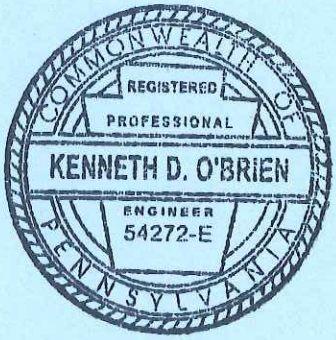
# Transportation Impact Study
# for
# The Promenade at Upper Dublin

*Upper Dublin Township, Montgomery County, PA*




**Kenneth D. O'Brien, P.E.**
**PA PE License Number PE54272**

Prepared by

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

**Fort Washington Office**
**425 Commerce Drive, Suite 200**
**Fort Washington, PA 19034**
**Phone: 215-283-9444**
**www.mcmahonassociates.com**

Prepared for

**BET Investments, Inc.**

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## Executive Summary

McMahon Associates, Inc. has completed a Traffic Impact Study for the proposed development to be located to the southeast of the intersection of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) in Upper Dublin Township, Montgomery County, Pennsylvania. This development is proposed to be located on Lots 3, 4, and 5 of the Montgomery Corporate Center and will occur in two phases. Phase 1 will consist of 115 age-restricted units and Phase 2 will consist of a mixed-use development, including 433 apartment units, a 6,500 square foot high turnover sit down restaurant with outdoor seating, a 2,000 square foot coffee shop with drive through and approximately 130,000 square feet of non-residential/commercial space. These lots were previously approved for 692,000 square feet of office space. Phase 1 of the development is expected to be constructed by 2018 while Phase 2 of the development is expected to be constructed in 2019. Access to Phase 1 of this development will be provided via Dryden Road and its existing full-movement signalized intersection with Welsh Road (S.R. 0063) as well as a full-movement unsignalized driveway to Dreshertown Road (S.R. 2024). With development of Phase 2, the unsignalized Dreshertown Road (S.R. 2024) access will be signalized and improved with separate turn lanes provided on Dreshertown Road (S.R. 2024). Additionally, a right-in/right-out only driveway to Welsh Road (S.R. 0063) will be provided in Phase 2.

The purpose of this study is to determine the impact of traffic on the adjacent roadways and intersections due to the proposed development. This study focuses on the existing (2015) conditions along with the projected future opening year (2018) conditions and PennDOT design year (2023) conditions, which is five years beyond the opening in accordance with PennDOT criteria, at the following intersections:

- Welsh Road (S.R. 0063) and Jarrettown Road
- Welsh Road (S.R. 0063) and Dresher Road
- Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024)
- Welsh Road (S.R. 0063) and Dryden Road

The evaluation of traffic conditions associated with the proposed development project reveals the following findings and conclusions:

- **Trip Generation** – Given the proposed Phase 1 use, age-restricted residential units, the traffic generation of Phase 1 is expected to be minimal. Based on trip generation data contained in the Institute of Transportation Engineers (ITE) publication entitled, *Trip Generation Manual, Ninth Edition,* Phase 1 the proposed development is expected to generate a total of approximately 50 new trips during the weekday morning peak hour, 50 new trips during the weekday afternoon peak hour, and 26 new trips during the Saturday midday peak hour. With full build of the site, the proposed development will generate approximately 460 new trips during the weekday morning peak hour, 699 new trips during the weekday afternoon peak hour, and 1,130 new trips during the Saturday midday peak hour.

  It should be noted that Lots 3, 4 and 5 of the Montgomery Corporate Center were previously approved for 692,000 square feet of office space which would generate approximately 882 new trips during the weekday morning peak hour, 854 new trips during the weekday afternoon peak

hour, and approximately 298 new trips during the Saturday midday peak hour. The total proposed development will generate fewer new peak hour trips during the weekday morning and weekday afternoon peak hours when area traffic volumes peak and more new trips during the Saturday midday peak hour, when area traffic volumes are lower.

- **Capacity/Level-of-Service Results for Off-Site Intersections** – The study intersections were evaluated to determine the operational characteristics under existing and future without- and with-development conditions. A review of the levels-of-service indicates that the study intersections will operate at similar levels-of-service overall during the future build-out year (2018) and PennDOT design year (2023).

- **Site Access** – Access to the development will be provided via Dryden Road and its existing full-movement signalized intersection with Welsh Road (S.R. 0063), as well as a full-movement, unsignalized driveway to Dreshertown Road (S.R. 2024). The Dreshertown Road (S.R. 2024) access will be constructed as part of Phase 1 of the development. With the addition of the development proposed in Phase 2, it is expected that this intersection will be signalized. Additionally, Dreshertown Road (S.R. 2024) will be widened to provide a northbound right-turn lane and southbound left-turn lane at the access driveway. Additionally, as part of Phase 2 of the development, an additional right-in/right-out only driveway will be provided along Welsh Road (S.R. 0063).

- **Proposed Improvements** – The following improvements are proposed in conjunction with this development:

  **Phase 1**
  - Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) – traffic signal timing modifications.
  - Dreshertown Road (S.R. 2024) Site Frontage – soften the existing horizontal and vertical curves along the site frontage of Dreshertown Road (S.R. 2024).

  **Phase 2**
  - Welsh Road (S.R. 0063) and Jarrettown Road – install an additional eastbound through lane on Welsh Road (S.R. 0063) and traffic signal timing modifications.
  - Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) – traffic signal timing modifications.
  - Welsh Road (S.R. 0063) and Dryden Road – traffic signal timing modifications.
  - Dreshertown Road (S.R. 2024) and Site Access – install a southbound left-turn lane and northbound right-turn lane on Dreshertown Road (S.R. 2024) and install a traffic signal.

The traffic analyses contained herein reveals that safe and efficient access to and from the proposed development can be provided and that the adjacent roadways and intersections can accommodate the projected site-generated traffic. Level-of-service and queue matrix tables are provided in **Appendix A** for the study area intersections and/or site accesses.

## Introduction

McMahon Associates, Inc. has completed a Traffic Impact Study for the proposed development to be located to the southeast of the intersection of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) in Upper Dublin Township, Montgomery County, Pennsylvania **(Figure 1)**. This development is proposed to be located on Lots 3, 4, and 5 of the Montgomery Corporate Center and will occur in two phases. Phase 1 will consist of 115 age-restricted units and Phase 2 will consist of a mixed-use development, including 433 apartment units, a 6,500 square foot high turnover sit down restaurant with outdoor seating, a 2,000 square foot coffee shop with drive through and approximately 130,000 square feet of non-residential/commercial space. These lots were previously approved for 692,000 square feet of office space. Phase 1 of the development is expected to be constructed by 2018 while Phase 2 of the development is expected to be constructed in 2019. Access to Phase 1 of this development will be provided via Dryden Road and its existing full-movement signalized intersection with Welsh Road (S.R. 0063) as well as a full-movement unsignalized driveway to Dreshertown Road (S.R. 2024). With development of Phase 2, the unsignalized Dreshertown Road (S.R. 2024) access will be signalized and improved with separate turn lanes provided on Dreshertown Road (S.R. 2024). Additionally, a right-in/right-out only driveway to Welsh Road (S.R. 0063) will be provided in Phase 2. A copy of the development site plans for Phase 1 and Phase 2 are provided in **Figures 2 and 2A**, respectively.

The purpose of this traffic study is to present an evaluation of the incremental traffic impacts of the phased proposed development within the study area in Upper Dublin Township, as well as to provide design recommendations regarding the site driveways in order to provide efficient access to the site.

Manual turning movement traffic counts were completed at the study intersections during the weekday morning peak period (7:00 AM to 9:00 AM), weekday afternoon peak period (4:00 PM to 6:00 PM), and Saturday midday peak period (11:00 AM to 2:00 PM). In order to assess the existing traffic conditions, these existing traffic volumes were subjected to detailed capacity/level-of-service analysis, in accordance with accepted methodologies, for the highest peak hour during each peak period, which serves as the basis for this evaluation.

Next, future traffic volumes without the development were projected utilizing an annual traffic growth rate to account for regional traffic growth, as well as known development projects in the area. The future traffic volumes were projected for the future opening year (2018) and PennDOT design year (2023), which is five years beyond the opening, in accordance with PennDOT criteria, at the study intersections. The future traffic volumes without the proposed development were then subjected to detailed capacity/level-of-service and queuing analysis.

Finally, the traffic generated by the proposed phases of the development was established based on accepted methodologies, and assigned to the roadway network and site accesses, as necessary. The site-generated traffic volumes were then added to the future without-development traffic volumes, and subjected to detailed capacity/level-of-service and queuing analysis to assess the future traffic conditions with development.

## Existing Transportation Setting

The proposed development will be located in the southeast corner of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) in Upper Dublin Township, Montgomery County, Pennsylvania. The existing roadways and intersections in the vicinity of the site, which comprise the study area roadway network, are described in this section.

### *Roadway Characteristics*

The characteristics of the study roadways surrounding the development project are described below in **Table 1.**

**Table 1 - Existing Roadway Characteristics**

| Roadway | Roadway Classification | | Travel Lanes (per direction) | Speed Limit (mph) |
|---|---|---|---|---|
| | Smart Transportation (1) | PennDOT (2) | | |
| Welsh Road (S.R. 0063) | Suburban, Regional Arterial | Other, Principal Arterial | 2 | 45 |
| Dreshertown Road (S.R. 2024) | Suburban, Community Arterial | Minor Arterial | 1 | 40 |
| Dresher Road | Suburban, Community Arterial | Minor Arterial | 2 | 35 |
| Dryden Road | Suburban, Local | Local Road | 1 | 25 |
| Jarrettown Road | Suburban, Community Arterial | Minor Arterial | 1 | 35 |

(1) Based on Table 5.1 – Roadway Categories in the PennDOT publication, *Smart Transportation Guidebook.*
(2) Based on the roadway classifications provided on PennDOT's internet Traffic Monitoring System (iTMS) website.

