

**ST. PATRICK'S EPISCOPAL DAY SCHOOL
TRANSPORTATION IMPACT STUDY
WASHINGTON, DC**

Submitted on behalf of:
St. Patrick's Episcopal Day School

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Section I INTRODUCTION

OVERVIEW

This report presents a Transportation Impact Study (TIS) conducted in support of the special exception application filed by St. Patrick's Episcopal Day School (herein referred as St. Patrick's or the Applicant). The case is scheduled to be heard by the District of Columbia Board of Zoning Adjustment (BZA) on December 11, 2012 (BZA Application #18465).

St. Patrick's Whitehaven Campus is located at 4700 Whitehaven Parkway in northwest Washington, DC between Foxhall Road NW and Reservoir Road NW, as shown on Figure 1-1. The subject site (Square 1372, Lot 817 and Square 1374, Lots 838, 839, and 857) is zoned R-1-B.

St. Patrick's is a co-educational school for Nursery School through Grade 8. The Lower School, comprised of Nursery through Grade 3, is located at the Whitehaven Campus. The Upper School consists of Grade 4 through Grade 8. The Whitehaven Campus also "houses" Grades 4 through 6 while Grades 7 and 8 are located at the MacArthur Campus.

Enrollment at the Whitehaven Campus currently is capped at 440 students, a cap that has been in place since 1990. The school's enrollment currently is at 462 students. The special exception application requests an increase in the enrollment to 485 students, an increase of 45 students from the current cap and an increase of 23 students from the current enrollment.

This study was conducted in order to assess the impacts of the proposed student cap increase on the surrounding road network as well as the pick-up/drop-off operations of the school.

STUDY SCOPE

Overview

This report presents the results of a transportation impact study conducted in conjunction with the proposed student cap increase for St. Patrick's

Whitehaven Campus. The scope of the study and proposed methodologies were discussed with the District Department of Transportation (DDOT). The agreed upon scoping document is included in Appendix A.

Study Area

The site's two adjacent intersections, the Foxhall Road/Whitehaven Parkway intersection and the Reservoir Road/Whitehaven Parkway intersection, were identified by DDOT during the scoping process as intersections that should be analyzed in the TIS. Additionally, the pick-up/drop-off operation along Whitehaven Parkway and the pick-up/drop-off lane along Whitehaven Parkway in front of the school were evaluated to determine what, if any, impact the proposed student cap increase would have on its operation.

Study Objectives

The objectives of this study were to:

1. Evaluate existing traffic conditions at the study intersections,
2. Evaluate the existing pick-up/drop-off operation along Whitehaven Parkway and in the pick-up/drop-off lane in front of the school,
3. Evaluate future traffic conditions at the study intersections without the proposed student cap increase,
4. Evaluate future traffic conditions at the study intersections with the proposed student cap increase,
5. Evaluate the future pick-up/drop-off operation along Whitehaven Parkway and in the pick-up/drop-off lane in front of the school with the proposed student cap increase,
6. Identify any traffic operational impacts at the study intersection associated with the proposed student cap increase,
7. Identify any operational impacts to the pick-up/drop-off operation associated with the proposed student cap increase, and

8. Recommend transportation improvements to promote the safe and efficient flow of vehicular and pedestrian traffic associated with the student cap increase.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this study are as follows:

1. St. Patrick's Whitehaven Campus, which includes Nursery through Grade 6, is proposing to increase current enrollment cap from 440 students to 485 students, or an increase of 45 students.
2. In actuality, the school's current enrollment is 462 students; therefore, the increase in enrollment from existing conditions to the proposed enrollment cap would be 23 students.
3. Both the Foxhall Road/Whitehaven Parkway and Reservoir Road/Whitehaven Parkway intersections currently operate with one approach at or near capacity during at least one of the commuter peak hours.
4. Under future conditions without the proposed enrollment increase, the westbound approach at the Reservoir Road/ Whitehaven Parkway would drop to a LOS E during the PM school peak hour due to increases in traffic from growth outside the immediate site vicinity and increases in traffic associated with planned or approved, but not yet constructed, developments in the study area. The remaining lane groups at both study intersections would operate with levels of service consistent with existing conditions during each peak hour.
5. St. Patrick's Carpool Initiative, which was implemented in September 2002, has been very successful in increasing the number of carpools and reducing vehicles trips to/from the school. Specifically, the Carpool Initiative has resulted in AVOs during the AM and PM school peak hours that exceed the goal of 1.60 students per vehicle each time the measurements have been taken over the past 10 years (three times per year). The latest AVO evaluation performed in conjunction with this study indicates the school is achieving a 1.71 AVO during the AM school peak hour and a 1.65 AVO during the PM school peak hour.
6. During morning drop-off and afternoon pick-up operations, vehicles queue in the parking lane (signed for no parking during school hours) on the north side of Whitehaven Parkway and proceed into the pick-up/drop-off lane in front of the school. School traffic on Whitehaven Parkway is directed by a police officer during the pick-up/drop-off times and the pick-up/drop-off lane is supervised by on-duty teachers.
7. The proposed enrollment cap increase of 23 students compared to existing conditions would result in an additional 26 AM peak hour, 14 PM school peak hour, and eight PM commuter peak hour vehicle trips on the roadway network.
8. The increase in traffic due to the enrollment cap increase would account for approximately one percent or less of the total future traffic at each of the study intersections.
9. The proposed enrollment cap increase would have a minimal impact on the eastbound approach to the Foxhall Road/Whitehaven Parkway intersection during the AM peak hour; however, this minimal impact could be mitigated by a minor timing adjustment (shifting one second of green time from the northbound/southbound phases to service the eastbound phase).
10. The proposed enrollment cap increase would increase the pick-up/drop-off relate queues along Whitehaven Parkway and in the pick-up/drop-off lane by one vehicle or less during the AM and PM school peak hours. The increase in pick-up/drop-off queues associated with the enrollment cap increase can be accommodated within the available storage on Whitehaven Parkway and in the pick-up/drop-off lane.
11. The proposed enrollment cap increase to 485 students would have a minimal impact on the surrounding roadway network and on the pick-up/drop-off operations at the school.

Section 2 BACKGROUND INFORMATION

EXISTING LAND USE

Site Land Use

The St. Patrick's Whitehaven Campus is located in Ward 3, which is in the northwest quadrant of the District. The Campus generally is bounded by Foxhall Road on the east, the Lab School of Washington on the west, Whitehaven Parkway on the north, and residential land uses on the south. The site is zoned R-1-B.

The Whitehaven Campus currently houses students from Nursery School through Grade 6. Enrollment at the Whitehaven Campus currently is capped at 440 students, a cap that has been in place since 1990, however, current enrollment is 462 students.

Surrounding Land Use

The area surrounding the Campus is comprised mainly of residential and institutional uses. Residential areas are located to the north, south and east of the school. George Washington University's Mount Vernon Campus, the Lab School of Washington, and the Field School are located to the north, west, and northeast of the St. Patrick's Whitehaven Campus, respectively.

The German Embassy also is located south of the Campus. Additionally, some retail uses are present to the northwest of the Campus, along MacArthur Boulevard.

ROADWAY NETWORK

The Whitehaven Campus is served by a connected network of arterial, collector, and local streets. The existing lane use and traffic controls in the study area are shown on Figure 2-1. A description of each of the roadways in the study area is included below:

Foxhall Road is a minor arterial with a posted speed limit of 25 miles per hour (mph) in the vicinity of the campus. Foxhall Road is a two-lane roadway north of Whitehaven Parkway and a four-lane roadway south of Whitehaven Parkway, with no on-street parking. The Foxhall Road/Whitehaven Parkway intersection is controlled by a traffic signal. Foxhall Road carries an average daily traffic volume of 12,100 vehicles per day (vpd) south of Whitehaven Parkway and 17,400 vpd north of Whitehaven Parkway.¹

MacArthur Boulevard is a four-lane principal arterial with a posted speed limit of 25 mph. The intersection of MacArthur Boulevard with Reservoir Road is controlled by a traffic signal and is located just north of the Reservoir Road/Whitehaven Parkway intersection. MacArthur Boulevard carries an average daily traffic volume of 15,200 vpd in the site vicinity.²

Reservoir Road is an east-west roadway that connects Canal Road and Wisconsin Avenue. Reservoir Road is a collector roadway west of MacArthur Boulevard and a minor arterial between MacArthur Boulevard and Wisconsin Avenue. Reservoir Road merges with MacArthur Boulevard just south of Whitehaven Parkway and then diverges again just north of Whitehaven Parkway. Reservoir Road carries an average daily traffic volume of 3,600 vpd west of MacArthur Boulevard and 12,200 vpd east of MacArthur Boulevard.³

Whitehaven Parkway is a two-lane local street oriented in the east-west direction that provides access to the subject site, the George Washington University Mount Vernon Campus, the Lab School of Washington, Our Lady of Victory, and a small number of single-family detached homes. The Foxhall Road/Whitehaven Parkway intersection is controlled by a traffic signal. The Reservoir Road/Whitehaven Parkway intersection is a stop controlled T-intersection. The northbound and southbound approaches are free flowing and Whitehaven Parkway is controlled by a stop sign.

PUBLIC TRANSPORTATION FACILITIES AND SERVICES

The Whitehaven Campus is located approximately 2½ miles from the Rosslyn Metro Station and approximately 2¾ miles from both the Dupont Circle Metro Station and the Foggy Bottom Metro Station.

Metrobus service in the area includes the Sibley Hospital-Stadium-Armory Line (Metrobus Route D6) and the MacArthur Boulevard-Georgetown Line (Metrobus Route D5). Both the Sibley Hospital-Stadium-Armory Line (Metrobus Route D6) and the MacArthur Boulevard-Georgetown Line (Metrobus Route D5) provides service to several Metro Stations including the Foggy Bottom-GWU Station, the Dupont Circle Station, the Farragut Stations (north and west), and Metro Center Station.

A total of 126 bus-trips are operated on these lines on a typical weekday, 80 bus-trips on a typical Saturday, and 60 bus-trips on a typical Sunday, as shown in Table 2-1.

Table 2-1
Metrobus Service (number of bus-trips)

Line	Weekday Service	Saturday Service	Sunday Service	Total
D6: Sibley Hospital-Stadium-Armory	112	80	60	252
D5: MacArthur Boulevard-Georgetown	14	--	--	14
Total	126	80	60	266

BICYCLE FACILITIES

Students that currently bike to/from the Campus park their bicycles in the school's parking garage on the north side of Whitehaven Parkway. There is no standard bicycle rack in the parking garage; however, students typically chain their bicycles to the railing, as shown in Exhibit I below:

Exhibit I
Existing Campus Bicycle Parking



Currently, no designated bicycle lanes or routes exist within the site vicinity. Bicyclists must share the roads with vehicular and pedestrian traffic. Topography in the area discourages bicycling.

The District of Columbia Bicycle Master Plan⁴ (DCBMP) seeks to create a more bicycle-friendly city by establishing high quality bicycle facilities and programs that are safe and convenient. According to the Bicycle Plan, under the existing conditions (i.e. bicyclists sharing the road), MacArthur Boulevard operates at a bicycle level of service (BLOS) "C" north of Whitehaven Parkway and at a BLOS "D" south of Whitehaven Parkway. Foxhall Road operates at a BLOS "E" in the study area. Reservoir Road operates at a BLOS "C" east of the MacArthur Boulevard merge point, at a BLOS "D" while combined with MacArthur Boulevard, and at a BLOS "F" west of the MacArthur Boulevard diverge point. A BLOS is not available for Whitehaven Parkway.

Additionally, the DCBMP reports the number of bicycle crashes that occurred between 2000 and 2002. No bicycle crashes occurred at either of the study intersections; however, one bicycle crash was reported at each of the MacArthur Boulevard/U Street NW and the Reservoir Road/Foxhall Road intersections during the three-year period. Both of these intersections fall within the one-mile bike-shed of the subject site.

Finally, the DCBMP identifies areas and corridors that are barriers to cyclists. These barriers include "freeways, railroad and highway grade separations, neighborhoods with heavy traffic, and other impediments to bicycle travel."⁵ No barrier areas or corridors identified in the DCBMP fall within the one-mile bike-shed of the site.

Figure 2-2, which displays a one-mile bike-shed for the subject site, illustrates the BLOS for the study area roadways, the reported bike crashes from 2000 to 2002 within the one-mile bike-shed, the multi-use trails in the area, and likely bike routes from the site to nearby bus stops.

PEDESTRIAN FACILITIES

Sidewalks generally are present within the study area; however, sidewalk deficiencies exist within the campus vicinity. Foxhall Road and Whitehaven Parkway contain portions of roadway with a sidewalk gap on one or both sides of the road. Figure 2-3 shows the gaps on Whitehaven Parkway within a one-quarter mile walk-shed as well as the likely walking routes to/from the nearby bus stops.

