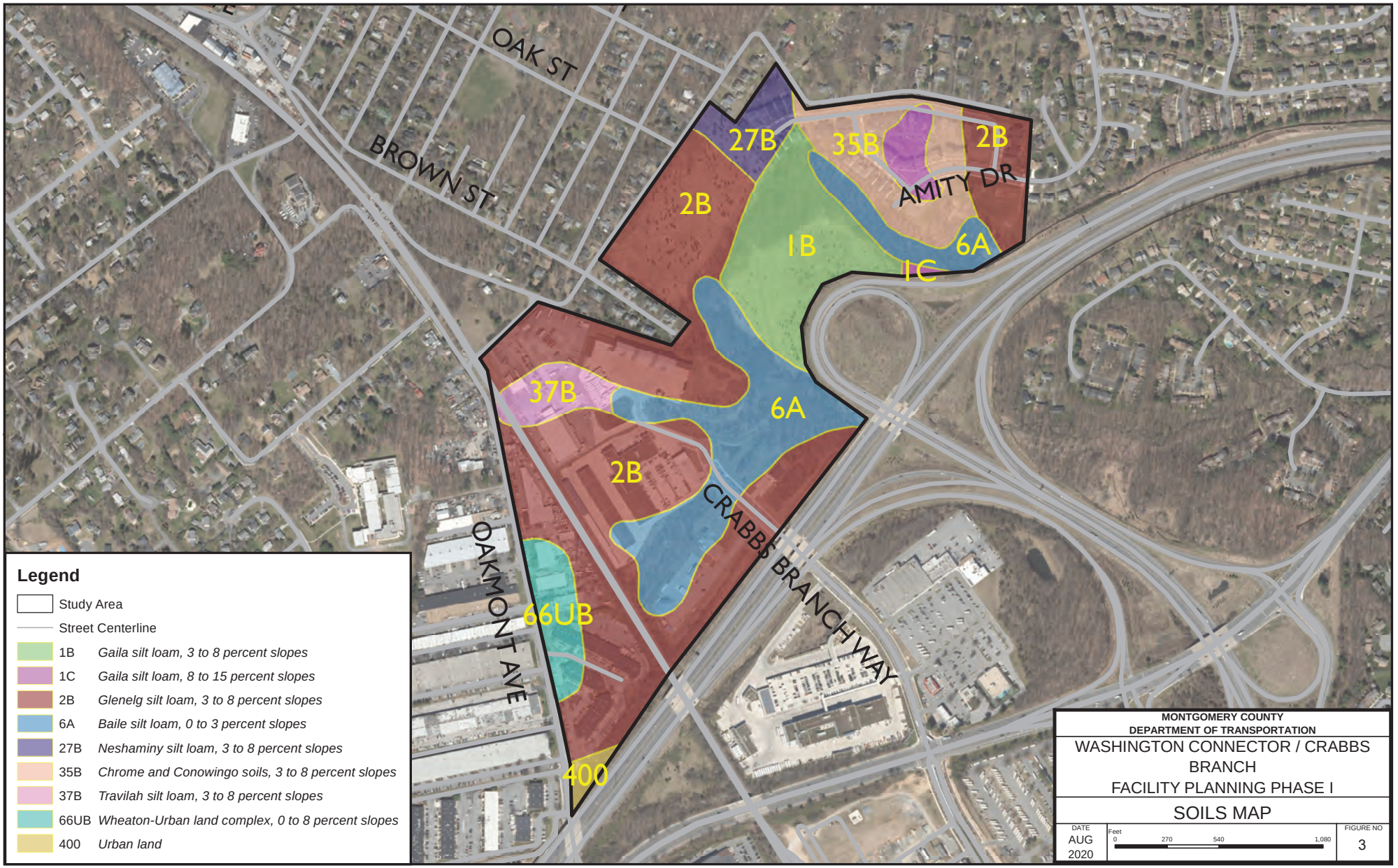
FIGURE NO
2

FIGURE 16.2


OAK ST
BROWN ST
AMITY DR
CRABBS BRANCH WAY
OAKMONT AVE
27B
35B
2B
2B
1B
6A
1C
37B
6A
2B
66UB
400
Legend
Study Area
Street Centerline
1B Gaila silt loam, 3 to 8 percent slopes
1C Gaila silt loam, 8 to 15 percent slopes
2B Glenelg silt loam, 3 to 8 percent slopes
6A Baile silt loam, 0 to 3 percent slopes
27B Neshaminy silt loam, 3 to 8 percent slopes