The following key intersections in the vicinity of the site comprise the study area:

- Welsh Road (S.R. 0063) and Jarrettown Road
- Welsh Road (S.R. 0063) and Dresher Road
- Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024)
- Welsh Road (S.R. 0063) and Dryden Road

The existing characteristics of the study intersections, including field sketches, signal plans, and photographs are summarized in **Appendix B.**

*Transit Services*

SEPTA bus routes 80 and 310 provide stops along Welsh Road (S.R. 0063) at Blair Mill Road (S.R. 2026) and Dryden Road. There is no regional rail station provided along the roadways surrounding the proposed development.

*Pedestrian Facilities*

There is an existing sidewalk system provided from Electronic Drive eastward along the northern side of Welsh Road (S.R. 0063) and along the western side of Dreshertown Road (S.R. 2024) near the intersections with Tuckerstown Road and St. Georges Road. There is no sidewalk provided along the site side of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) in the vicinity of the site.

## Existing Traffic Conditions

This section provides a summary of the existing (2015) daily and peak hour traffic conditions on the study area roadways and intersections surrounding the proposed development.

### *Traffic Count Data*

Manual turning movement traffic counts were conducted at the study intersections during the weekday morning peak period (7:00 AM to 9:00 PM), weekday afternoon peak period (4:00 PM to 6:00 PM), and Saturday midday peak period (11:00 AM to 2:00 PM). The results of these traffic counts are tabulated by 15-minute intervals in **Appendix C**. The four highest consecutive 15-minute peak intervals during these traffic count periods constitute the peak hours that are the basis of this traffic analysis. The resultant 2015 existing weekday morning, weekday afternoon, and Saturday midday peak hours are depicted in **Figure 3A**.

### *Capacity/Level of Service Analysis*

The peak hour traffic volumes were analyzed to determine the existing and future operating conditions, both without and with the proposed development, in accordance with the standard techniques contained in the current *Highway Capacity Manual (2010)*. These standard capacity/level-of-service analysis techniques, which calculate total control delay, are more thoroughly described in **Appendix D** for both signalized and unsignalized intersections, as well as the correlation between average total control delay and the respective level-of-service (LOS) criteria for each intersection type.

The results of the capacity/level-of-service analyses are illustrated in **Figure 3B** for the existing peak hour traffic conditions, and detailed capacity/level-of-service analysis worksheets are contained in **Appendix E**. Specific details regarding the analysis results and traffic operations for each intersection are contained in the "Capacity/Level-of-Service Results" section of this study.

## Site Characteristics

This section presents the details of the proposed site, including the incremental increase in traffic volumes generated by the development during the peak hours and distribution of this site traffic to the study area roadways, as well as the proposed site access configuration, and traffic control.

### *Trip Generation*

Traffic volumes generated by the proposed development were prepared based on trip generation data compiled from numerous studies contained in the Institute of Transportation Engineers (ITE) publication, *Trip Generation, 9th Edition*. **Table 2** present the anticipated vehicular trip generation for Phase 1 of the proposed development.

**Table 2 - Vehicular Trip Generation (Phase 1)** (1)

| Land Use | Size | Weekday Morning | | | Weekday Afternoon | | | Saturday Midday | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total | In | Out | Total |
| **Age-Restricted Housing**(2) | **115 units** | **18** | **32** | **50** | **31** | **19** | **50** | **12** | **14** | **26** |
| Previously Approved Development(3) | 440,000 s.f. | 430 | 59 | 489 | 84 | 409 | 493 | 102 | 87 | 189(4) |
| **Difference** | | **-412** | **-27** | **-439** | **-53** | **-390** | **-443** | **-90** | **-73** | **-163** |

(1) Based on ITE's *Trip Generation Manual, Ninth Edition.*
(2) Based on equations for ITE Land Use Code 251 – Senior Adult Housing Detached.
(3) From *Traffic Impact Study* for the Montgomery Corporate Center prepared by McMahon Associates, Inc. dated December 2010.
(4) Since not included in December 2010 traffic impact study, the rates for ITE Land Use Code 710 contained in ITE publication, *Trip Generation, 9th Edition,* 2012 were utilized.

Table 2 also shows a comparison of Phase 1 of the proposed development to the previously approved office development on Lots 4 and 5 of the Montgomery Corporate Center. This comparison shows the proposed Phase 1 of this development is expected to generate significantly fewer trips than the approved Lots 4 and 5 office use, approximately 439 fewer total new trips during the weekday morning peak hour, approximately 443 fewer total new trips during the weekday afternoon peak hour, and approximately 163 fewer total new trips during the Saturday midday peak hour.

**Table 3** presents the anticipated vehicular trip generation for Phases 1 and 2 of the proposed development.

**Table 3 - Vehicular Trip Generation (Phases 1 and 2) (1)**

| Land Use | Size | Weekday Morning | | | Weekday Afternoon | | | Saturday Midday | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total | In | Out | Total |
| Age-Restricted Housing(2) | 115 units | 18 | 32 | 50 | 31 | 19 | 50 | 12 | 14 | 26 |
| -Internalization(3) | | -2 | -12 | -14 | -16 | -12 | -28 | -4 | -4 | -8 |
| "New" Trips | | 16 | 20 | 36 | 15 | 7 | 22 | 8 | 10 | 18 |
| Apartment(4) | 433 units | 43 | 173 | 216 | 166 | 90 | 256 | 99 | 98 | 197 |
| -Internalization(3) | | -5 | -32 | -37 | -47 | -31 | -78 | -10 | -10 | -20 |
| "New" Trips | | 38 | 141 | 179 | 119 | 59 | 178 | 89 | 88 | 177 |
| Townhouses(5) | 36 units | 4 | 19 | 23 | 17 | 9 | 26 | 9 | 8 | 17 |
| -Internalization(3) | | -0 | -8 | -8 | -9 | -6 | -15 | -4 | -2 | -6 |
| "New" Trips | | 4 | 11 | 15 | 8 | 3 | 11 | 5 | 6 | 11 |
| Restaurant(6) | 8,000 s.f. | 47 | 39 | 86 | 47 | 32 | 79 | 60 | 53 | 113 |
| -Internalization(3) | | -28 | -8 | -36 | -22 | -20 | -42 | -14 | -13 | -27 |
| -Pass-by(7) | | -6 | -11 | -17 | -11 | -5 | -16 | -15 | -13 | -28 |
| New" Trips | | 13 | 20 | 33 | 14 | 7 | 21 | 31 | 27 | 58 |
| Coffee Shop W/Drive Through(8) | 2,000 s.f. | 103 | 98 | 201 | 43 | 43 | 86 | 85 | 84 | 169 |
| -Internalization(3) | | -41 | -13 | -54 | -21 | -25 | -46 | -19 | -19 | -38 |
| -Pass-by(9) | | -30 | -42 | -72 | -11 | -9 | -20 | -26 | -26 | -52 |
| New" Trips | | 32 | 43 | 75 | 11 | 9 | 20 | 40 | 39 | 79 |
| Retail(10) | 147,000 s.f. | 122 | 75 | 197 | 372 | 404 | 776 | 584 | 539 | 1,123 |
| -Internalization(3) | | -17 | -20 | -37 | -39 | -60 | -99 | -28 | -31 | -59 |
| -Pass-by(11) | | -25 | -13 | -38 | -113 | -117 | -230 | -145 | -132 | -277 |
| New" Trips | | 80 | 42 | 122 | 220 | 227 | 447 | 411 | 376 | 787 |
| **Total** | | **337** | **436** | **773** | **676** | **597** | **1,273** | **849** | **796** | **1,645** |
| **-Internalization** | | **-93** | **-93** | **-186** | **-154** | **-154** | **-308** | **-79** | **-79** | **-158** |
| **-Pass-by** | | **-61** | **-66** | **-127** | **-135** | **-131** | **-266** | **-186** | **-171** | **-357** |
| **New" Trips** | | **183** | **277** | **460** | **387** | **312** | **699** | **584** | **546** | **1,130** |

(1) Based on ITE's *Trip Generation Manual, Ninth Edition.*
(2) Based on equations for ITE Land Use Code 251 – Senior Adult Housing Detached.
(3) Based on rates contained in ITE publication, *Trip Generation Manual.*
(4) Based on equations for ITE Land Use Code 220 – Apartment.
(5) Based on equations for ITE Land Use Code 230 – Residential Condominium/Townhouse.
(6) Based on rates for ITE Land Use Code 932 – High Turnover Sit-Down Restaurant, including an additional 1,500 square feet for outdoor seating.
(7) According to *Trip Generation Manual* for Land Use Code 932, approximately 43% of total trips during the PM peak hour are pass-by trips. Assumed 33% for AM and SAT peak hours.
(8) Based on rates for ITE Land Use Code 937 – Coffee Shop with Drive Through Window.
(9) Used pass-by data for Land Use Code 934 since no pass-by data provided for Land Use Code 937. According to *Trip Generation Manual* for Land Use Code 934, approximately 49% and 50% of total trips during the AM and PM peak hours are pass-by trips, respectively. Assumed 40% for SAT peak hour.
(10) Based on equations for ITE Land Use Code 820 – Shopping Center.
(11) According to *Trip Generation Manual* for Land Use Code 820, approximately 34% and 26% of total trips during the PM and SAT peak hours are pass-by trips, respectively. Assumed 24% for AM peak hour.

It should be noted that some level of interaction or internalization is also expected on the site between the various uses of this development once Phase 2 is constructed, as drivers will, at times, visit more than one portion of the site on a given visit, such as a driver visiting the coffee shop and then going to a retail store. As a result, the total development traffic was reduced to account for this interaction based on methodologies contained in ITE's publication, *Trip Generation Manual.*

Phase 2 of the development will include pass-by traffic, which are vehicles that are already on the roadway network that will divert to the site as an interim stop on the way to their ultimate destination. Since pass-by traffic is already on the adjacent roadways, this portion of the total development traffic on the roadway/intersection network is part of future without-development traffic volumes, and does not represent additional traffic added to the roadway network. Therefore, the total traffic associated with Phase 2 of the development was reduced by the pass-by traffic to estimate the "new," or primary, site traffic generated by Phase 2 of the development, that traffic which will be added to the study area's streets and intersections, and is shown in Table 3.