The signalized intersection of Foxhall Road and Whitehaven Parkway includes painted crosswalks and countdown pedestrian signals that allow safe crossing maneuvers. The pedestrian curb ramps on the west side of Foxhall Road are compliant with the Americans with Disabilities Act (ADA) standards; however, the two ramps on the east side of Foxhall Road currently are not compliant. The unsignalized intersection of Whitehaven Parkway and Reservoir Road includes a painted crosswalk on the westbound vehicle approach. The curb ramps for this pedestrian crossing are non-compliant with ADA standards as they do not include detectable warning strips at the roadway entrance.

A mid-block crosswalk also is present on Whitehaven Parkway connecting the school to the gymnasium and parking garage on the north side of the roadway. This crossing is indicated with warning signs as well as pavement markings. The curb ramps for this crossing also are not ADA compliant since detectable warning strips at the roadway entrance are not present. There also are several locations where the sidewalks along Whitehaven Parkway cross vehicular driveways without curb ramps and, where curb ramps are present, detectable warning strips are missing.

Field observations of the study area also revealed that a tree on the west side of Reservoir Road, across from Whitehaven Parkway, partially obstructs the sidewalk creating a narrow pedestrian pathway.

Pictures of the pedestrian facilities in the study area can be found in Appendix B.

The District of Columbia Pedestrian Master Plan⁶ (DCPMP) strives to make Washington, DC safer and more walkable by improving sidewalks, roadway crossings, and the quality of the pedestrian environment as well as by ensuring that the District's policies and procedures support walking.

The DCPMP provides an overview of existing pedestrian conditions, recommends new pedestrian projects and programs, establishes performance measures, and provides a plan for implementation through 2018.

The DCPMP estimates areas of pedestrian activity and deficiency. Within the campus vicinity, MacArthur Boulevard contains areas of moderate pedestrian activity and moderate pedestrian deficiency and Foxhall Road and Reservoir Road contain areas of low pedestrian activity and low pedestrian deficiency as shown on Figure 2-3.

The DCPMP provides pedestrian crash data for the years 2000 through 2006. No pedestrian crashes occurred at either of the study intersections or within the one-quarter mile walk-shed during the seven-year period.

As part of the DCPMP, eight priority corridors (one in each ward) were identified based on areas of heavy pedestrian traffic and deficient walking conditions. The priority corridor in Ward 3 is Wisconsin Avenue NW from Western Avenue NW to Woodley Road NW and, therefore, is outside of the study area. No specific improvements to roadways in the study area were outlined in the DCPMP.

Section 3 EXISTING CONDIITONS ANALYSIS

TRAFFIC VOLUMES

Turning movement, bicycle, and pedestrian counts were conducted at the following intersections on Thursday, November 1, 2012 from 6:45 AM to 10:00 AM and from 2:00 PM to 7:00 PM:

1. Foxhall Road/Whitehaven Parkway and
2. Reservoir Road/Whitehaven Parkway.

These counts were conducted at a time in which Congress was not in session and two days after a significant weather event impacted the Washington, DC area. Knowing that the traffic counts may have been influenced by these factors and at the request of DDOT, the November 1, 2012 counts at the Foxhall Road/Whitehaven Parkway intersection were compared to counts conducted by Gorove/Slade on April 24, 2012 for The Field School TIS (dated October 1, 2012). This comparison revealed that the November 1, 2012 counts were lower than those recorded by Gorove/Slade on April 24, 2012. The comparison and the proposed increases to the November 1, 2012 counts were provided to DDOT and, after a thorough review, (see Appendix C), DDOT selected the following peak hours and approved the following methodology:

AM School/Commuter Peak Hour

- ☐ Foxhall Road/Whitehaven Parkway
 - Use the 7:30 AM to 8:30 AM hour as a baseline.
 - Use the April 24, 2012 turning movement counts when higher than the corresponding November 1, 2012 volumes.
 - This methodology results in an approximately eight percent increase in overall intersection volumes at this intersection.
- ☐ Reservoir Road/Whitehaven Parkway
 - Use the 8:00 AM to 9:00 AM hour as a baseline.
 - Increase each turning movement by approximately eight percent per the overall intersection volume increase at the Foxhall Road/Whitehaven Parkway intersection.

PM Commuter Peak Hour

- ☐ Foxhall Road/Whitehaven Parkway
 - Use the 4:45 PM to 5:45 PM hour as a baseline.
 - Use the April 24, 2012 turning movement counts when higher than the corresponding November 1, 2012 volumes.
 - This methodology results in an approximately 23 percent increase in overall intersection volumes at this intersection.
- ☐ Reservoir Road/Whitehaven Parkway
 - Use the 5:30 PM to 6:30 PM hour as a baseline.
 - Increase each turning movement by approximately 23 percent per the overall intersection volume increase at the Foxhall Road/Whitehaven Parkway intersection.

PM School Peak Hour

- ☐ Foxhall Road/Whitehaven Parkway
 - Use the 2:30 PM to 3:30 PM hour as a baseline.
 - Increase the turning movements to/from the north on Foxhall Road by 21 percent based on a comparison to the April 24, 2012 counts.
 - This methodology results in an approximately 18 percent increase in overall intersection volumes at this intersection.
- ☐ Reservoir Road/Whitehaven Parkway
 - Use the 2:30 PM to 3:30 PM hour as a baseline.
 - Increase each turning movement by approximately 18 percent per the overall intersection volume increase at the Foxhall Road/Whitehaven Parkway intersection.

Based on the above methodology, peak hour baseline traffic volumes are summarized on Figure 3-1. Traffic count data are included in Appendix D.

CAPACITY ANALYSIS

Capacity/level of service (LOS) analyses were conducted at the study intersections based on the existing lane use and traffic control shown on Figure 2-1, baseline traffic volumes shown on Figure 3-1, and traffic signal timings obtained from DDOT, included in Appendix E.

Synchro software (Version 7, Build 773) was used to evaluate levels of service at the study intersections during the three determined peak hours. Synchro is a macroscopic model used to evaluate the effects of changing intersection geometrics, traffic demands, traffic control, and/or traffic signal settings and to optimize traffic signal timings. The levels of service reported were taken from the Highway Capacity Manual 2000 (HCM) reports generated by Synchro. Levels of service descriptions are included in Appendix F.

The results of the analyses are summarized in Table 3-1. Capacity analysis worksheets are included in Appendix G.

As shown in Table 3-1, a few intersection lane groups currently are operating at or near capacity under existing conditions. Specifically, the Whitehaven Parkway eastbound approach to Foxhall Road operates at capacity (LOS E) in the AM peak period while the Whitehaven Parkway westbound approach to Reservoir Road operates over capacity (LOS F) in both the AM and PM commuter peak periods.

Table 3-1
Existing Levels of Service

Intersection/ Lane Group	AM Peak	PM School Peak	PM Commuter Peak
1: Foxhall Road/Whitehaven Parkway			
EBLR	E (60.4)	D (52.7)	D (44.1)
NBL	B (13.0)	A (5.7)	A (4.1)
NBT	B (14.3)	A (7.3)	A (5.4)
SBT	B (15.5)	A (6.9)	A (5.1)
SBR	A (7.1)	A (5.3)	A (2.9)
OVERALL	C (23.5)	B (14.0)	A (8.4)
2: Reservoir Road/Whitehaven Parkway			
WBLR	F [*]	D [30.1]	F [292.9]
SBLT	B [12.0]	A [3.3]	A [3.3]
[9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh * = Delay theoretically greater than 999.9 seconds			

Section 4 FUTURE BACKGROUND CONDITIONS

TRAFFIC VOLUMES

Overview

In order to forecast year 2015 background traffic volumes in the study area without the proposed student enrollment increase, increases in traffic associated with growth outside the immediate site vicinity (regional growth) and increases in traffic associated with planned or approved but not yet constructed developments in the study area (pipeline developments) were considered.

Regional Growth

DDOT's historical average daily traffic (ADT) maps were examined to determine an appropriate growth rate for the study area. The historical ADTs indicate that traffic volumes in the study area actually decreased from 2002 (the earliest year of data available) to 2010 (the last year of data of available). Nonetheless, a growth rate of one percent per year, compounded annually over three years (2012 to 2015), conservatively was applied to the baseline vehicular volumes shown on Figure 3-1. The resulting 2015 volumes with regional growth are shown on Figure 4-1.

Pipeline Developments

Five other developments that are planned in and around the study area were identified during the scoping process; however, only four were considered as part of the background traffic growth for the 2015 study year (see Figure 1-1 for locations). As described below, St. Patrick's Episcopal High School was not included in the future traffic forecasts, since it is expected to be completed after the 2015 build-out year analyzed in this study.

St. Patrick's Episcopal High School

St. Patrick's is approved to develop a 9.2-acre tract of land located on the east side of Foxhall Road, between Hoban Road and Whitehaven Parkway in northwest Washington, DC. As proposed, the

development would consist of an independent school with approximately 440 students in Grades 7 through 12 and approximately 100 faculty/staff members.

The build-out of this development would not occur prior to the Whitehaven Campus reaching the proposed student enrollment cap; therefore, site trips associated with this pipeline development were not included in the 2015 traffic forecasts.

GW Mount Vernon 2010 Campus Plan

The GW Mount Vernon 2010 Campus Plan includes a student enrollment cap increase to 1,725 students by year 2020 and a faculty/staff increase to 150 faculty/staff by year 2020. As part of the plan, four new academic buildings and one new residential building are proposed. According to the TIS for the GW Mount Vernon 2010 Campus Plan performed by Wells + Associates (dated November 2009), 1,119 students were enrolled in 2009 and 81 faculty/staff were employed in 2009.

To determine the number of site trips that should be added to the roadway network for the 2015 study year, the increases in students and faculty/staff were assumed to occur linearly between the 2009 and 2020. For students, interpolating between an enrollment of 1,119 in 2009 and a future enrollment of 1,725 in 2020, it was assumed that the student enrollment in 2015 would be 1,450 students (or an increase of 331 students from the 2009 enrollment). For faculty/staff, interpolating between 81 faculty/staff in 2009 and 150 faculty/staff in 2020, it was assumed that 119 faculty/staff would be employed in 2015 (or an increase of 38 faculty/staff from the 2009 level).

Utilizing site-specific trip generation rates developed in the TIS for the GW Mount Vernon 2010 Campus Plan, the additional 331 students and 38 faculty/staff in 2015 would generate 31 AM peak hour vehicle trips and 20 PM commuter peak hour vehicle trips. Note that the PM commuter peak hour site trips for the GW Mount Vernon Campus Plan conservatively were utilized for the PM school peak hour also.

The AM, PM school, and PM commuter peak hour trips were added to the roadway network based on the distributions developed in the GW Mount Vernon 2010 Campus Plan TIS.

Supporting data for the GW Mount Vernon 2010 Campus Plan trip generation, distribution, and assignment are included in Appendix H.

Phillips Park

The Phillips Park residential development is located east of Foxhall Road and south of W Street in northwest Washington, DC. The proposed development received approval from the BZA in July 2005 and, upon full occupancy, will consist of 46 single-family detached residential dwelling units. At the time that this report was submitted, the development was approximately 50 percent occupied; therefore, the traffic that would be generated by the remaining 23 dwelling units was included in the 2015 traffic forecasts.

Based on the Institute of Transportation Engineers' (ITE) Trip Generation⁷ Land Use Code (LUC) 210 (Single-Family Detached Housing), the 23 unoccupied dwelling units in Phillips Park would generate 26 AM peak hour vehicular trips and 28 PM commuter peak hour vehicular trips. Note that the PM commuter peak hour site trips for Phillips Park conservatively were utilized for the PM school peak hour also. The AM, PM school, and PM commuter peak hour trips were added to the roadway network based on the distributions utilized for Phillips Park in the GW Mount Vernon Campus Plan TIS (performed by Wells + Associates and dated November 2009).

Lab School of Washington

The Lab School of Washington currently has 267 students enrolled at its Main Campus located at 4759 Reservoir Road, NW. Under a January 2007 Order of the BZA (Order No. 17383A), a maximum enrollment of 330 students is permitted; therefore, an additional 63 students could be enrolled at the Lab School under this order. Since the increased enrollment is approved, the traffic that would be generated by the additional students was included in the 2015 traffic forecasts.

Based on site specific trip generation rates calculated by Wells + Associates from September 20, 2012, the additional 63 students would generate 58 AM peak hour vehicle trips, 25 PM school peak hour vehicle trips, and 16 PM commuter peak hour vehicle trips. The AM, PM school, and PM commuter peak hour trips were added to the roadway network based on the distributions utilized for the Lab School in the GW Mount Vernon Campus Plan TIS (performed by Wells + Associates and dated November 2009).

Supporting data for the Lab School trip generation are included in Appendix H.