35B Chrome and Conowingo soils, 3 to 8 percent slopes
37B Travilah silt loam, 3 to 8 percent slopes
66UB Wheaton-Urban land complex, 0 to 8 percent slopes
400 Urban land
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONNECTOR / CRABBS BRANCH
FACILITY PLANNING PHASE I
SOILS MAP
DATE
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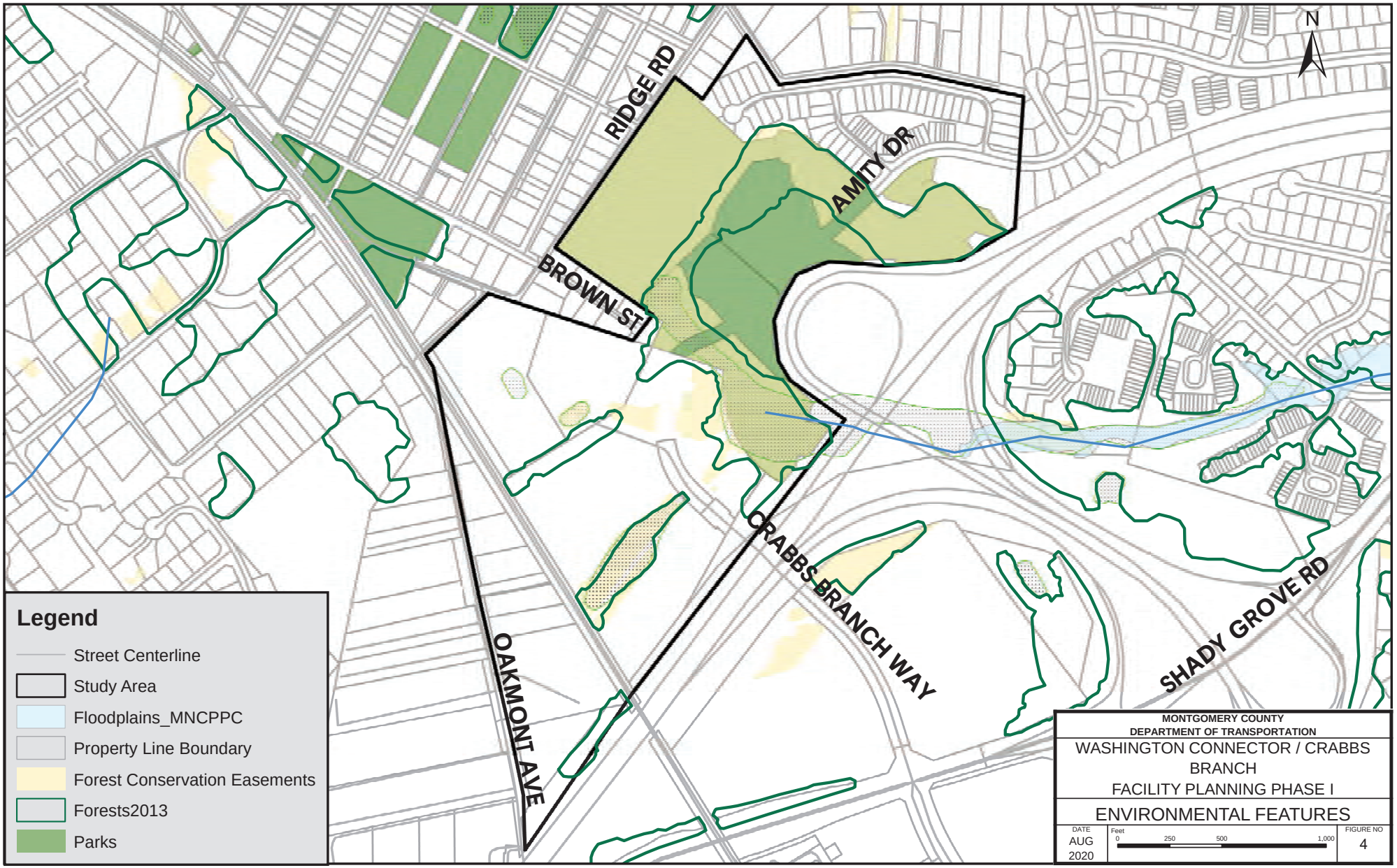
0 270 540 1,080
FIGURE NO
3