**Table** 4 shows a comparison of the trip generation of Phases 1 and 2 of this development and the previously approved 692,000 square feet of office space on Lots 3, 4, and 5 of the Montgomery Corporate Center.

**Table 4 - Vehicular Trip Generation Comparison**

| Land Use | Size | Weekday Morning | | | Weekday Afternoon | | | Saturday Midday | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total | In | Out | Total |
| **Total Development Phases 1 and 2 (New Trips)** | --- | **183** | **277** | **460** | **387** | **312** | **699** | **584** | **546** | **1,130** |
| Previously Approved Development(1) | 692,000 s.f. | 776 | 106 | 882 | 145 | 709 | 854 | 161 | 137 | 298(2) |
| **Difference** | | **-593** | **171** | **-422** | **242** | **-397** | **-155** | **423** | **409** | **832** |

(1) From *Traffic Impact Study* for the Montgomery Corporate Center prepared by McMahon Associates, Inc. dated December 2010.

(1) Since not included in December 2010 traffic impact study, the rates for ITE Land Use Code 710 contained in ITE publication, *Trip Generation, 9th Edition,* 2012 were utilized.

A comparison of the proposed full build (Phases 1 and 2) of the development to the previously approved office development on Lots 3, 4 and 5 of the Montgomery Corporate Center shows the proposed development is expected to generate approximately 422 fewer total new trips during the weekday morning peak hour, approximately 155 fewer total new trips during the weekday afternoon peak hour, and approximately 832 more total new trips during the Saturday midday peak hour than the previously approved 692,000 square feet of office space on Lots 3, 4 and 5 of the Montgomery Corporate Center. It should be noted that while the proposed development will generate more total new trips during the Saturday midday peak hour than the previously approved use of the site, area traffic volumes during the Saturday midday peak hour are considerably lower than the weekday morning and weekday afternoon peak hours.

*Trip Distribution and Assignment*

Site-generated traffic will approach and depart the site via different routes depending on factors such as the existing traffic patterns, location of major roadways, and the location of the development's site accesses. The overall distribution percentages for the anticipated directions of approach and departure are illustrated in **Figures 4A and 4C** for the "new" site trips for Phase 1 and Phase 2 of the development, respectively. The net "new" trip assignment for the development is then illustrated in **Figures 4B and 4D** for the weekday morning, weekday afternoon, and Saturday midday peak hours. Phase 2 "pass-by trip" assignment for the three peak hours is illustrated in **Figure 4E**. The net total "new" and "pass-by" trip assignment for phases one and two is then illustrated in **Figure 4F**.

*Site Access Configuration and Traffic Control*

Access to Phase 1 of the development will be provided via Dryden Road and its existing full-movement signalized intersection with Welsh Road (S.R. 0063) as well as a full-movement unsignalized driveway to Dreshertown Road (S.R. 2024). It is recommended to maintain the existing lane configurations at the intersection of Welsh Road (S.R. 0063) and Dryden Road under both Phases 1 and 2 of this development.

Under Phase 2 of this development it is proposed to signalize the intersection of Dreshertown Road (S.R. 2024) and site access and provide a 225-foot northbound right-turn lane and 175-foot southbound left-turn lane on Dreshertown Road (S.R. 2024). Once this intersection is signalized, it is expected that Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) traffic will divert to this access to bypass the intersection of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024). In addition to the accesses provided in Phase 1 of this development, Phase 2 of the development will include an additional right-in/right-out only driveway to Welsh Road (S.R. 0063).

Since Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) are State roads, any modifications to the intersection of Welsh Road (S.R. 0063) and Dryden Road and the proposed site access to Dreshertown Road (S.R. 2024) will be subject to the review and approval of PennDOT for issuance of a Highway Occupancy Permit.

## Future Build-Out Year (2018) and PennDOT Design Year (2023) Traffic Conditions

This section presents the future build-out year and PennDOT design year (five years after build-out) traffic conditions, both without and with the proposed development, which is anticipated to be complete by 2018. The future 2018 build-out year and PennDOT design year (2023) without-development traffic volumes were estimated by increasing the existing 2015 traffic volumes to account for regional and local growth, as described below. The incremental increase due to the anticipated trip generation for the site was then added, resulting in the 2018 and 2023 future build-out year with-development traffic volumes.

### *Regional Growth*

According to the traffic growth rates complied by PennDOT's Bureau of Planning and Research *Growth Factors for August 2015 to July 2016*, the anticipated growth for similar urban, non-interstate roadway in Montgomery County is 0.64 percent per year. To account for regional traffic growth, the existing (2015) peak hour traffic volumes were increased by the annual traffic growth rate of 0.64 percent per year, compounded for three years, or 1.93 percent total for the build-out year (2018) and for eight years, or 5.24 percent for the PennDOT design year (2023).

### *Local Growth*

In addition to the regional growth, traffic volumes associated with the following proposed developments in the vicinity of the site were included:

- FW Triangle Development – proposed mixed-use development located along Susquehanna Road north of Dreshertown Road (S.R. 2024). The pharmacy portion of the development was open at the time of the counts so only the proposed 6,400 square foot office, 5,670 square foot restaurant, and 24 townhomes were included as background growth.
- Zieger Rose Farm Development – proposed residential development to be located on the southwestern corner of the intersection of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024). The development will consist of 105 age-restricted units.
- Horsham Retail Development – proposed retail development to be located on the northern side of Blair Mill Road to the west of New Road. The development will consist of a 5,585 square foot Wawa convenience store with 16 fueling positions, a 12,900 square foot pharmacy with drive through, and three high turnover sit down restaurants totaling 17,200 square feet.
- Residential Development – proposed residential development to be located along Witmer Road to the west of Dresher Road. The development will consist of 15 single family homes.
- Residential Development – proposed residential development to be located in the northeast corner of the intersection of Dresher Road and Witmer Road. The development will consist of 250 apartment units.

Information on these proposed area developments is provided in **Appendix F.**

*Future without Development Traffic Volumes*

The total background growth was then added to the existing 2015 traffic volumes along with the traffic anticipated for the five proposed developments noted above. The resultant future 2018 build-out year peak hour traffic volumes are illustrated in **Figure 5A** for the weekday morning, weekday afternoon, and Saturday midday peak hours. The resultant future 2023 PennDOT design year peak hour traffic volumes are illustrated in **Figure 6A** for the weekday morning, weekday afternoon, and Saturday midday peak hours.

*Planned Roadway Improvements*

Through discussions with the Township, three intersection improvements were identified as potentially being completed by other developments in the area which are expected to be constructed in the spring of 2016. These improvements include:

- An eastbound left-turn lane on Welsh Road (S.R. 0063) at its intersection with Dresher Road.
- An eastbound right-turn lane on Welsh Road (S.R. 0063) at its intersection with Dreshertown Road (S.R. 2024).
- A northbound right-turn lane on Jarrettown Road at its intersection with Welsh Road (S.R. 0063).

These improvements are proposed in conjunction with the proposed age-restricted residential development (Zieger Rose Farm) located on the southwestern corner of the intersection of Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024).

*Future with Development Traffic Volumes*

The site generated traffic volumes, as shown in Figure 4B, were then added to the future 2018 without-development traffic volumes (Figure 5A). The resultant future 2018 with-development peak hour traffic volumes are illustrated in **Figure 5B** for the weekday morning, weekday afternoon, and Saturday midday peak hours. Detailed spreadsheets summarizing the traffic volumes are provided in **Appendix G.**

The site generated traffic volumes, as shown in Figure 4F, were also added to the future 2023 without-development traffic volumes (Figure 6A). The resultant future 2023 with-development peak hour traffic volumes are illustrated in **Figure 6B** for the weekday morning, weekday afternoon, and Saturday midday peak hours. Detailed spreadsheets summarizing the traffic volumes are provided in Appendix G.

The future 2018 peak hour traffic volumes for the build-out year, as illustrated in Figures 5A and 5B, were then subjected to detailed capacity/level-of-service analysis. The results of the traffic analyses are illustrated in **Figures 5C and 5D**, and the detailed capacity/level-of-service analysis worksheets are

provided in **Appendices H and I.** Specific details regarding the analysis results and traffic operations are provided later in this report.

The future 2023 peak hour traffic volumes for the build-out year, as illustrated in Figures 6A and 6B, were then subjected to detailed capacity/level-of-service analysis. The results of the traffic analyses are illustrated in **Figures 6C and 6D**, and the detailed capacity/level-of-service analysis worksheets are provided in **Appendices J and K**. Specific details regarding the analysis results and traffic operations are provided later in this report.

## Capacity/Level-of-Service Results

This section presents a detailed summary of the traffic analysis results for the existing and future build-out year (2018) and PennDOT design year (2023) traffic conditions, both without and with the proposed development, for the peak hours at the study area intersections and site accesses.

According to PennDOT's *Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permit Plans,* no mitigation requirements are required for an overall level-of-service drop from without- to with development conditions (i.e. LOS D to LOS E), if the increase in overall delay per vehicle is less than 10 seconds (i.e., 48.2 to 56.5 seconds per vehicle); however, PennDOT reserves the right to look at individual lane groups where level-of-service drops may occur.

### *Welsh Road (S.R. 0063) and Dresher Road*

Under existing conditions, this signalized intersection operates at acceptable conditions overall (LOS D or better) with all of the lane groups also operating at acceptable conditions (LOS D or better) during all three peak hours with exception of the southbound Dresher Road left-turn lane (LOS F) during the weekday afternoon peak hour. Under future build-out year (2018) and future PennDOT design year (2023) without-development conditions, with the installation of an eastbound left-turn lane along Welsh Road (S.R. 0063), this signalized intersection will operate at acceptable conditions overall (LOS C or better) with all of the lane groups also operating at acceptable conditions (LOS D or better) during all three peak hours.