Field School of Washington

The Field School of Washington currently has 323 students enrolled at its middle/high school located on Foxhall Road north of W Street. The campus also includes 77 faculty and staff. The Field School recently submitted an application to the BZA to increase the student and faculty/staff populations while adding additional building space. The application requested an increase in the student enrollment to 400 (an increase of 77) students along with an increase to 110 (an increase of 33) full-time equivalent (FTE) faculty and staff. The student enrollment and faculty/staff increases would occur by 2018, according to a TIS submitted by Gorove/Slade (dated October 1, 2012).

According to the Gorove/Slade TIS for the Field School, the proposed increase in faculty/staff would result in negligible increases to site trips during the peak hours. To determine the number of site trips that should be added to the roadway network for the 2015 study year, the increase in student enrollment was assumed to occur linearly between now and the Field School study year of 2018. That is, interpolating between an enrollment of 323 in 2012 and a future enrollment of 400 in 2018, it was assumed that the student enrollment in 2015 would be 362 students (or an increase of 39 students from the existing enrollment). Utilizing site-specific trip generation rates developed by Gorove/Slade, the additional 39 students in 2015 would generate 16 AM peak hour vehicle trips, 20 PM school peak hour vehicle trips, and nine PM commuter peak hour vehicle trips. The AM, PM school, and PM commuter peak hour trips were added to the roadway network based on the distributions utilized for the Field School in Gorove/Slade's October 1, 2012 TIS.

Supporting data for the Field School trip generation, distribution, and assignment are included in Appendix H.

Combined Pipeline Developments

Details for each of the pipeline developments are included in Appendix H. The traffic associated with the pipeline developments combined is shown at each of the study intersections on Figure 4-2.

Background Forecasts

Background 2015 traffic forecasts were developed by combining the existing traffic volumes grown to the year 2015 (shown on Figure 4-1) with the pipeline traffic volumes shown on Figure 4-2. The resulting 2015 background traffic forecasts are shown on Figure 4-3.

CAPACITY ANALYSIS

Capacity/level of service (LOS) analyses were conducted at the study intersections based on the existing lane use and traffic control shown on Figure 2-1, future background traffic forecasts shown on Figure 4-3, and existing DDOT traffic signal timings.

The Synchro level of service results for the 2015 background conditions without the St. Patrick's student enrollment increase are presented in Appendix I and summarized in Table 4-1.

As shown in Table 4-1, lane groups that were operating at or near capacity under existing conditions would continue to operate at or near capacity under the 2015 background conditions. The Whitehaven Parkway westbound approach to Reservoir Road would drop from a LOS D in the PM school peak hour under existing conditions to a LOS E under the 2015 background conditions.

Table 4-1
2015 Background Levels of Service

Intersection/ Lane Group	AM Peak	PM School Peak	PM Commuter Peak
1: Foxhall Road/Whitehaven Parkway			
EBLR	E (73.8)	D (54.0)	D (44.4)
NBL	B (15.9)	A (6.2)	A (4.5)
NBT	B (15.3)	A (7.9)	A (5.9)
SBT	B (16.9)	A (7.5)	A (5.6)
SBR	A (7.2)	A (5.6)	A (3.0)
OVERALL	C (27.2)	B (14.7)	A (8.9)
2: Reservoir Road/Whitehaven Parkway			
WBLR	F [*]	E [44.2]	F [420.1]
SBLT	B [14.0]	A [3.6]	A [3.8]
[9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh * = Delay theoretically greater than 999.9 seconds			

QUEUE ANALYSIS

A queuing analysis was conducted for 2015 conditions without the St. Patrick's student enrollment increase. Synchro was used to conduct the analyses, using the 95th percentile queue lengths. The results are summarized in Table 4-2. Queue reports are provided in Appendix J.

As shown in Table 4-2, all of the lane group queues are contained within the available storage under the 2015 background conditions.

Table 4-2
 95th Percentile Queue Summary (in feet)
 2015 Background Conditions

Intersection/ Lane Group	Available Storage	AM Peak	PM School Peak	PM Commuter Peak
1: Foxhall Road/Whitehaven Parkway				
EBLR	315	230 [#]	172	120
NBL	1,200	62	39	45
NBT	1,200	262	210	267
SBT	515	302 [#]	162	217
SBR	75	34	20	18
2: Reservoir Road/Whitehaven Parkway				
WBLR	1,260	*	139	502
SBLT	100	73	11	10
* Delay theoretically greater than 999.9 seconds; queue cannot be calculated # 95 th percentile volume exceeds capacity; queue may be longer.				

Section 5

SITE ANALYSIS

OVERVIEW

St. Patrick's is a co-educational school for Nursery School through Grade 8. The Lower School, comprised of Nursery through Grade 3, is located at the Whitehaven Campus. The Upper School consists of Grades 4 through 8. The Whitehaven Campus also "houses" Grades 4 through 6 while Grades 7 and 8 are located at the MacArthur Campus.

Enrollment at the Whitehaven Campus currently is capped at 440 students, a cap that has been in place since 1990. The school's enrollment currently is at 462 students. The special exception application requests an increase in the enrollment to 485 students, an increase of 45 students from the current cap and an increase of 23 students from the current enrollment.

EXISTING SITE CURB CUTS

On the north side of Whitehaven Parkway, two curb cuts provide access to St. Patrick's gymnasium parking garage/lot. Both of these curb cuts allow for two-way operation and are full-access with the southbound approach operating under stop control (i.e., yielding to Whitehaven Parkway traffic).

On the south side of Whitehaven Parkway, five curb cuts provide access to the school. The western-most curb cut is for a service driveway and the eastern-most curb cut provides access to a surface parking lot. Both of these curb cuts allow for two-way operation and are full-access with the northbound approach operating under stop control (i.e., yielding to Whitehaven Parkway traffic).

The remaining three curb cuts on the south side of Whitehaven Parkway (between the western-most and eastern-most curb cuts) provide access to the school's pick-up/drop-off lane. Of these three curb cuts, the western-most curb cut is an entrance only and the eastern-most curb cut is an exit only. The middle curb cut is rarely used by the school and typically is blocked (by cones or a vehicle) to prevent its use. The northbound exiting maneuvers from the eastern pick-up/drop-off curb cut operate under stop control (i.e., yielding to Whitehaven Parkway traffic).

All existing curb cuts will remain unchanged with the proposed student enrollment increase since no physical improvements are proposed with the special exception application.

Figure 5-1 displays each of the existing curb cuts described herein.

PICK-UP/DROP-OFF PROCEDURES

Pick-Up/Drop-Off Lane

A 250-foot long pick-up/drop-off lane is located on the south side of Whitehaven Parkway in front of the school. The lane is long enough to accommodate a queue of approximately 12 to 14 vehicles (based on a parked car length of 18 to 20 feet). This lane ranges from 16 to 28 feet wide with a five to seven foot median between the pick-up/drop-off lane and Whitehaven Parkway. The lane operates one-way eastbound at all times. Therefore the western curb cut operates as an entry only and the eastern curb cut operates as an exit only. Figure 5-2 displays the pick-up/drop-off lane circulation.

Arrivals

All cars approaching the school are only to enter Whitehaven Parkway via Foxhall Road but may exit Whitehaven Parkway via Foxhall Road or Reservoir Road/MacArthur Boulevard. In the morning, parents have been instructed to enter the pick-up/drop-off lane by making the westbound left from Whitehaven Parkway into the westernmost access to the pick-up/drop-off lane. To exit the pick-up/drop-off lane, the school has instructed parents to exit via the eastern access and proceed eastbound or westbound on Whitehaven Parkway.

In practice, however, some parents approach the pick-up/drop-off lane in the eastbound direction on Whitehaven Parkway and turn right into the pick-up/drop-off lane. This approach is discouraged.

During the morning drop-off period, a police officer is present on Whitehaven Parkway directing traffic into the pick-up/drop-off lane. Additionally, St. Patrick's teachers on duty facilitate the unloading of students in the pick-up/drop-off lane. Students are dropped off from the right side of the car, onto the sidewalk.

Departures

Students wait in their homerooms at the end of the school day to be picked up in the pick-up/drop-off lane. Parents/guardians are issued numbered tags corresponding to their carpool number, which are displayed on the interior car dashboard.

A police officer on Whitehaven Parkway directs westbound drivers into the parking lane along the north side of Whitehaven Parkway (not utilized for parking during school hours) so the vehicles can queue without blocking through traffic on Whitehaven Parkway. The on-duty teachers radio to the School Office the numbers displayed in the waiting vehicles. Using an on-line system, on-duty teachers in the School Office enter the numbers into a computer. The names of the students whose numbers have been called are then displayed in the homerooms. Students then exit the building and are directed to their cars in the pick-up/drop-off lane by on-duty teachers.

After students are loaded into the vehicle, parents have been instructed to exit via the eastern curb cut.

In practice, a few drivers turn right into the pick-up/drop-off lane, although the percentage is smaller than during the drop-off in the morning.

SITE SPECIFIC DATA COLLECTION

Turning movement counts were conducted at the ingress/egress access points to/from the school's pick-up/drop-off lane on Whitehaven Parkway on Wednesday, October 17, 2012 from 7:00 AM to 9:30 AM and from 2:00 PM to 5:00 PM. During this same time period, the number of vehicles queued in the pick-up/drop-off lane and along Whitehaven Parkway (waiting to enter the pick-up/drop-off lane) were recorded every 30 seconds. Finally, during the same time period, average vehicle occupancy (AVO) counts were conducted for each vehicle picking up or dropping off students.

The data collected for the St. Patrick's site is included in Appendix K.

STUDENT ARRIVAL/DEPARTURE TIMES

Nursery School (Nursery and Pre-Kindergarten)

Arrival Times: Monday through Friday, school starts at 9:00 AM. Early arrival begins 8:05 AM. Regular arrival begins at 8:50 AM.

Departure Times: Monday through Thursday, half day dismissal at 12:00 PM. Full-day dismissal begins at 2:50 PM. On Friday, dismissal is at 12:00 PM.

Lower/Upper Schools (Kindergarten through Grade 6)

Arrival Times: Monday through Friday, children begin arriving at 7:30 AM and must be at school by 8:00 AM for Grades 4, 5, and 6 and by 8:10 AM for Kindergarten through Grade 3.

Departure Times: Monday through Friday, academic classes end at 2:45 PM. Dismissal begins at 2:50 PM.

Upper School (Grades 7 and 8)

Arrival Times: All students in Grades 7 and 8 must arrive at the Whitehaven Campus by 7:50 AM (and preferably earlier, beginning at 7:30 AM) in order to ride the shuttle bus to the MacArthur Campus. Under no circumstances, including missing the shuttle bus, may a student be delivered directly to the MacArthur Campus, unless they are returning from an off-campus appointment after 9:00 AM.

Departure Times: Grades 7 and 8 students are shuttled to the Whitehaven Campus after dismissal from the MacArthur Campus and then are dismissed from the Whitehaven Campus after sports daily, except Thursdays.

Two shuttle buses pick up Grade 7 and 8 students at the Whitehaven Campus in the morning. The first bus arrives at the Whitehaven Campus at 7:40 AM and typically carries approximately 30 students to the MacArthur Campus. The second bus arrives at the Whitehaven Campus at 7:50 and carries approximately 20 students to the MacArthur Campus. In the afternoon, shuttle buses drop off students at the Whitehaven Campus at 3:20 PM and 3:35 PM. Both buses typically drop off approximately 30 students.

In order to minimize impacts to neighborhood streets, the shuttle that operates between the two campuses operates on the following route: from the MacArthur Campus, the buses head northbound on MacArthur Boulevard, turn right on Arizona Avenue, turn right on Loughboro Road, then turn right onto Foxhall Road (heading southbound), and finally turn right onto Whitehaven Parkway (heading westbound) to the Whitehaven Campus.

Preferential Dismissal Times (Nursery through Grade 6)

Cars retrieving only Nursery School students or three or more students in Nursery through Grade 6 may arrive beginning at 2:45 PM, with dismissal of students beginning at 2:50 PM.

Cars retrieving at least two students may begin arriving at 3:00 PM.

Cars retrieving one student in Kindergarten through Grade 6 may begin arriving only after 3:15 PM.

Cars arriving earlier than their allotted times will be directed to leave Whitehaven Parkway and to return at the proper time.

Extended Day Coverage

Extended day coverage is available to all children, Nursery through Grade 6, from the end of the school day until 6:00 PM. About 50 students participate.

After-School Activities

St. Patrick's offers a wide variety of after-school activities for students beginning in Kindergarten, including study hall, dance, cooking, language arts, computer science, and other classes. Most classes start at 3:15 or 4:00 PM, and last for 45 minutes.

Sports

Students in Grades 5 and 6 may participate in after-school, interscholastic and intramural sports. St. Patrick's is a member of the Capital Athletic Conference (CAC), which is comprised of ten independent schools in Maryland, Virginia, and the District of Columbia. St. Patrick's fields interscholastic teams on the junior varsity (Grades 5 and 6) and varsity (Grades 7 and 8) levels. Fall sports include soccer and cross country at the junior varsity and varsity levels as well as soccer at the intramural level and lacrosse as a clinic. The only winter sport for the Whitehaven Campus students is basketball at the junior varsity and varsity levels. Spring sports include lacrosse and track and field at the junior varsity and varsity levels.