FIGURE 16.3


N
RIDGE RD
AMITY DR
BROWN ST
OAKMONT AVE
CRABBS BRANCH WAY
SHADY GROVE RD
Legend
Street Centerline
Study Area
Floodplains_MNCPPC
Property Line Boundary
Forest Conservation Easements
Forests2013
Parks
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONNECTOR / CRABBS BRANCH
FACILITY PLANNING PHASE I
ENVIRONMENTAL FEATURES
DATE
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2020
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500
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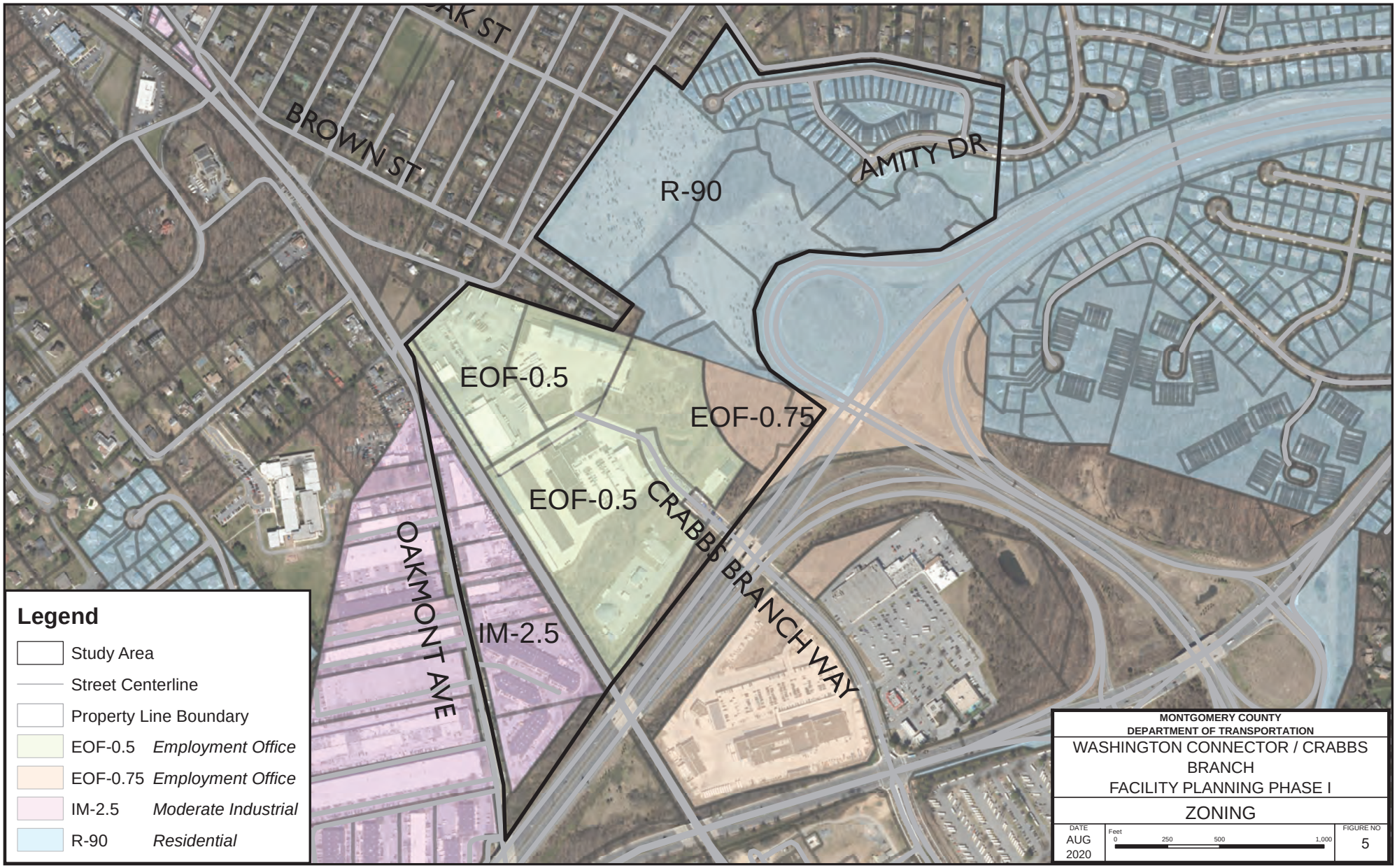
FIGURE NO
4