With development of the site, similar levels-of-service will exist at this intersection overall during all three peak hours as observed under without-development conditions.

### *Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024)*

Under existing conditions, this signalized intersection operates at overall LOS B during the weekday morning peak hour, overall LOS E during the weekday afternoon peak hour, and overall LOS A during the Saturday midday peak hour with the eastbound Welsh Road (S.R. 0063) approach operating at LOS F during the weekday afternoon peak hour. Under future build-out year (2018) and future PennDOT design year (2023) without-development conditions, and the installation of an eastbound right-turn lane along Welsh Road (S.R. 0063), this signalized intersection will operate at acceptable conditions overall (LOS C or better) with all of the lane groups also operating at acceptable conditions (LOS D or better) during all three peak hours with exception of the northbound Dreshertown Road (S.R. 2024) left-turn lane (LOS E) during the weekday afternoon peak hour under 2023 future without-development conditions.

With development of the site, similar levels-of-service will exist at this intersection overall and for each movement during all three peak hours as observed under without-development conditions.

*Welsh Road (S.R. 0063) and Dryden Road*

Under existing conditions, future build-out year (2018), and future PennDOT design year (2023) without-development conditions, this signalized intersection operates at highly acceptable conditions overall (LOS A) with all of the lane groups also operating at acceptable conditions (LOS D or better) during all three peak hours with exception of the northbound and southbound left-turn lanes (LOS E) during the weekday morning peak hour.

With development of the site, similar levels-of-service will exist at this intersection overall and for each movement during all three peak hours as observed under without-development conditions.

*Welsh Road (S.R. 0063) and Jarrettown Road*

Under existing conditions, this signalized intersection operates at acceptable conditions overall (LOS D or better) during all three peak hours with delay (LOS E and F) experienced on several movements during the weekday morning and weekday afternoon peak hours. Under future build-out year (2018) and future PennDOT design year (2023) without-development conditions, with the installation of a northbound right-turn lane along Jarrettown Road, this signalized intersection will operate at acceptable conditions overall (LOS D or better) with all of the lane groups also operating at acceptable conditions (LOS D or better) during all three peak hours.

With development of the site it is recommended to provide an additional eastbound through lane, extending the two eastbound through lanes that currently exist east of Jarrettown Road, further west. With this improvement, similar levels-of-service will exist at this intersection overall and for each movement during all three peak hours as observed under without-development conditions.

*Dreshertown Road (S.R. 2024) and Site Access*

Under 2018 future with-development conditions, this unsignalized intersection will operate at overall LOS A during the weekday morning, weekday afternoon, and Saturday midday peak hours with all movements operating at LOS D or better during all three peak hours.

Under 2023 future with-development conditions, this signalized intersection will operate at overall LOS B during the weekday morning, weekday afternoon, and Saturday midday peak hours with all movements operating at LOS D or better during all three peak hours.

*Welsh Road (S.R. 0063) and Site Access*

Under 2023 future with-development conditions, this unsignalized intersection will operate at overall LOS A during the weekday morning, weekday afternoon, and Saturday midday peak hours with all movements operating at LOS C during all three peak hours.

*Proposed Roadway Improvements*

The following improvements are recommended in conjunction with this development:

**Phase 1**

- Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) – traffic signal timing modifications.
- Dreshertown Road (S.R. 2024) Site Frontage - soften the existing horizontal and vertical curves along the site frontage of Dreshertown Road (S.R. 2024).

**Phase 2**

- Welsh Road (S.R. 0063) and Jarrettown Road – install an additional eastbound through lane on Welsh Road (S.R. 0063) and traffic signal timing modifications.
- Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) – traffic signal timing modifications.
- Welsh Road (S.R. 0063) and Dryden Road – traffic signal timing modifications.
- Dreshertown Road (S.R. 2024) and Site Access – install a southbound left-turn lane and northbound right-turn lane on Dreshertown Road (S.R. 2024) and install a traffic signal.

*95th Percentile Queue Analysis*

95th percentile queue analyses were conducted at the study intersections using Synchro 8 software. The queue analysis is summarized in Appendix A. Based on the analyses, in most cases the 2018 and 2023 future with-development queues are similar to the 2018 and 2023 future without-development queues increasing minimally with the proposed development.

*Previously Approved Development*

As stated previously, Lot 3 of the Montgomery Corporate Center development on the Prudential property was previously approved for 262,000 square feet of office space. As a comparison to the analysis provided earlier in the report, an additional analysis was completed to indicate the impact of the development of Lot 3 as the approved office use instead of the currently proposed mixed use development. The overall distribution percentages for the anticipated directions of approach and departure, net "new" trip assignment for the proposed age-restricted development and potential 262,000 square feet of office space on Lot 3, and detailed capacity/level-of-service analysis worksheets are provided in **Appendix L.** According to this analysis, the study intersections will operate at similar levels-of-service overall and for each movement during all three peak hours compared to the future conditions with the proposed development. All roadway improvements proposed in this report to mitigate the impact of the proposed mixed use development would be needed to mitigate the impact of the approved office use.

## Summary and Conclusions

Access to Phase 1 of this development will be provided via Dryden Road and its existing full-movement signalized intersection with Welsh Road (S.R. 0063) as well as a full-movement unsignalized driveway to Dreshertown Road (S.R. 2024). With development of Phase 2, the unsignalized Dreshertown Road (S.R. 2024) access will be signalized and improved with separate turn lanes provided on Dreshertown Road (S.R. 2024). Additionally, a right-in/right-out only driveway to Welsh Road (S.R. 0063) will be provided in Phase 2. Since Welsh Road (S.R. 0063) and Dreshertown Road (S.R. 2024) are State roads, any modifications to the intersection of Welsh Road (S.R. 0063) and Dryden Road and the proposed site access to Dreshertown Road (S.R. 2024) will be subject to the review and approval of PennDOT for issuance of a Highway Occupancy Permit. In conjunction with this development, it is proposed to soften the existing horizontal and vertical curves along the site frontage of Dreshertown Road (S.R. 2024) as well as install an additional eastbound through lane on Welsh Road (S.R. 0063) at its intersection with Jarrettown Road.

The traffic analyses contained herein reveals that safe and efficient access to and from the proposed development can be provided and that the adjacent roadways and intersections can accommodate the projected site-generated traffic.