One-hour practices are typically scheduled Monday through Friday between 3:00 PM and 5:00 PM. Home games and meets typically fall within this timeframe as well, although some games/meets end after 5:00 PM.

The school contracts for bus transportation for away games. Buses park at the curb on the north side of Whitehaven Parkway in front of the gymnasium to pick up and discharge passengers.

CARPOOL INITIATIVE

In order to encourage carpooling, thereby reducing single-occupant vehicle trips, St. Patrick's implemented a Carpool Initiative program in September 2002. The Carpool Initiative includes community education, carpool marketing, preferential dismissal times for families based on the size of their carpool, a financial incentive for families and other carpoolers with students in both the Nursery School and higher grade levels at arrival time, and monitoring steps (the school conducts monitoring studies three times per year).

To facilitate the formation of carpools, a letter sent to St. Patrick's families prior to the beginning of the school year directs parents to an interactive Google map with St. Patrick's family addresses and a user-friendly, visual method for identifying other families within your own neighborhood area or along your route to school. Contact information is available via the website and parents are encouraged to coordinate with other families looking to form a carpool. A copy of the Carpool Letter that is sent to St. Patrick's families is included in Appendix K.

Prior to the implementation of the school's Carpool Initiative, St. Patrick's AVO during the critical morning and afternoon peak hours was 1.41 and 1.33 students per vehicles, respectively. The primary goal of the Carpool Initiative was to increase the school's AVO to 1.60 students per vehicle or greater during both the AM and PM peak hours. The first count after the implementation of the Carpool Initiative revealed that the school's AVO during the morning and afternoon peak hour had increased to 1.82 and 1.85 students per vehicle, respectively. As a result of the Carpool Initiative, St. Patrick's had exceeded its 1.60 AVO goal by 14 to 16 percent.

In the ten years since its implementation in September 2002, the Carpool Initiative at St. Patrick's has continued to meet or exceed its AVO goal each time it has been measured. As measured on Wednesday, October 17, 2012, and shown in Table 5-1, the current morning and afternoon peak hour AVO's are 1.71 and 1.65 students per vehicle, respectively. For purposes of trip generation in the subsequent section, the AVO for the PM commuter peak also is presented in Table 5-1 and was found to be 1.56 students per vehicle. Note that the PM

commuter peak is not required to meet the 1.60 students per vehicle AVO goal.

Table 5-1
AVO Summary

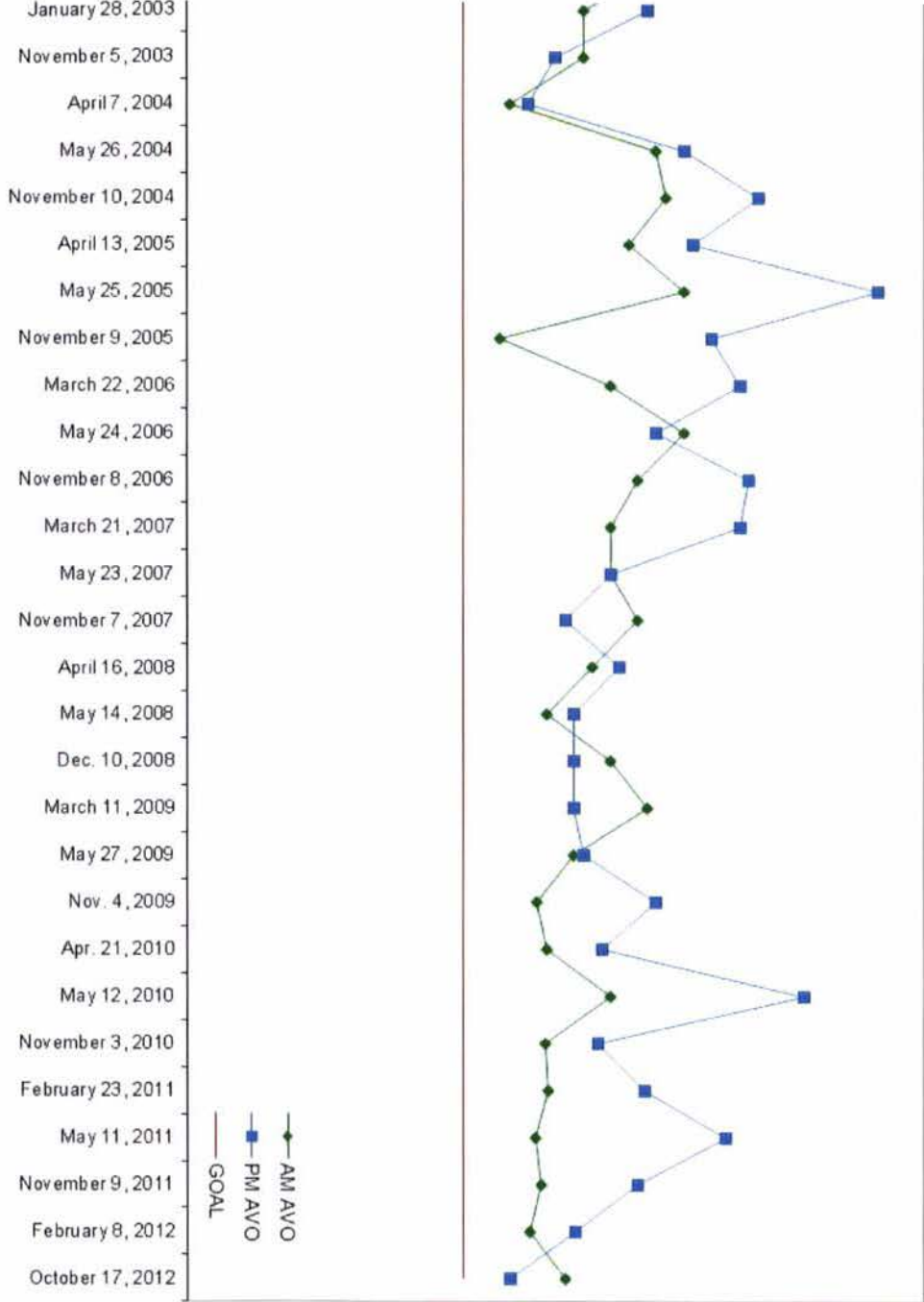
Peak Hour	Vehicles	Students	AVO (students/vehicle)
AM Peak Hour 7:15 AM – 8:15 AM	264	452	1.71
PM School Peak Hour 2:30 PM – 3:30 PM	150	248	1.65
PM Commuter Peak Hour* 4:00 PM – 5:00 PM	72	112	1.56

* Note that the 4:00 PM to 5:00 PM hour data for the school conservatively was used for the PM Commuter peak hour analysis at the study intersections since data at the school was not recorded after 5:00 PM and the PM commuter peak at the study intersections ranged from 4:45 PM to 6:30 PM.

The measured AVOs for previous years and the October 17, 2012 measurement are shown in Exhibit 5-1.

NON-AUTO MODE SPLIT

Per DDOT's request, the mode split for students at the Whitehaven Campus was calculated based on data collected in the field and information obtained from St. Patrick's. Specifically, the traffic counts indicate that five students bike to/from the Whitehaven Campus (St. Patrick's confirmed that five to six students bike regularly to school), St. Patrick's has indicated that approximately two Whitehaven Campus students walk to/from school on a regular basis, thereby leaving the remaining 455 students who are driven to/from school. Therefore, the mode split for Whitehaven Campus students currently is: one percent bike, 1/2 percent walk, and 98 1/2 percent are driven.



TRIP GENERATION ANALYSIS

The Whitehaven Campus enrollment currently is 462 students. The proposed enrollment cap of 485 students would result in 23 additional students attending the St. Patrick's Whitehaven Campus. This equates to an approximately five percent increase in students over the existing enrollment level.

Utilizing the number of vehicles counted during each peak hour (shown in Table 5-1), the five percent increase can be applied and equated to the trip generation increases shown in Table 5-2.

Table 5-2
Trip Generation Summary

Peak Hour	Inbound	Outbound	Total
AM Peak Hour 7:15 AM – 8:15 AM	13	13	26
PM School Peak Hour 2:30 PM – 3:30 PM	7	7	14
PM Commuter Peak Hour* 4:00 PM – 5:00 PM	4	4	8

SITE TRIP DISTRIBUTION

Based on the turning movement counts conducted at the ingress/egress access points to/from the school's pick-up/drop-off lane on Whitehaven Parkway, the distribution of vehicles entering and exiting the pick-up/drop-off lane were determined for each of the peak hour. Furthermore, the turning movement counts conducted at the two study intersections were used to determine the distribution of site trips at these intersections. Figure 5-3 displays the inbound and outbound site trip distributions.

SITE TRAFFIC ASSIGNMENTS

The site-generated traffic volumes were assigned to the public roadway network according to the directional distributions shown in Figure 5-3. The resulting site traffic assignments are shown on Figure 5-4.

PICK-UP/DROP-OFF QUEUE ANALYSIS

As previously mentioned, during the October 17, 2012 data collection, the queue in the pick-up/drop-off lane and the queue along westbound Whitehaven Parkway was recorded every 30 seconds during the morning and afternoon pick-up/drop-off operation at the school. Table 5-3 summarizes the results of the queue study under the existing enrollment during the AM and PM peak hours of the school (7:15 AM to 8:15 AM and 2:30 PM to 3:30 PM).

Table 5-3
Queues for Pick-up/Drop-off Operation (in vehicles)
with Existing Enrollment
During AM and PM School Peak Hours

Measurement	Pick-up/ Drop-off Lane		Whitehaven Parkway	
	AM	PM	AM	PM
Average	3	7	1	2
90 th Percentile	6	11	4	7
Maximum	10	12	14	13

As documented in Table 5-2, the additional 23 students would result in 13 additional vehicles during the AM peak hour and seven additional vehicles during the PM school peak hour, which potentially could increase the queues compared to existing conditions. To determine the impact of the increased number of vehicles on the queues associated with the pick-up/drop-off evaluation the existing queues were increased proportional to the anticipated increase in vehicles. The resulting pick-up/drop-off queues with the 485 student enrollment are shown in Table 5-4.

Table 5-4
Queues for Pick-up/Drop-off Operation (in vehicles)
with Future Enrollment
During AM and PM School Peak Hours

Measurement	Pick-up/ Drop-off Lane		Whitehaven Parkway	
	AM	PM	AM	PM
Average	3	8	1	2
90 th Percentile	6	12	4	7
Maximum	11	13	15	14

As determined by comparing the anticipated future queues in Table 5-4 to the existing queues in Table 5-3, during each of the school peak hours, the average, 90th percentile, and maximum queues in the pick-up/drop-off lane and along Whitehaven Parkway are anticipated to increase by one car length or less with increased student enrollment and associated increase in vehicle trip generation.

Since the pick-up/drop-off lane can accommodate approximately 12 to 14 vehicles, the maximum future queues will be accommodated in the existing lane. Furthermore, along Whitehaven Parkway, approximately 150 feet (or seven to eight vehicles) of storage is available in the parking lane between the point of entry to the pick-up/drop-off lane and the main GW driveway on the north side of Whitehaven Parkway and another 280 feet (or 14 to 16 vehicles) of storage is available between the main GW driveway and the area where vehicles may be parked during school pick-up/drop-off hours. Therefore, the maximum future queues along Whitehaven Parkway will be accommodated in the existing parking lane on the north side of the roadway.

PARKING

The school's parking needs currently are served by approximately 92 off-street parking spaces (30 in the church lot, 40 in the upper level of the gym garage, and 22 in the lower level of the gym garage). Additionally, back-in angle parking along Whitehaven Parkway also is available for the school's use. No changes to the parking supply are proposed in conjunction with the enrollment cap increase. Additionally, since students attending St. Patrick's are not of driving age and only a student enrollment increase is proposed, no additional parking demand is anticipated.

Section 6 TOTAL FUTURE CONDITIONS

TRAFFIC FORECASTS

Total future traffic forecasts with the proposed campus cap increase were determined by combining the 2015 background traffic forecasts shown in Figure 4-3 with the site traffic volumes shown on Figure 5-4 to yield the 2015 total future traffic forecasts shown on Figure 6-1.

PROPORTIONAL IMPACT ANALYSIS

In order to determine the amount of traffic on the surrounding roadways that is attributable to the student enrollment increase, a proportional impact assessment was conducted. That is, the additional trips generated as a result of the increase in student enrollment (from today's enrollment of 462 to the proposed cap of 485) were compared to the total future traffic forecasts at each intersection. Table 6-1 displays the results of the proportional impact analysis.