FIGURE 16.4


AK ST
BROWN ST
AMITY DR
R-90
EOF-0.5
EOF-0.75
EOF-0.5
CRABBS BRANCH WAY
OAKMONT AVE
IM-2.5
Legend
Study Area
Street Centerline
Property Line Boundary
EOF-0.5 Employment Office
EOF-0.75 Employment Office
IM-2.5 Moderate Industrial
R-90 Residential
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONNECTOR / CRABBS BRANCH
FACILITY PLANNING PHASE I
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AUG 2020
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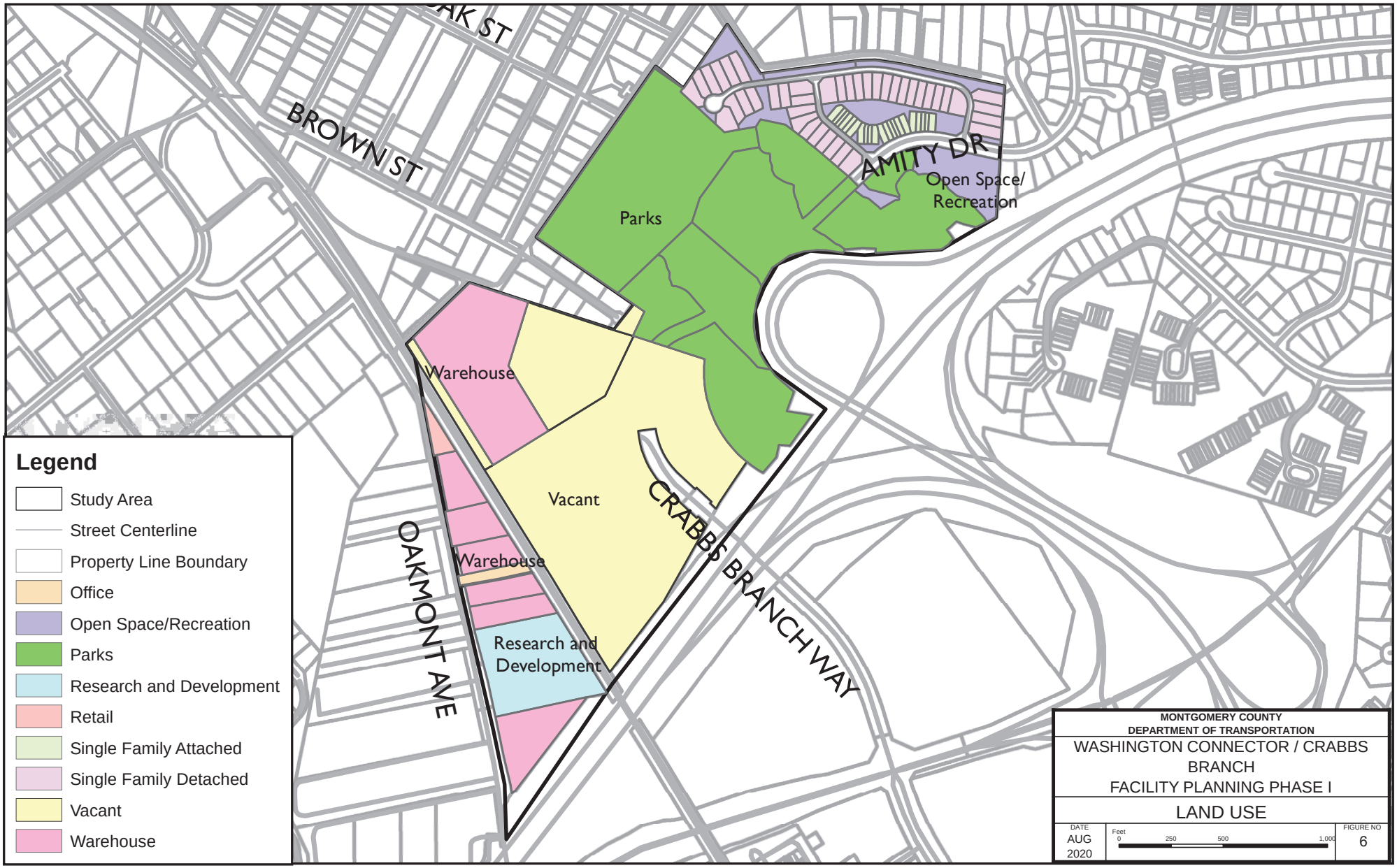
FIGURE NO
5

FIGURE 16.5


AK ST
BROWN ST
AMITY DR
Open Space/
Recreation
Parks
Warehouse
Vacant
Warehouse
Research and
Development
OAKMONT AVE
CRABBS BRANCH WAY
Legend
Study Area
Street Centerline
Property Line Boundary
Office
Open Space/Recreation
Parks
Research and Development
Retail
Single Family Attached
Single Family Detached
Vacant
Warehouse
MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION
WASHINGTON CONNECTOR / CRABBS
BRANCH
FACILITY PLANNING PHASE I
LAND USE
DATE
AUG
2020
Feet
0
250
500
1,000
FIGURE NO
6

17. Reference and Sources

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ii. https://pubs.usgs.gov/ha/730l/report.pdf
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