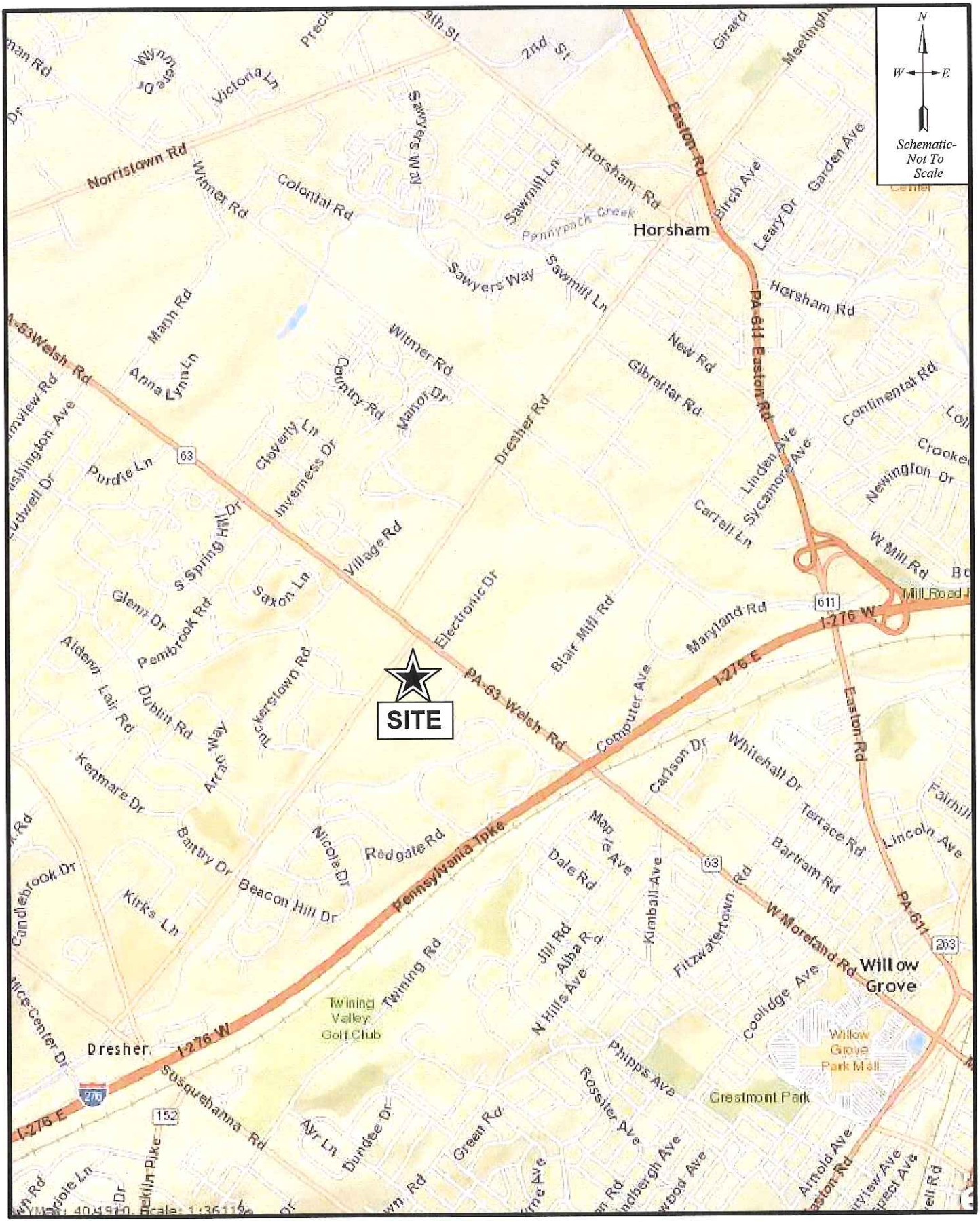


**FIGURE 1**

Site Location Map

# THE PROMENADE AT UPPER DUBLIN

**UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA**

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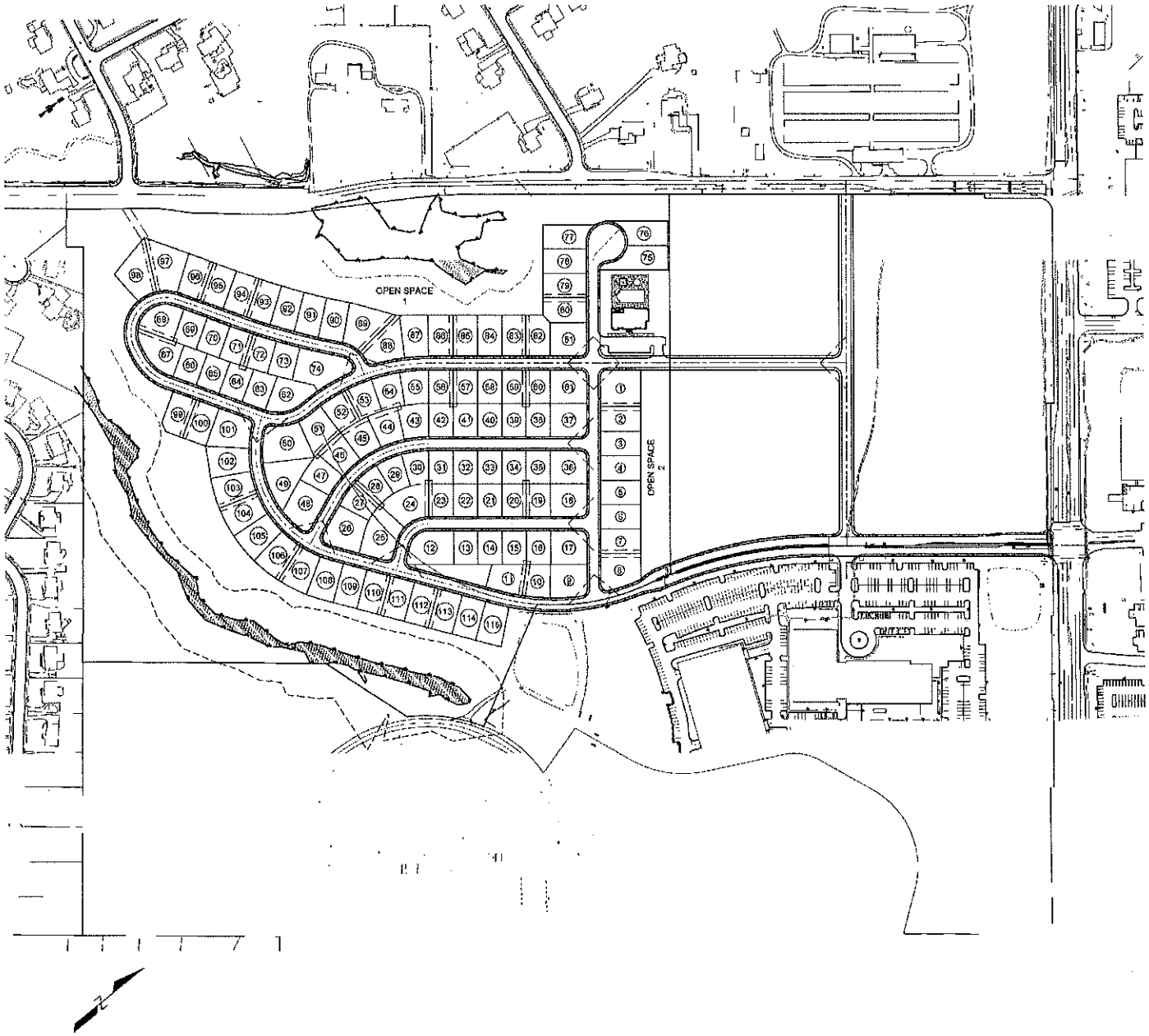


**FIGURE 2**

Site Plan - Phase 1 (prepared by Gilmore & Associates, Inc.)

# THE PROMENADE AT UPPER DUBLIN

**UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA**

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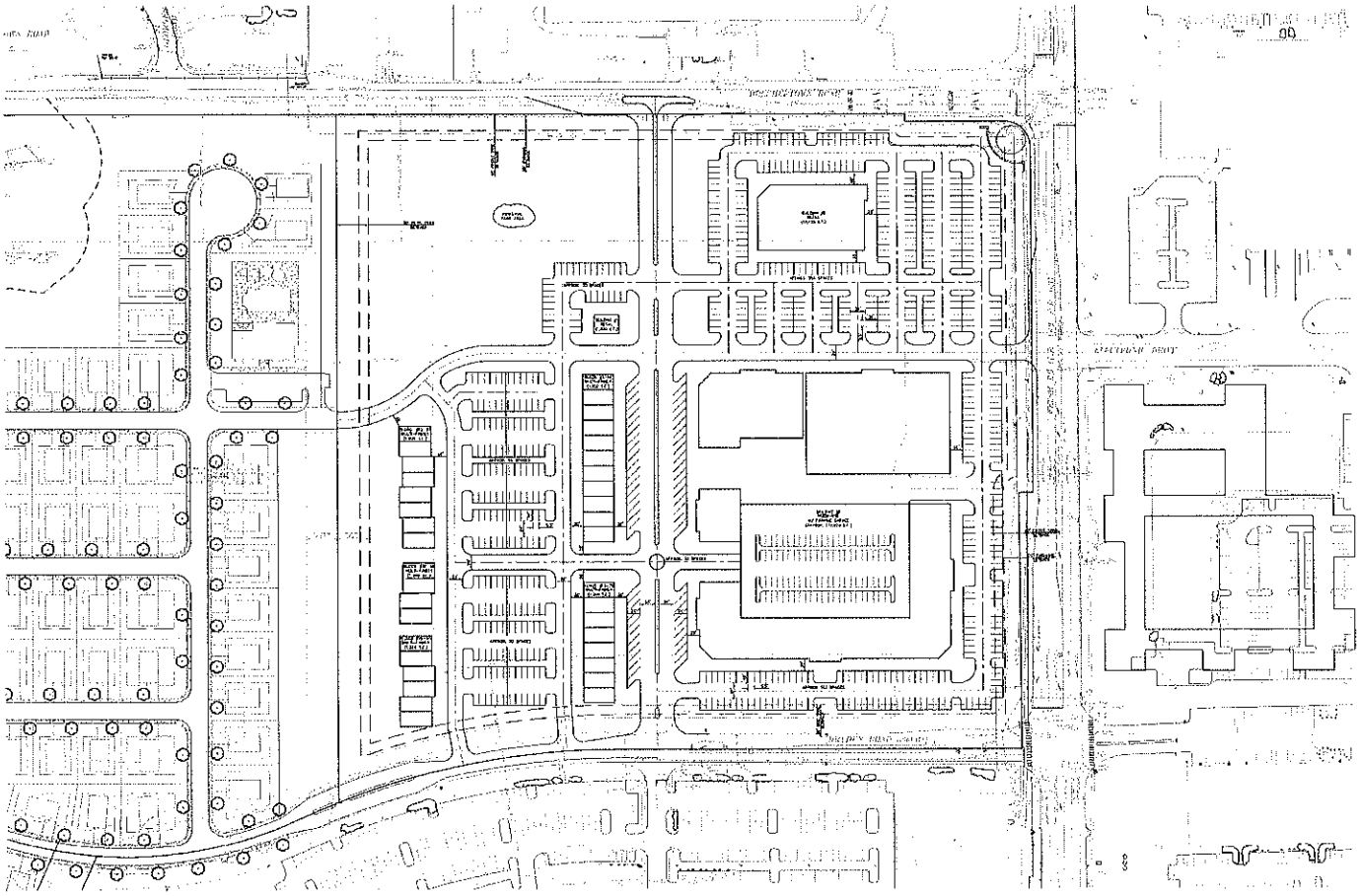

**FIGURE 2A**

Site Plan - Phase 1 & 2 (prepared by Gilmore & Associates, Inc.)