Table 6-1
Proportional Impact Analysis

Intersection	AM Peak	PM School Peak	PM Commuter Peak
Foxhall Road/Whitehaven Parkway	1.1%	<1.0%	<1.0%
Reservoir Road/Whitehaven Parkway	<1.0%	<1.0%	<1.0%

Generally speaking, site impacts of five percent or less are low and generally reflect negligible effects on traffic operations and delays. Site impacts between five and 15 percent generally are considered moderate and minor effects on traffic operations and delays could be expected. Site impacts of more than 15 percent generally are considered significant.⁸

As shown in Table 6-1, the proportional impact of the enrollment increase at the study intersections is

expected to be insignificant and would increase traffic volumes by one percent or less during the peak hours at each of the study intersections.

CAPACITY ANALYSIS

Capacity analyses were performed for the study intersections using the existing lane use and traffic control shown on Figure 2-1, the total future peak hour traffic forecasts shown on Figure 6-1, and existing signal timings.

The Synchro level of service results for the 2015 total future conditions with the St. Patrick's student enrollment increase are presented in Appendix L and summarized in Table 6-2.

Table 6-2
2015 Total Future Conditions Levels of Service

Intersection/ Lane Group	AM Peak	PM School Peak	PM Commuter Peak
1: Foxhall Road/Whitehaven Parkway			
EBLR	F (83.6)	D (54.9)	D (44.7)
NBL	B (16.5)	A (6.4)	A (4.6)
NBT	B (15.3)	A (8.1)	A (6.0)
SBT	B (16.9)	A (7.7)	A (5.7)
SBR	A (7.3)	A (5.8)	A (3.1)
OVERALL	C (29.4)	B (15.1)	A (9.0)
2: Reservoir Road/Whitehaven Parkway			
WBLR	F [*]	E [44.5]	F [438.3]
SBLT	B [14.1]	A [3.6]	A [3.8]
[9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh * = Delay theoretically greater than 999.9 seconds			

As shown in Table 6-2, levels of service with the proposed student enrollment increase are projected to be consistent with background conditions with one exception. In the AM peak hour, the eastbound approach on Whitehaven Parkway at Foxhall Road

would operate at a LOS E (with 73.8 seconds of delay per vehicle) under background conditions but would drop to a LOS F (with 83.6 seconds of delay per vehicle) with the proposed student enrollment increase.

QUEUE ANALYSIS

A queuing analysis was conducted for 2015 total future conditions. Synchro was used to conduct the analyses, using the 95th percentile queue lengths. The results are summarized in Table 6-3 and queue reports are provided in Appendix M.

Table 6-3
95th Percentile Queue Summary (in feet)
2015 Total Future Conditions

Intersection/ Lane Group	Available Storage	AM Peak	PM School Peak	PM Commuter Peak
1: Foxhall Road/Whitehaven Parkway				
EBLR	315	240 [#]	177	122
NBL	1,200	65	40	45
NBT	1,200	262	210	271
SBT	515	302 [#]	162	220
SBR	75	35	21	18
2: Reservoir Road/Whitehaven Parkway				
WBLR	1,260	*	142	516
SBLT	100	74	11	11
* Delay theoretically greater than 999.9 seconds; queue cannot be calculated				
* 95 th percentile volume exceeds capacity; queue may be longer.				

As shown in Table 6-3, the intersection queue lengths under the total future conditions are consistent with those projected under background conditions. Where queue lengths are projected to increase with the proposed enrollment cap increase, the projected queues are within one car length and remain within the available storage for that movement.

IMPROVEMENT ANALYSIS

As previously mentioned, the proposed enrollment increase would have a very slight impact during the AM peak hour at the Foxhall Road/Whitehaven

Parkway intersection. This impact could be mitigated through a minor signal timing adjustment (shifting one second of green time from the northbound/southbound phases to service the eastbound phase).

Tables 6-4 and 6-5 document the impact of this timing adjustment on the levels of service and queues, respectively, at the Foxhall Road/Whitehaven Parkway intersection. The Synchro reports are provided in Appendix N.

Table 6-4
2015 Total Future Conditions Levels of Service
with Timing Adjustment

Intersection/ Lane Group	AM Peak
1: Foxhall Road/Whitehaven Parkway	
EBLR	E (65.6)
NBL	B (19.7)
NBT	B (16.9)
SBT	B (18.9)
SBR	A (7.9)
OVERALL	C (26.9)
(9.2) = signalized intersection control delay in sec/veh	

Table 6-5
95th Percentile Queue Summary (in feet)
2015 Total Future Conditions with Timing Adjustment

Intersection/ Lane Group	Available Storage	AM Peak
1: Foxhall Road/Whitehaven Parkway		
EBLR	315	231 [#]
NBL	1,200	86 [#]
NBT	1,200	275
SBT	515	368 [#]
SBR	75	38
* 95 th percentile volume exceeds capacity; queue may be longer.		

Section 7 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this study are as follows:

1. St. Patrick's Whitehaven Campus, which includes Nursery through Grade 6, is proposing to increase current enrollment cap from 440 students to 485 students, or an increase of 45 students.
2. In actuality, the school's current enrollment is 462 students; therefore, the increase in enrollment from existing conditions to the proposed enrollment cap would be 23 students.
3. Both the Foxhall Road/Whitehaven Parkway and Reservoir Road/Whitehaven Parkway intersections currently operate with one approach at or near capacity during at least one of the commuter peak hours.
4. Under future conditions without the proposed enrollment increase, the westbound approach at the Reservoir Road/ Whitehaven Parkway would drop to a LOS E during the PM school peak hour due to increases in traffic from growth outside the immediate site vicinity and increases in traffic associated with planned or approved, but not yet constructed, developments in the study area. The remaining lane groups at both study intersections would operate with levels of service consistent with existing conditions during each peak hour.
5. St. Patrick's Carpool Initiative, which was implemented in September 2002, has been very successful in increasing the number of carpools and reducing vehicles trips to/from the school. Specifically, the Carpool Initiative has resulted in AVOs during the AM and PM school peak hours that exceed the goal of 1.60 students per vehicle each time the measurements have been taken over the past 10 years (three times per year). The latest AVO evaluation performed in conjunction with this study indicates the school is achieving a 1.71 AVO during the AM school peak hour and a 1.65 AVO during the PM school peak hour.
6. During morning drop-off and afternoon pick-up operations, vehicles queue in the parking lane (signed for no parking during school hours) on the north side of Whitehaven Parkway and proceed into the pick-up/drop-off lane in front of the school. School traffic on Whitehaven Parkway is directed by a police officer during the pick-up/drop-off times and the pick-up/drop-off lane is supervised by on-duty teachers.
7. The proposed enrollment increase of 23 students compared to existing conditions would result in an additional 26 AM peak hour, 14 PM school peak hour, and eight PM commuter peak hour vehicle trips on the roadway network.
8. The increase in traffic due to the enrollment cap increase would account for approximately one percent or less of the total future traffic at each of the study intersections.
9. The proposed enrollment cap increase would have a minimal impact on the eastbound approach to the Foxhall Road/Whitehaven Parkway intersection during the AM peak hour; however, this minimal impact could be mitigated by a minor timing adjustment (shifting one second of green time from the northbound/southbound phases to service the eastbound phase).
10. The proposed enrollment cap increase would increase the pick-up/drop-off relate queues along Whitehaven Parkway and in the pick-up/drop-off lane by one vehicle or less during the AM and PM school peak hours. The increase in pick-up/drop-off queues associated with the enrollment cap increase can be accommodated within the available storage on Whitehaven Parkway and in the pick-up/drop-off lane.
11. The proposed enrollment cap increase to 485 students would have a minimal impact on the surrounding roadway network and on the pick-up/drop-off operations at the school.

REFERENCES

- ¹ 2010 Traffic Volumes, District Department of Transportation, Traffic Services Administration, Washington, D.C [http://ddot.dc.gov/DC/DDOT/About+DDOT/Maps/Traffic+Volume+Map+2010].
- ² Ibid.
- ³ Ibid.
- ⁴ District of Columbia Bicycle Master Plan, District Department of Transportation, April 2005, [http://ddot.dc.gov/DC/DDOT/On+Your+Street/Bicycles+and+Pedestrians/Bicycles/Bicycle+Master+Plan/DC+Bicycle+Master+Plan+-+April+2005].
- ⁵ Ibid.
- ⁶ District of Columbia Pedestrian Master Plan, District Department of Transportation, April 2009, [http://ddot.dc.gov/DC/DDOT/On+Your+Street/Bicycles+and+Pedestrians/Pedestrians/Pedestrian+Master+Plan/Pedestrian+Master+Plan+2009].
- ⁷ Trip Generation, 9th Edition, Volume 2, Institute of Transportation Engineers, Washington, DC, 2012.
- ⁸ Connecticut Avenue Transportation Study – Draft Final Report, DMJM+Harris, Inc., June 2003.

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FIGURES



Figure I-1
Site Location Map



St. Patrick's Episcopal Day School
Washington, DC

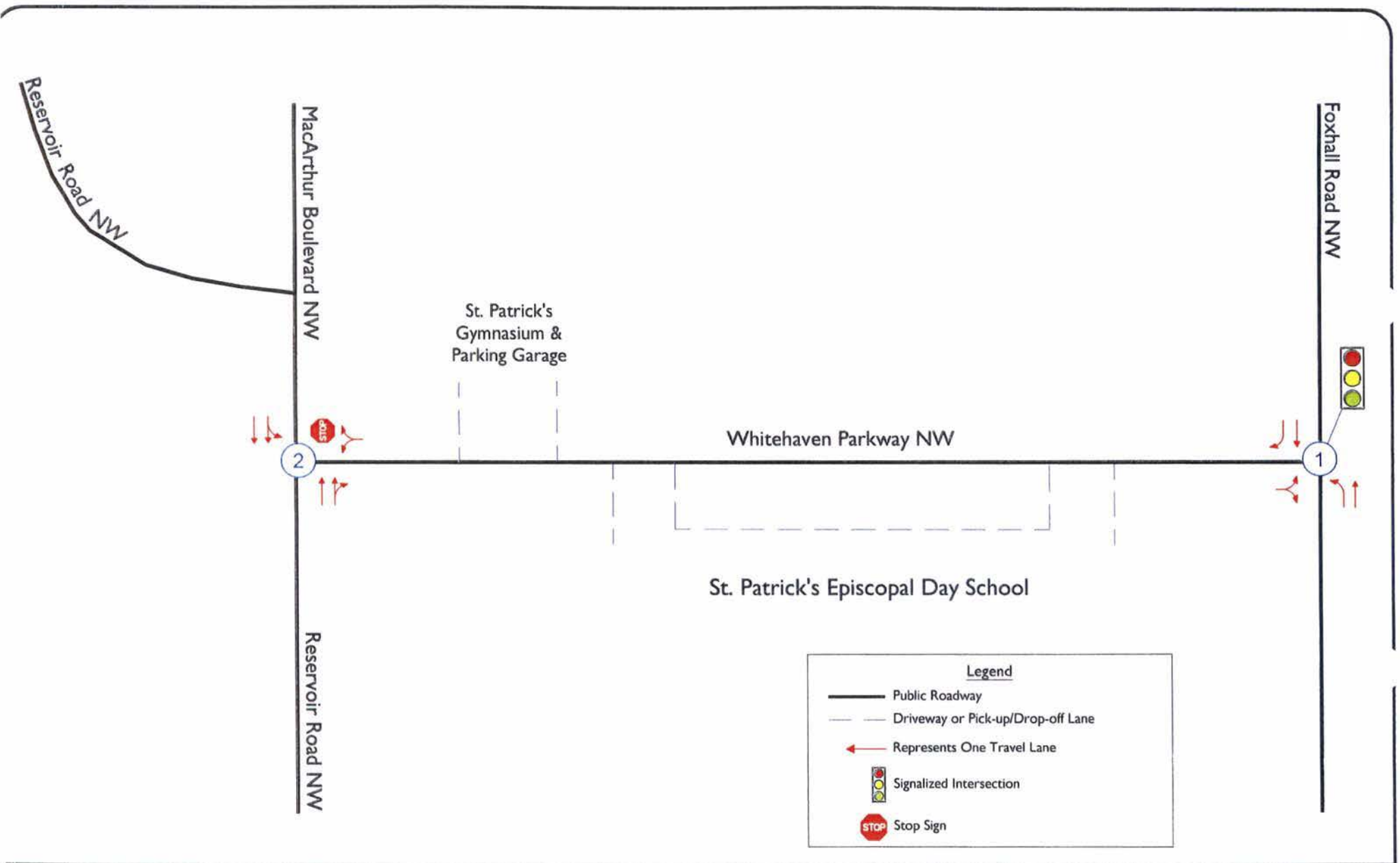


Figure 2-1
Existing Lane Use and Traffic Control



Figure 2-2
One Mile Bike-Shed



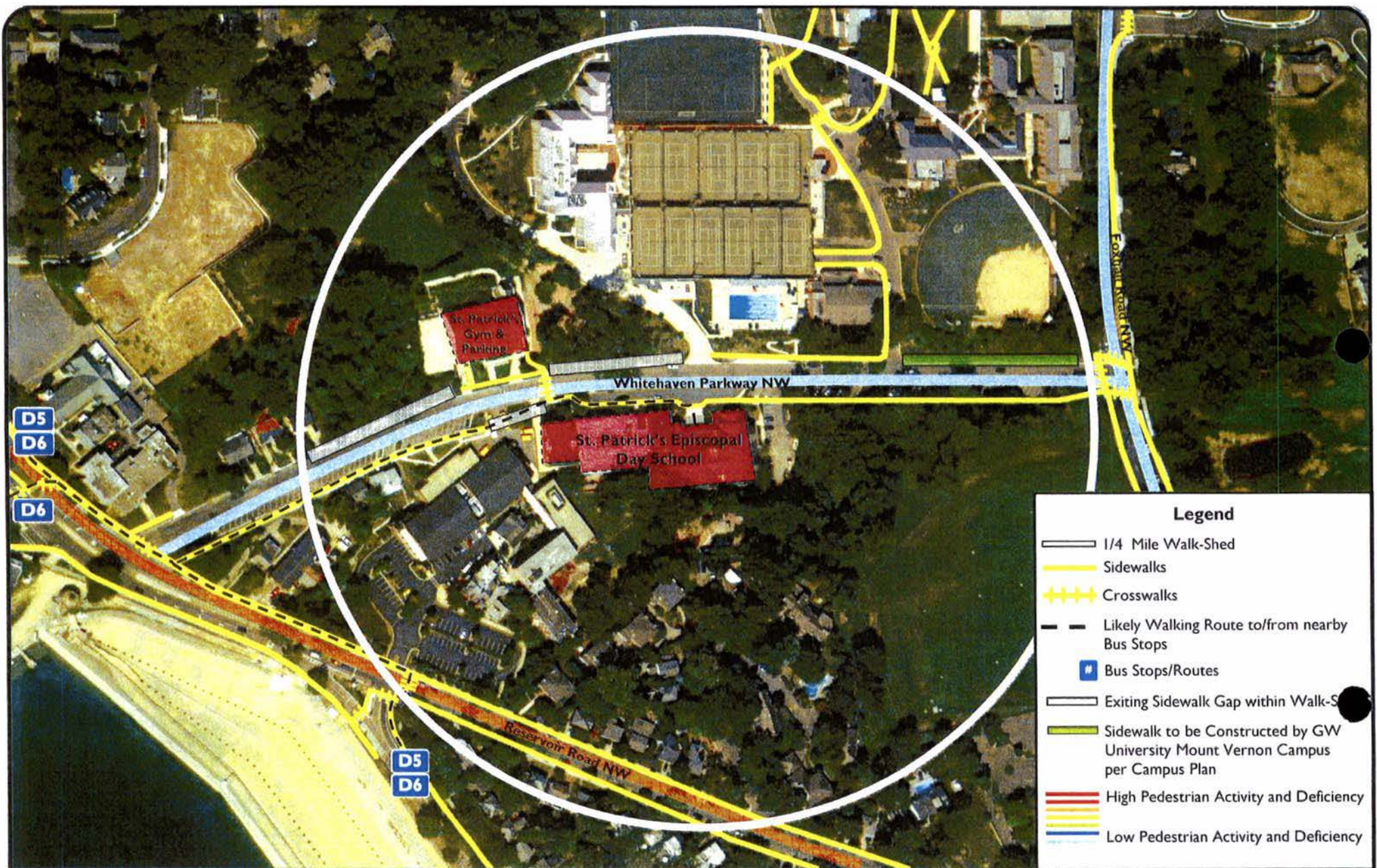


Figure 2-3
One Quarter Mile Walk-Shed

St. Patrick's Episcopal Day School
Washington, DC

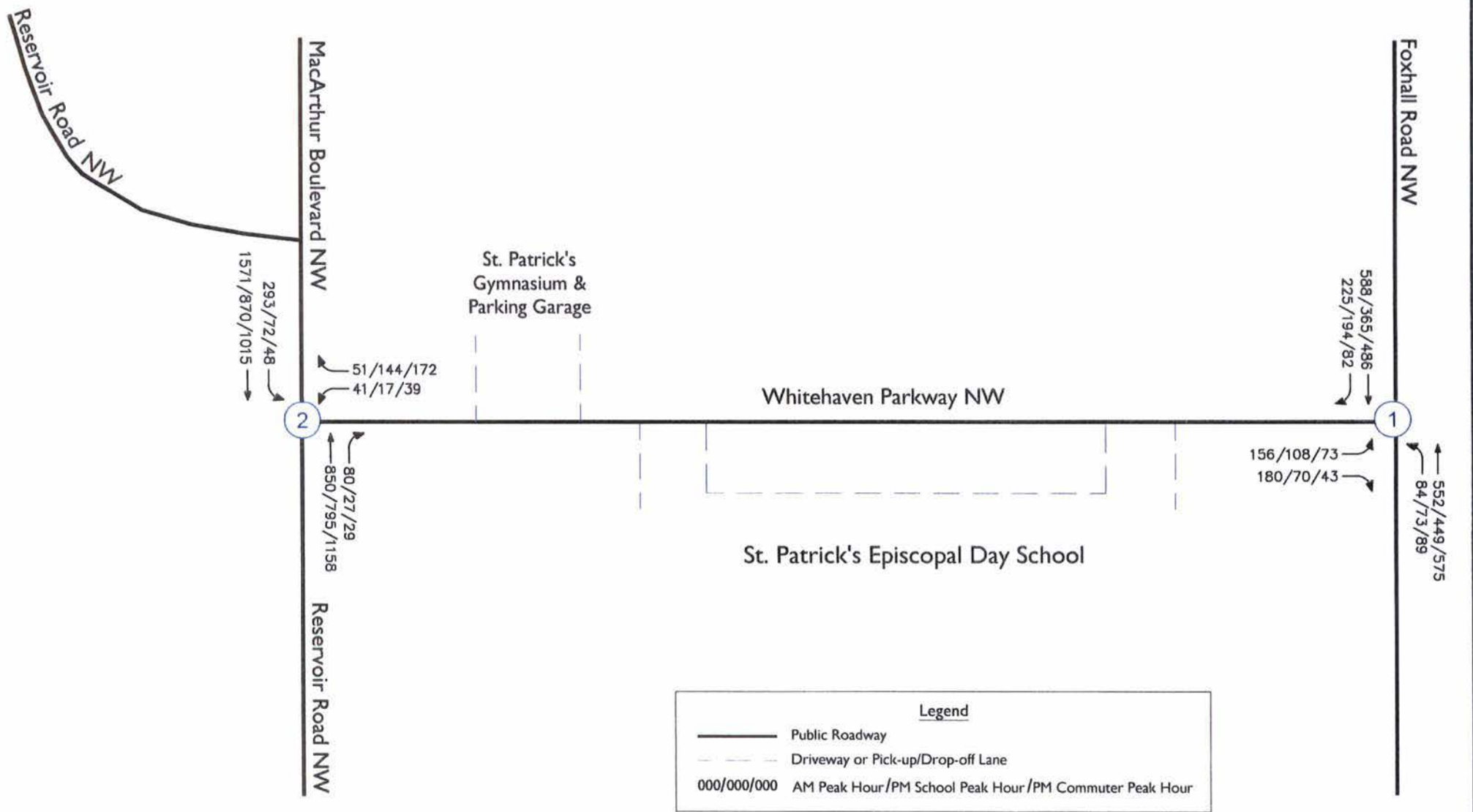


Figure 3-1
2012 Existing Peak Hour Traffic Volumes

North
Not to Scale

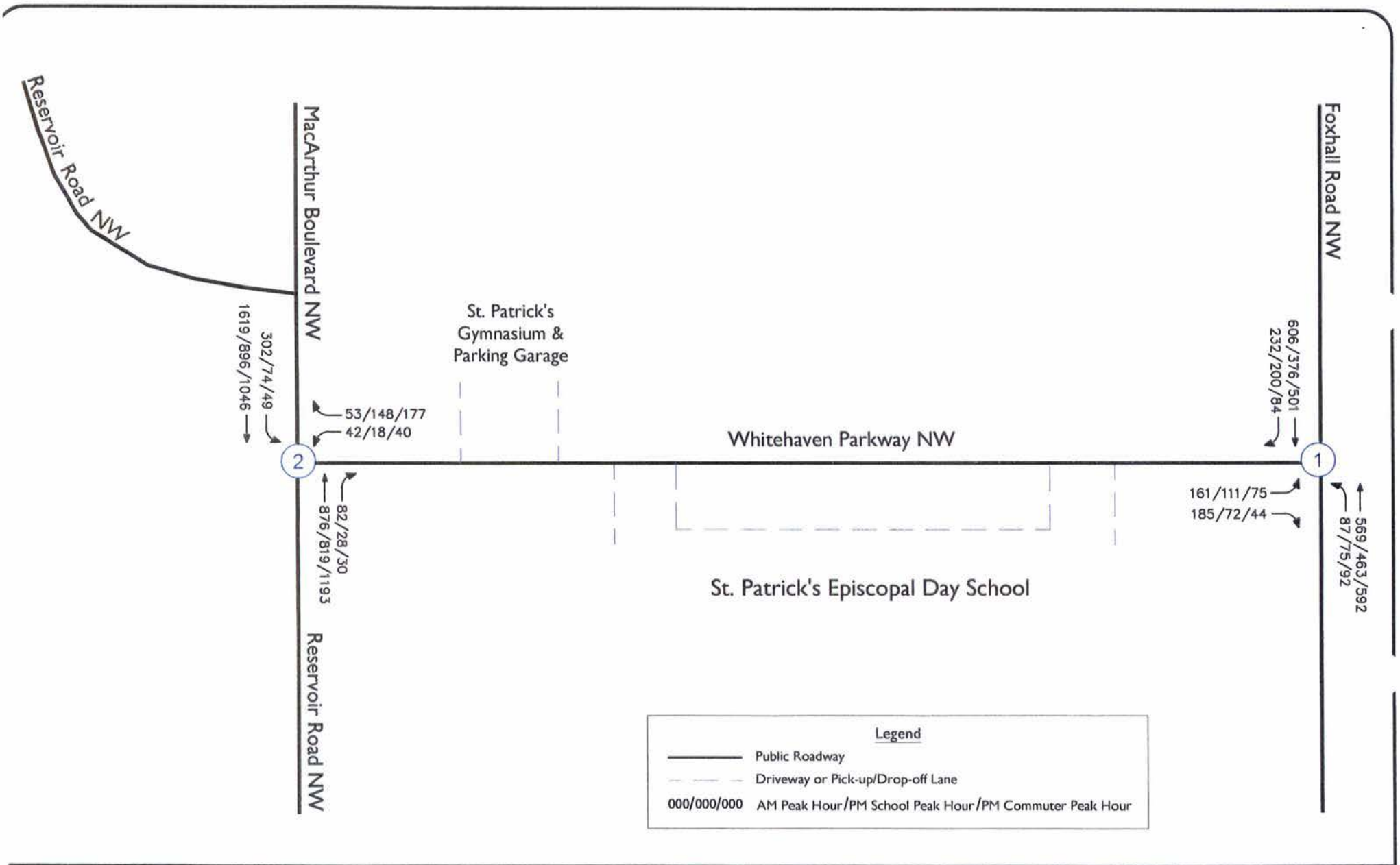


Figure 4-1
Existing Peak Hour Traffic Volumes plus Regional Growth (2015)