# THE PROMENADE AT UPPER DUBLIN

**UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA**

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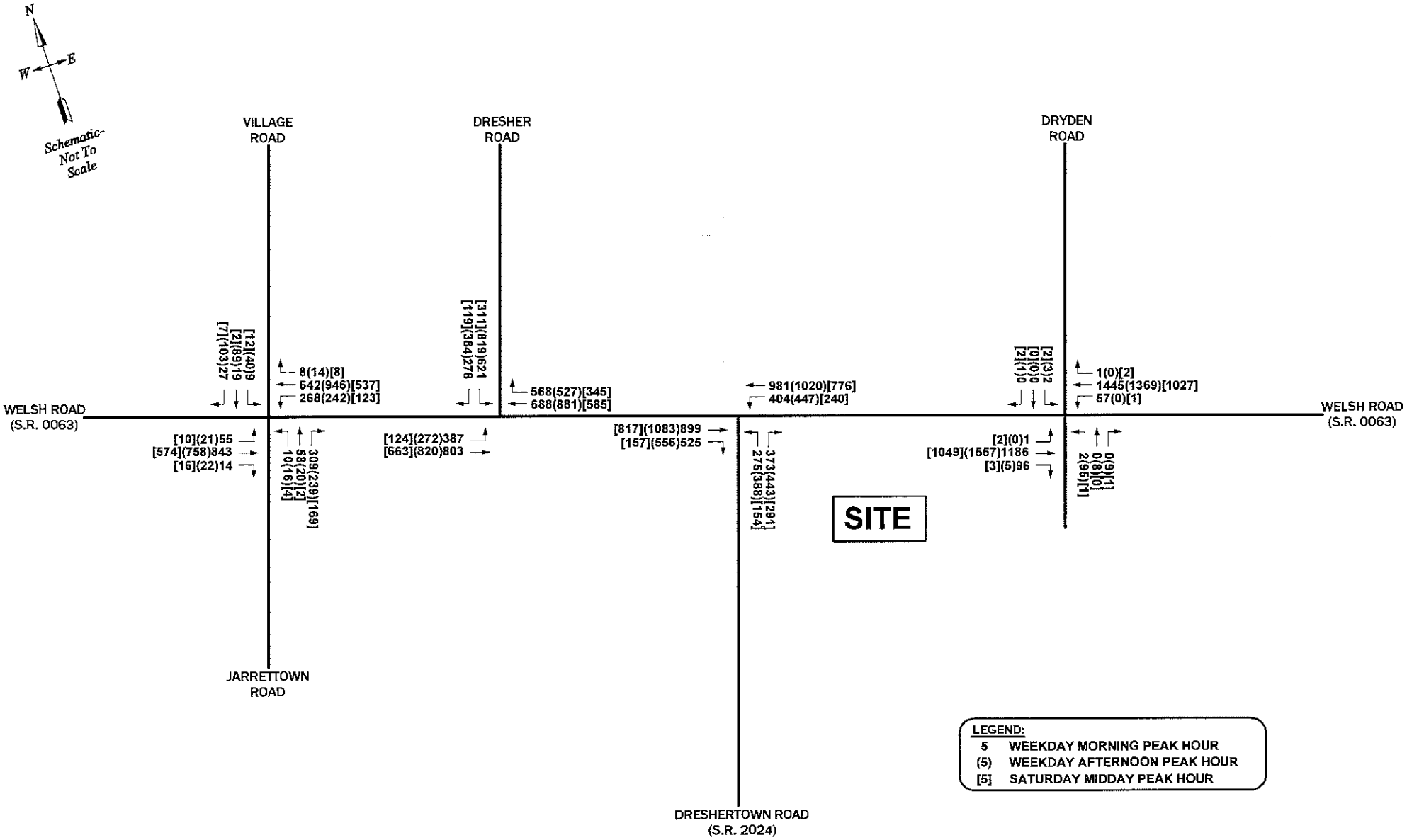


**FIGURE 3A**

2015 Existing Peak Hour Traffic Volumes

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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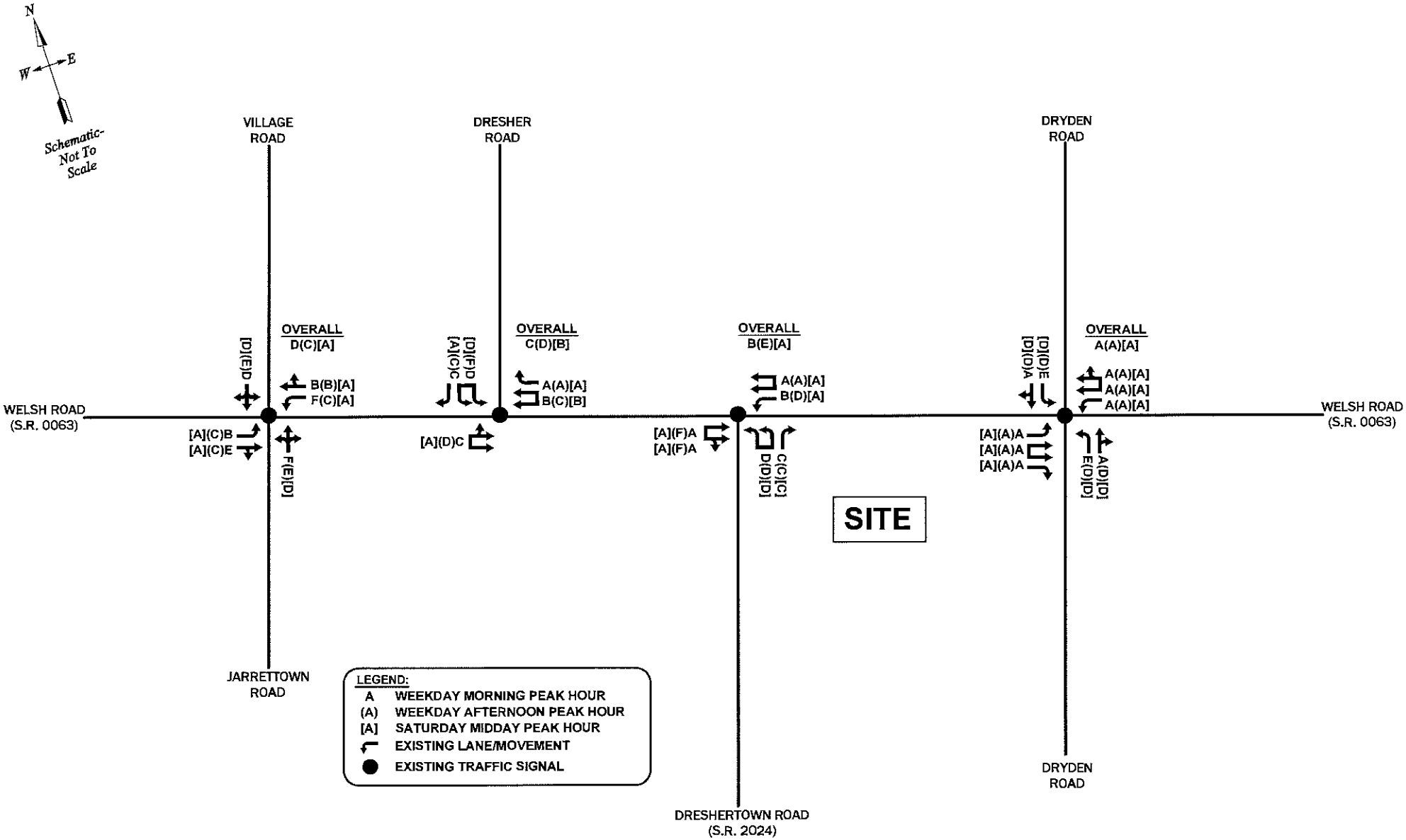


**FIGURE 3B**

2015 Existing Levels of Service

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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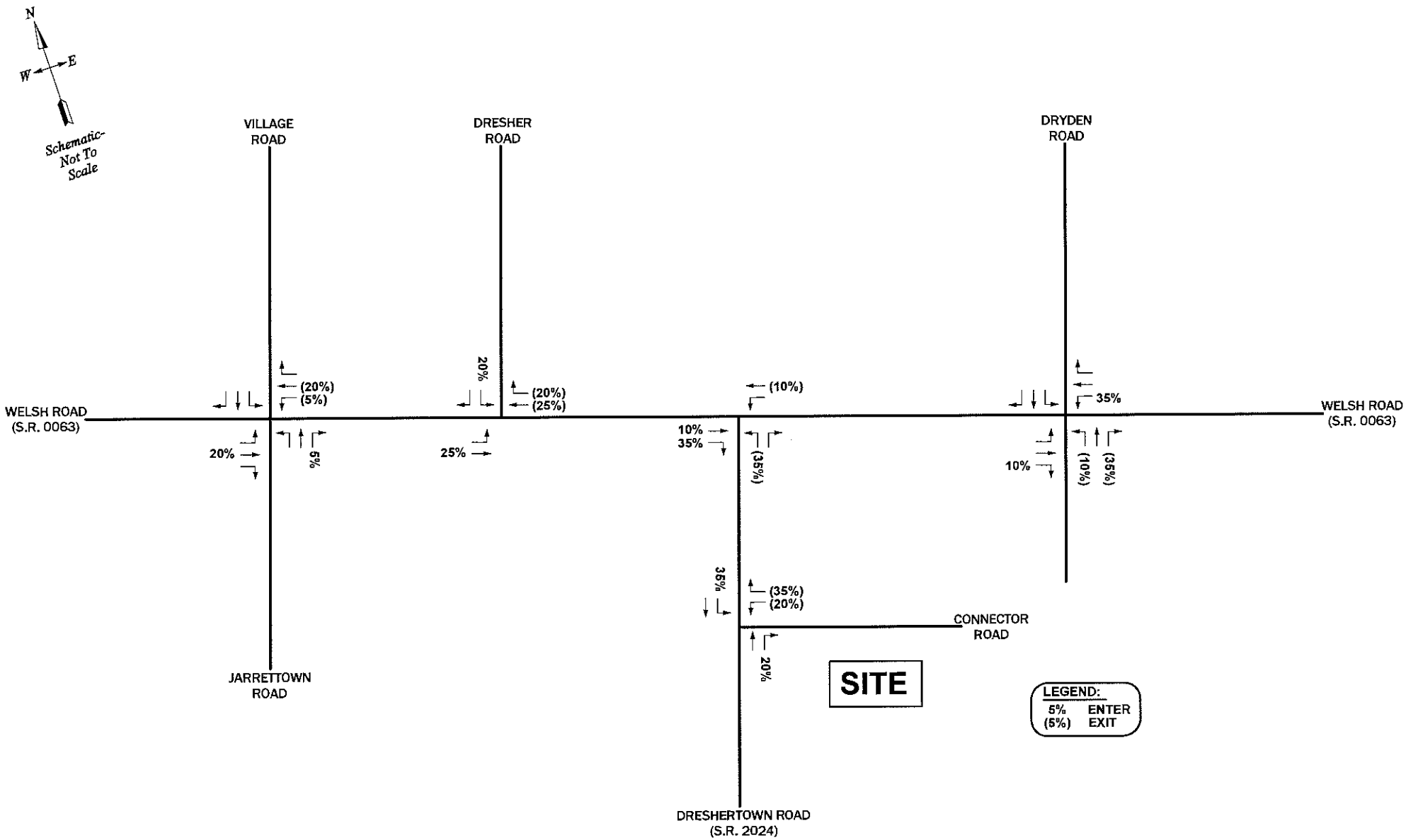


**FIGURE 4A**

"New" Trip Distribution (Phase 1)