North
Not to Scale

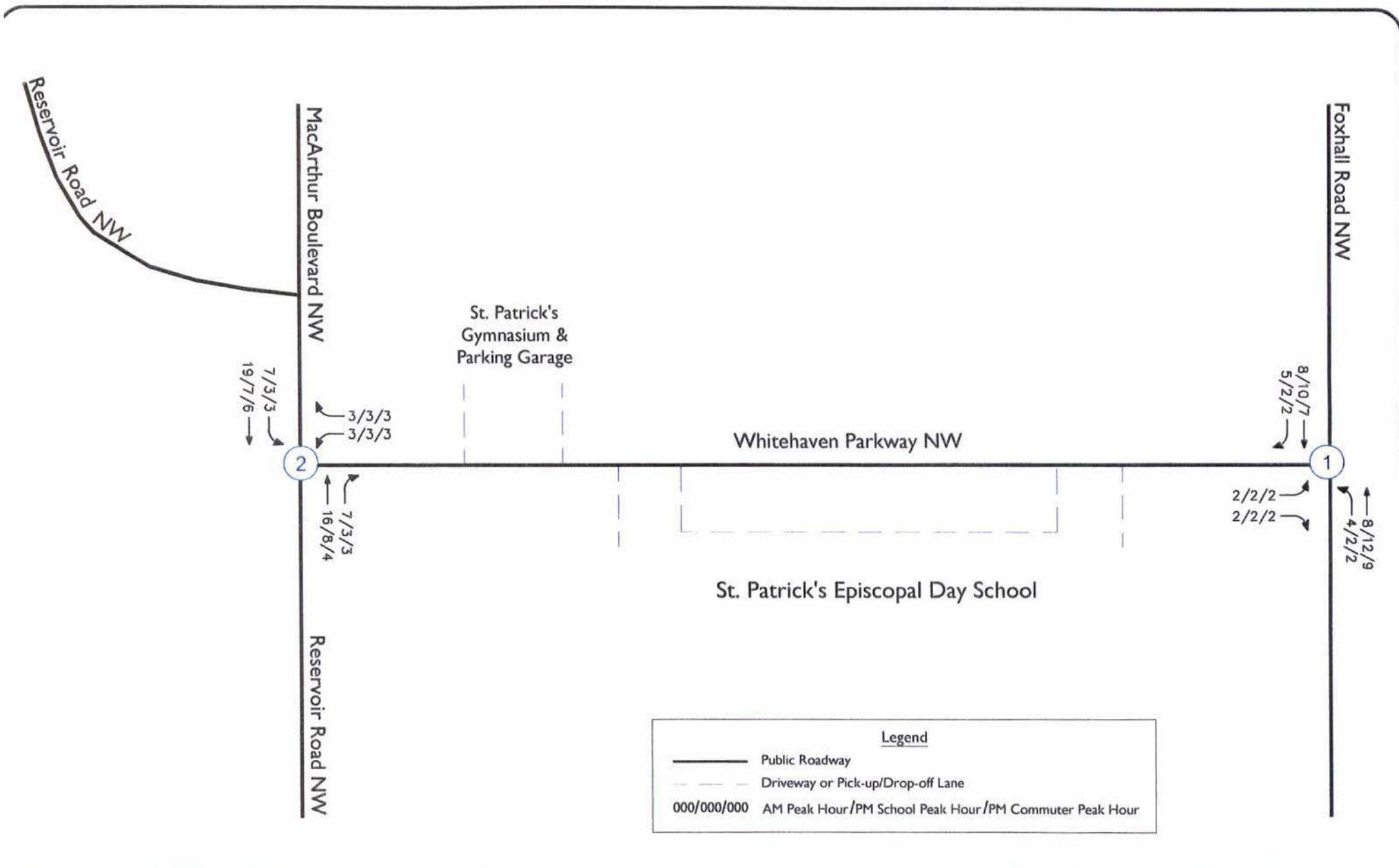


Figure 4-2
Total Pipeline Trips

North
Not to Scale

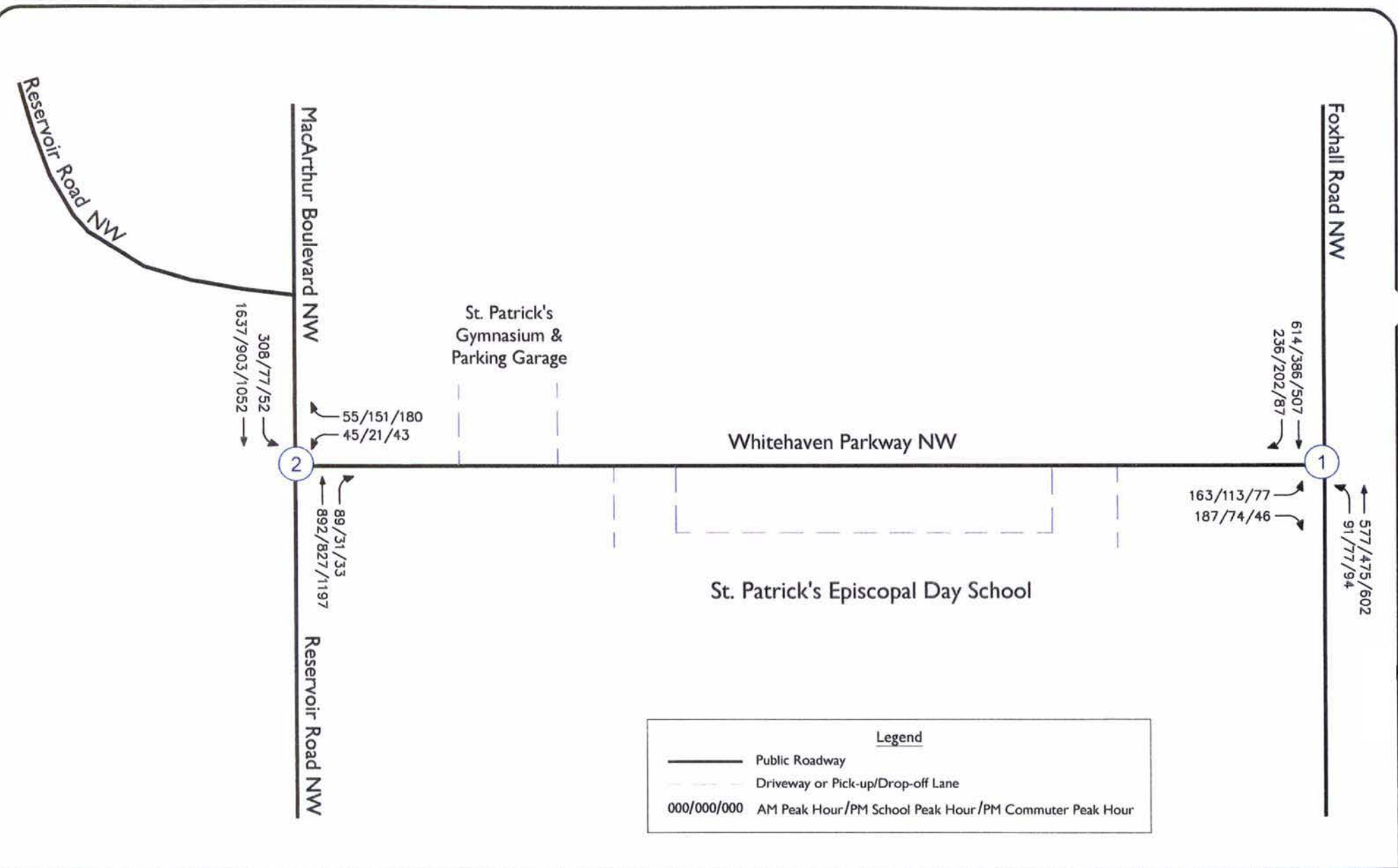


Figure 4-3
2015 Background Peak Hour Traffic Forecasts

North
Not to Scale

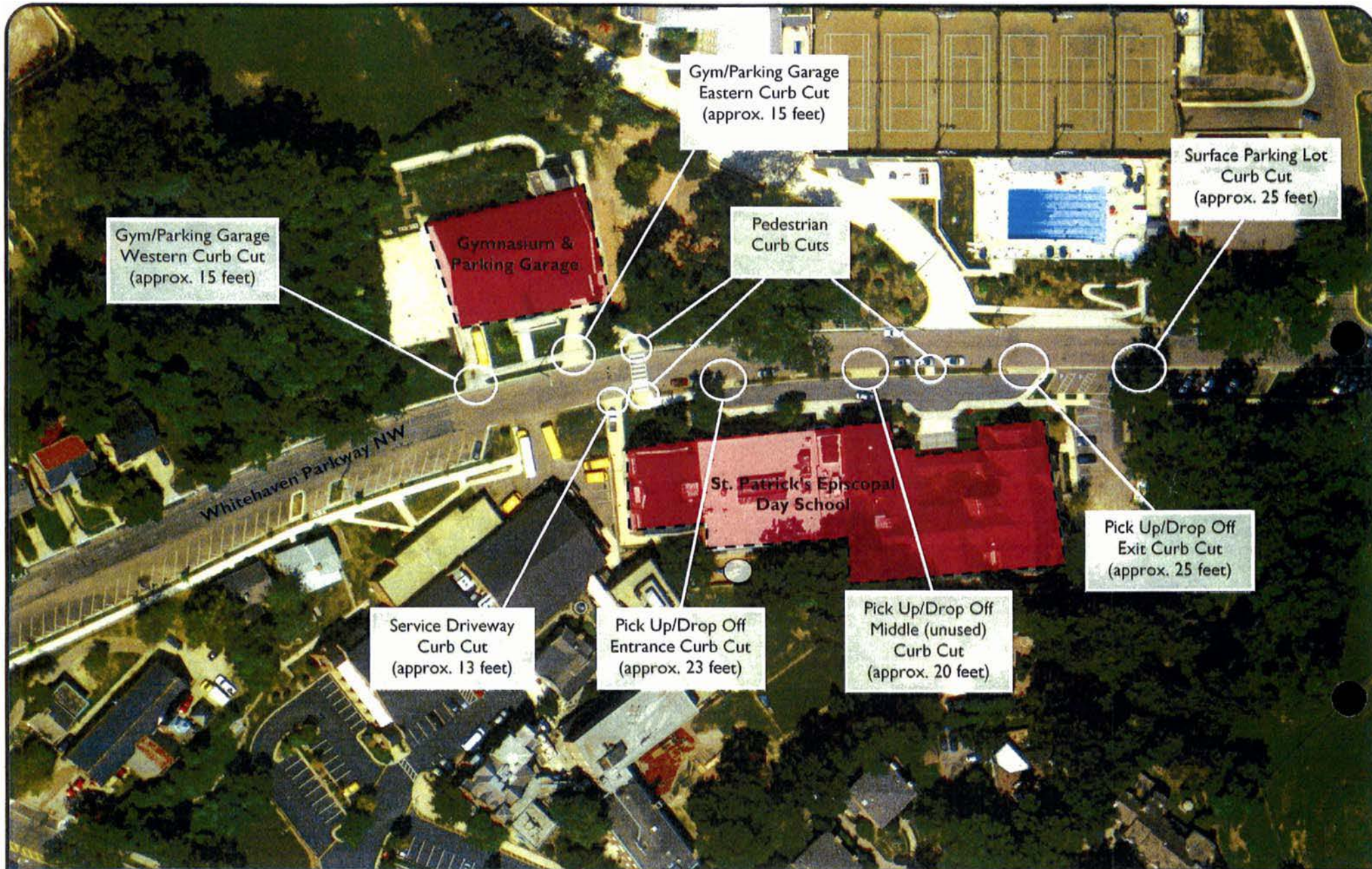


Figure 5-1
Existing Curb Cuts



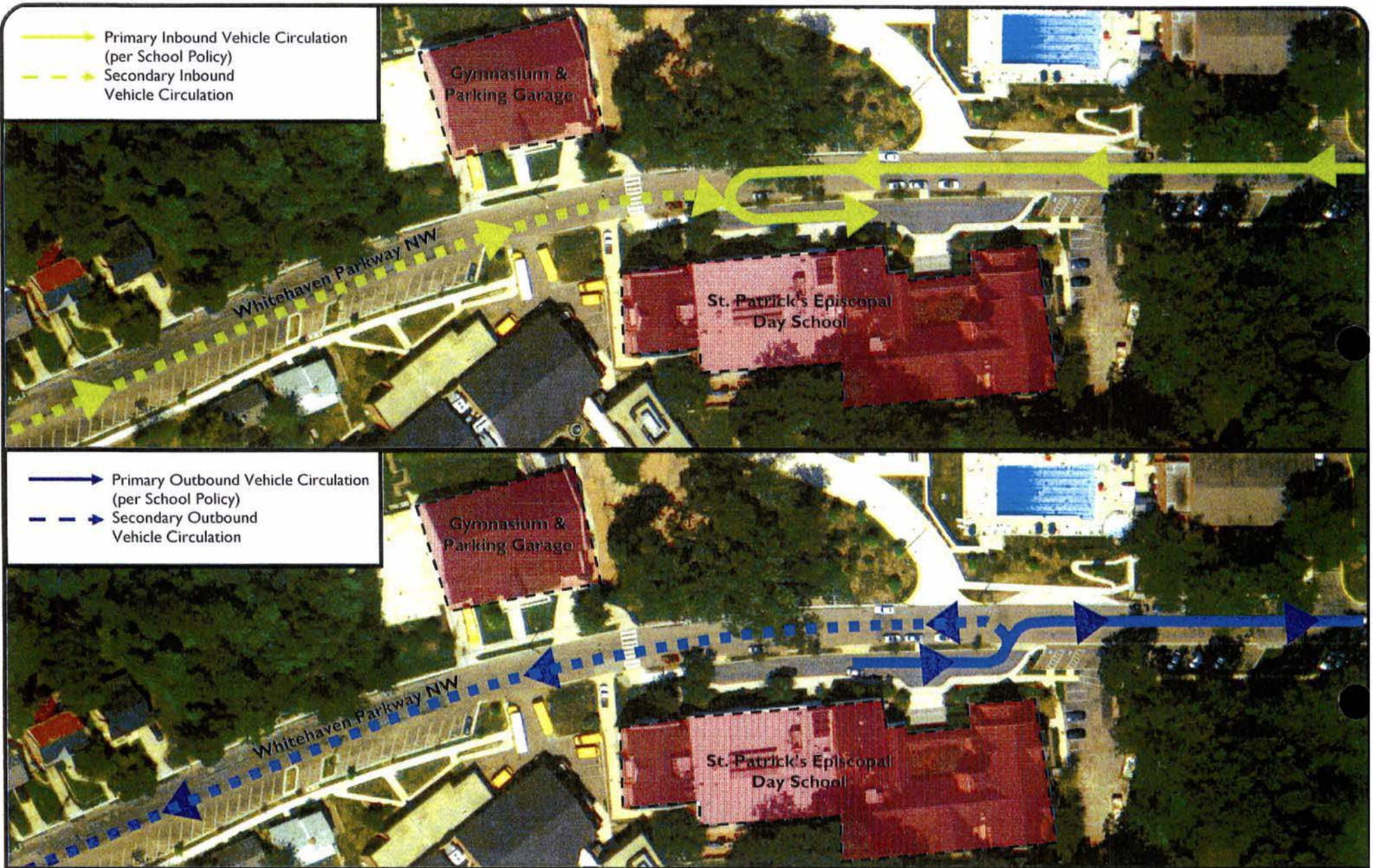


Figure 5-2
Circulation for Pick-up/Drop-off Operation



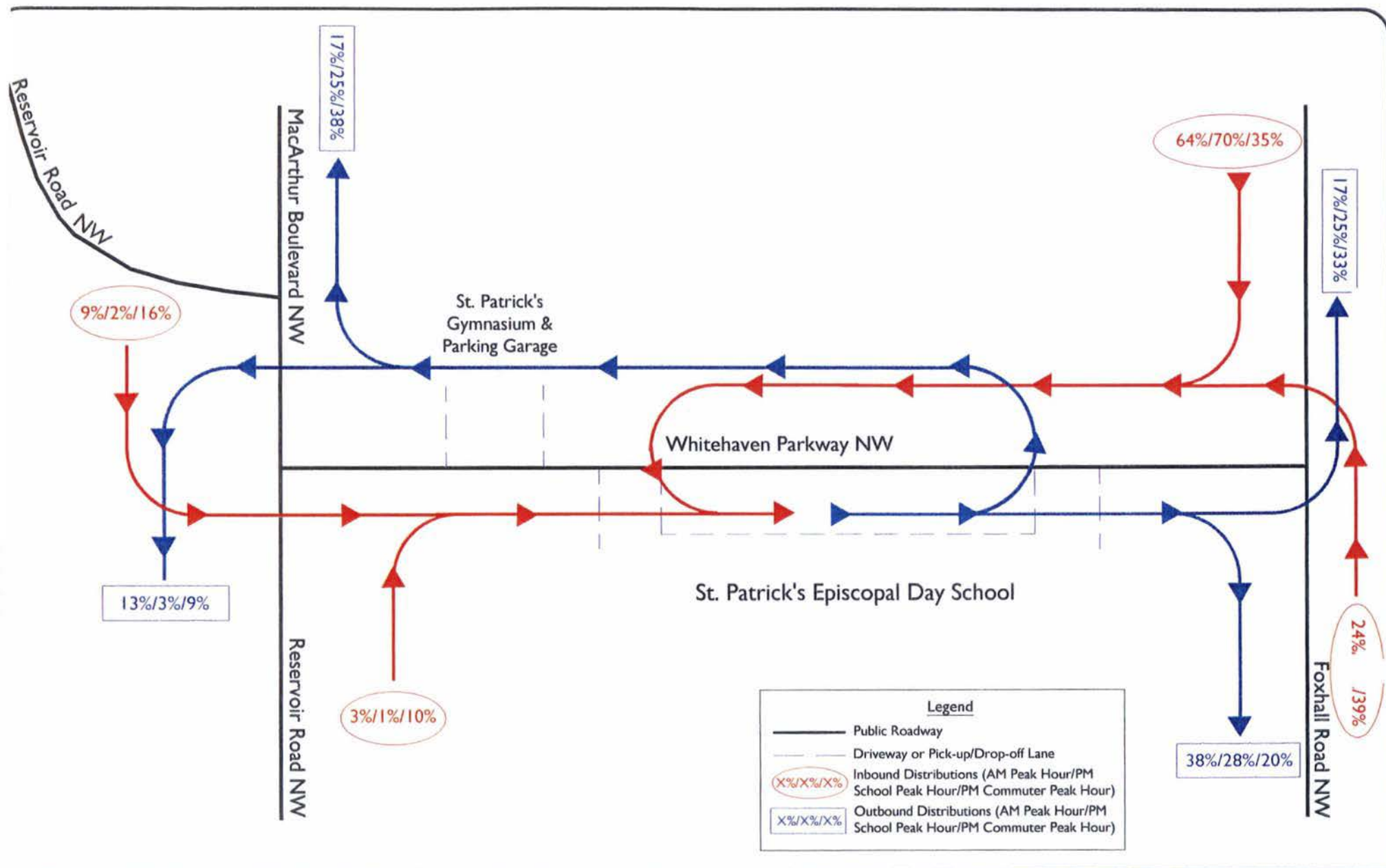


Figure 5-3
Site Trip Distributions

North
Not to Scale

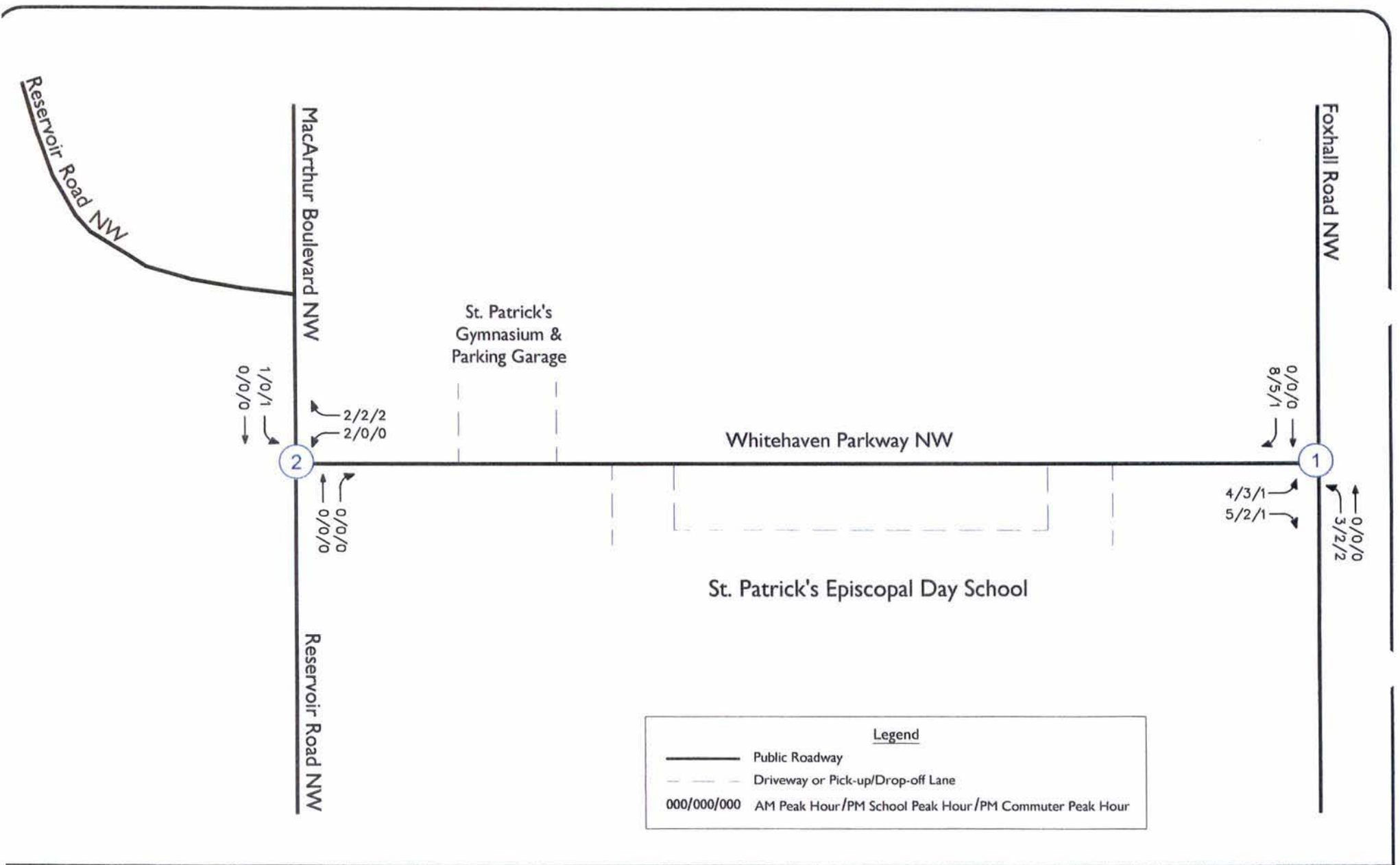


Figure 5-4
Total Site Trips

North
Not to Scale

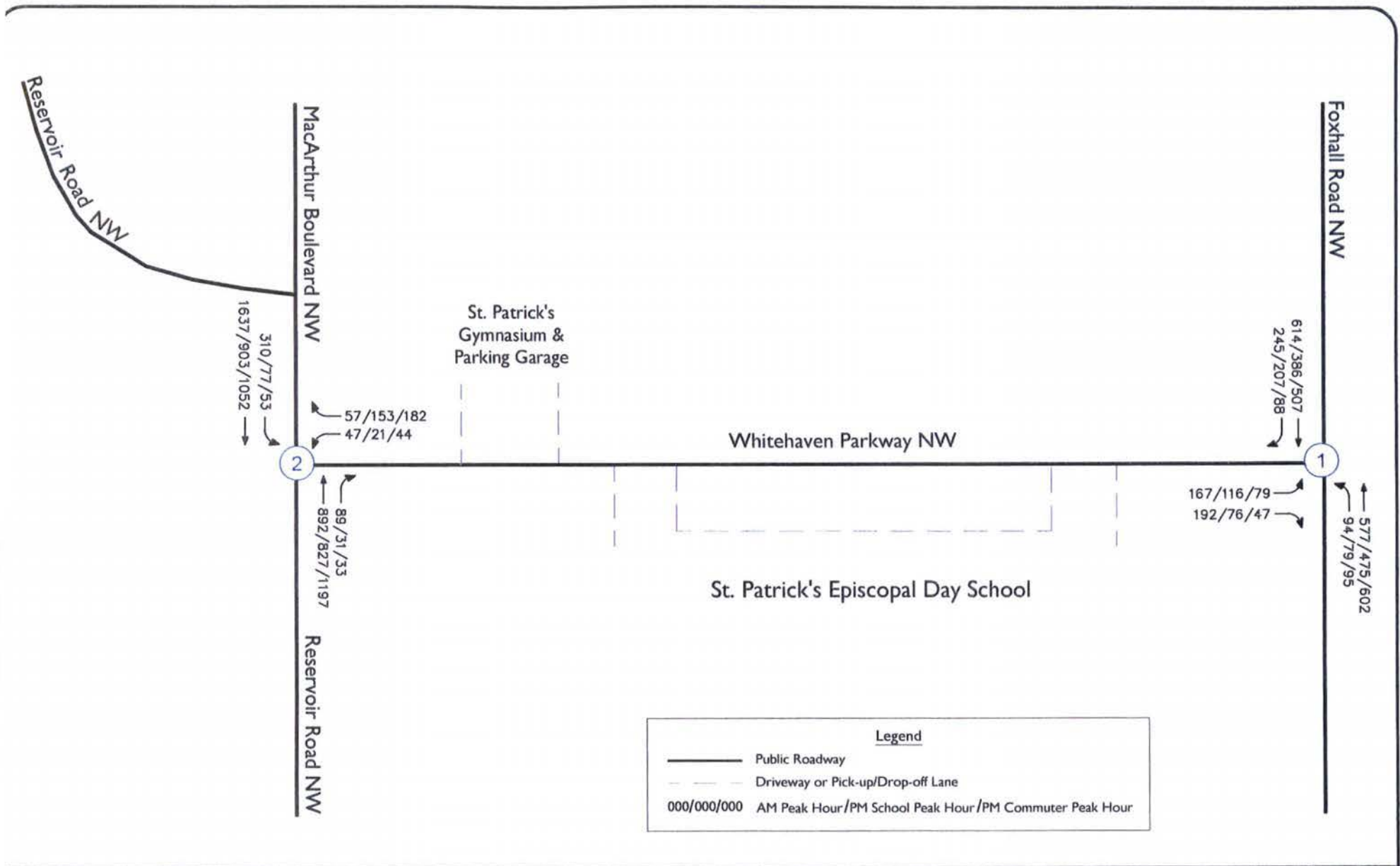


Figure 6-1
2015 Total Future Peak Hour Traffic Forecasts

North
Not to Scale