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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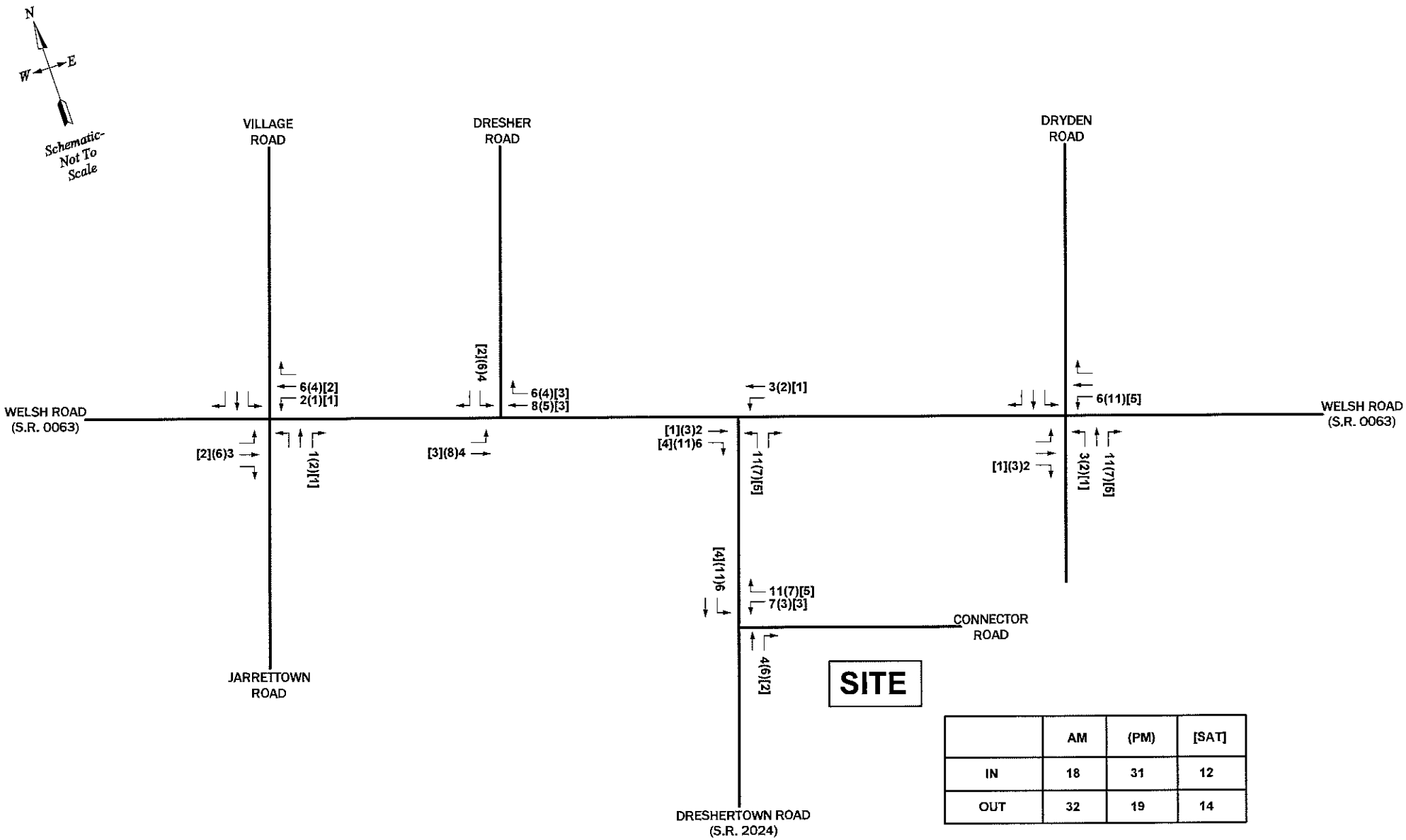


| | AM | (PM) | [SAT] |
|---|---|---|---|
| IN | 18 | 31 | 12 |
| OUT | 32 | 19 | 14 |

**FIGURE 4B**

"New" Trip Assignment (Phase 1)

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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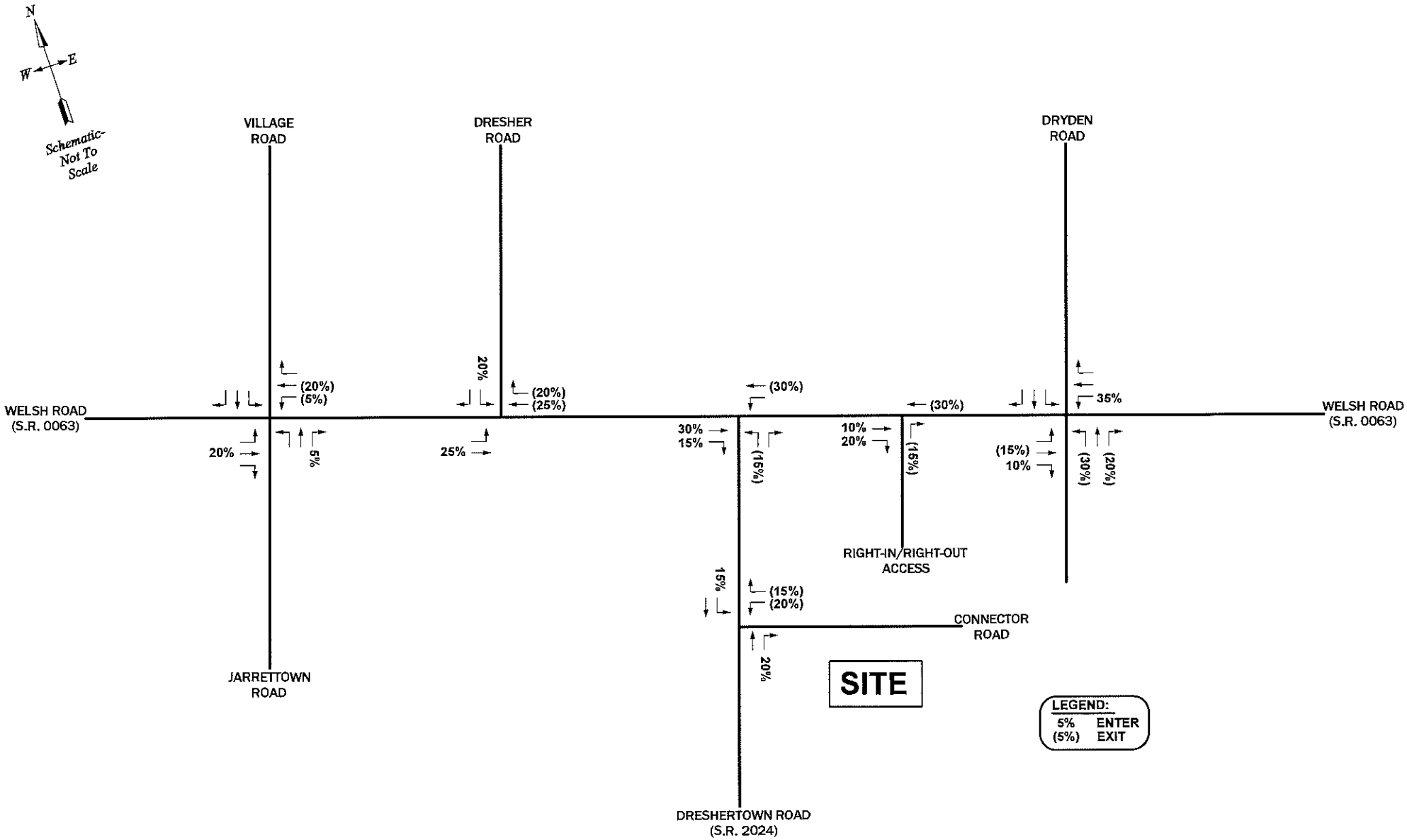


**FIGURE 4C**

"New" Trip Distribution (Phase 2)

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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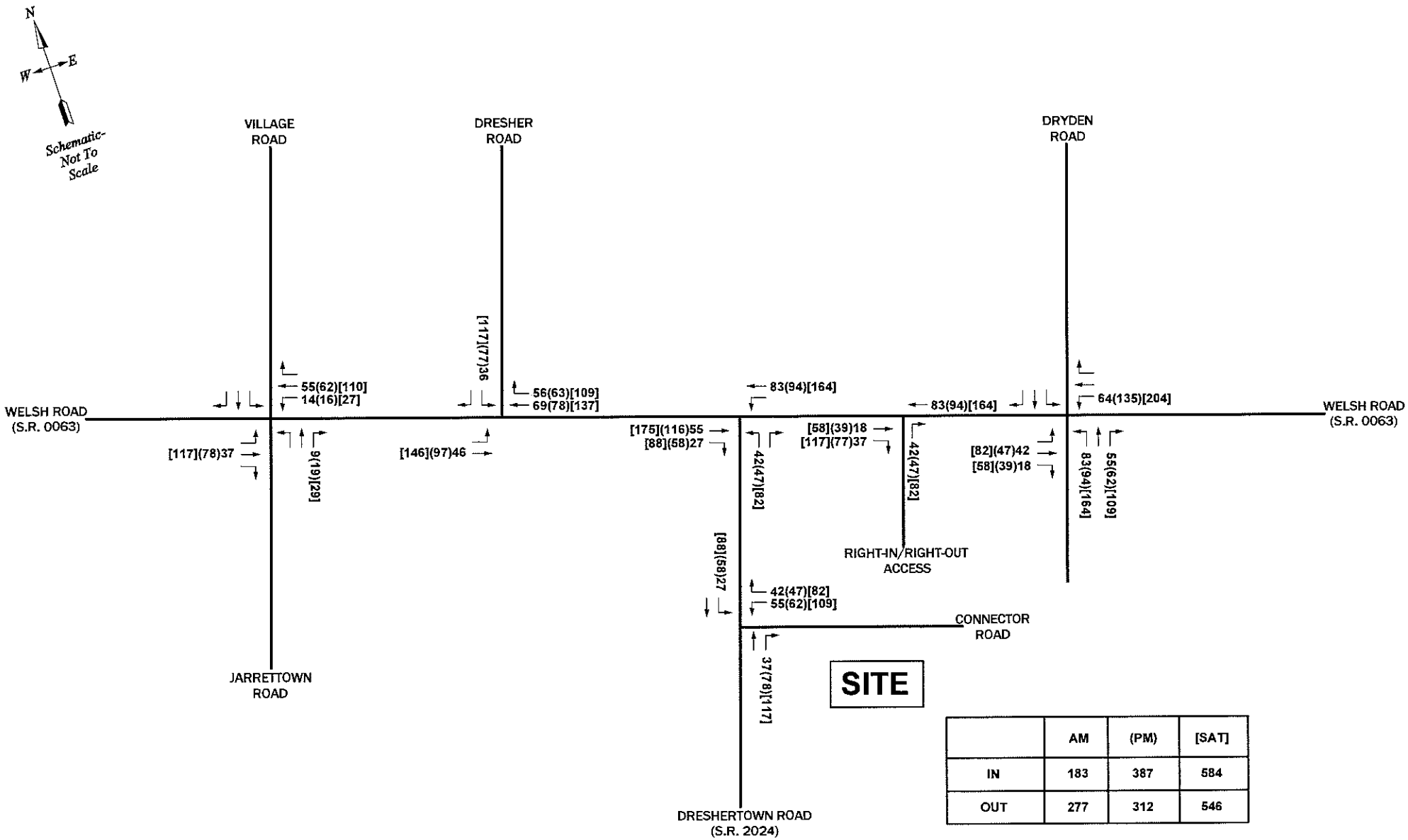


| | AM | (PM) | [SAT] |
|---|---|---|---|
| IN | 183 | 387 | 584 |
| OUT | 277 | 312 | 546 |

**FIGURE 4D**

"New" Trip Assignment (Phase 2)

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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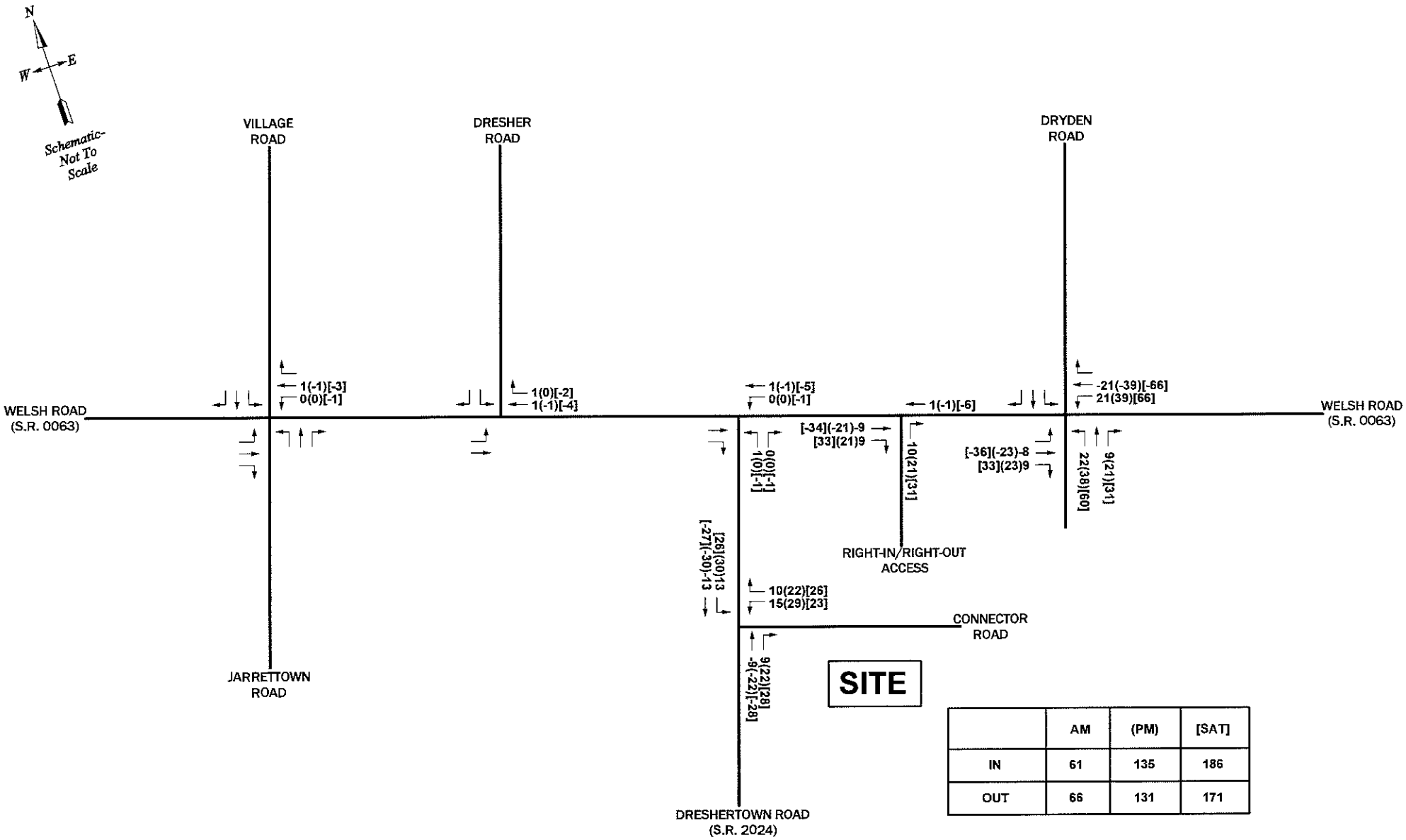


| | AM | (PM) | [SAT] |
|---|---|---|---|
| IN | 61 | 135 | 186 |
| OUT | 66 | 131 | 171 |

**FIGURE 4E**

Pass-by Trips (Phase 2)

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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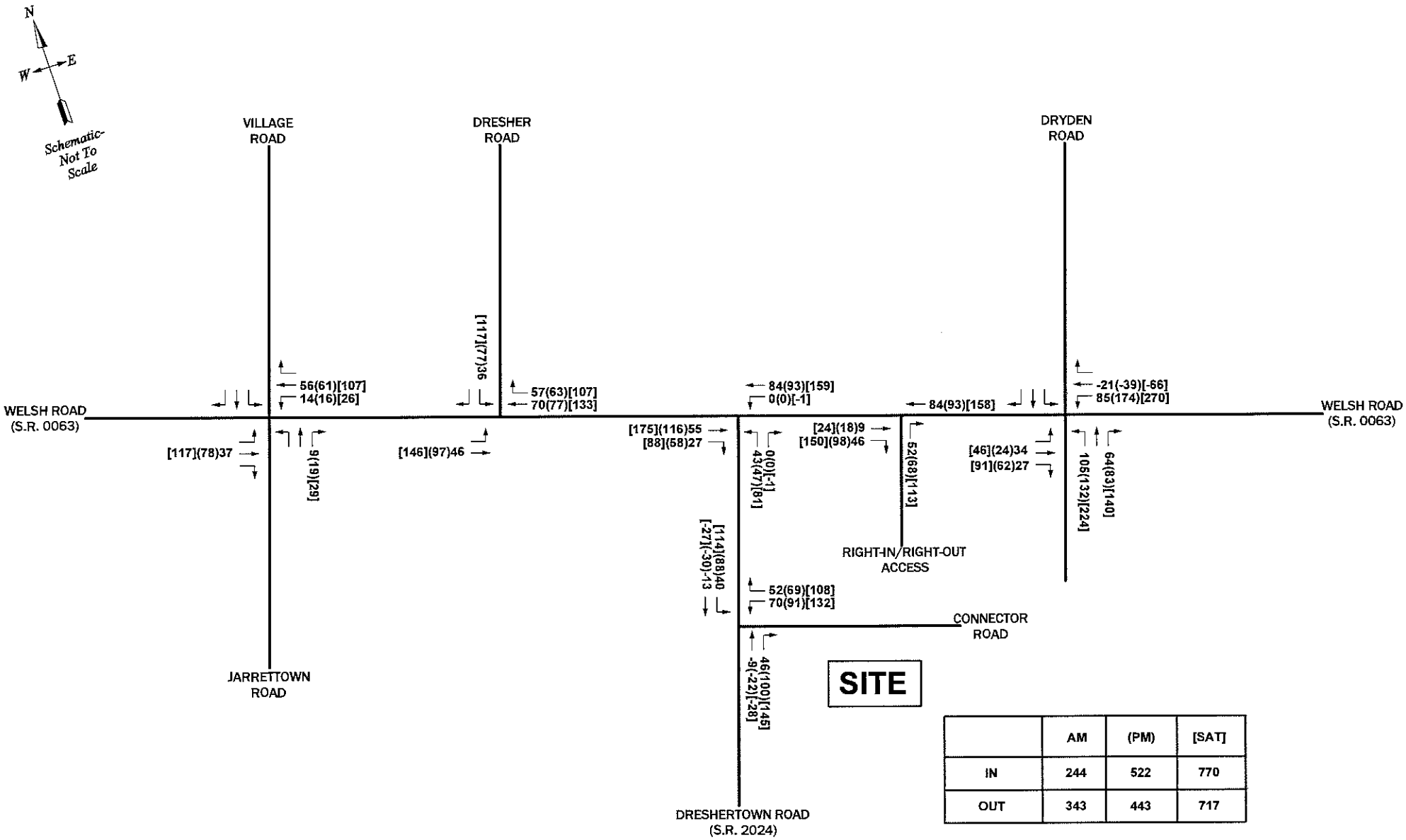


| | AM | (PM) | [SAT] |
|---|---|---|---|
| IN | 244 | 522 | 770 |
| OUT | 343 | 443 | 717 |

**FIGURE 4F**

Net "New" and Pass-by Trips (Phase 2)

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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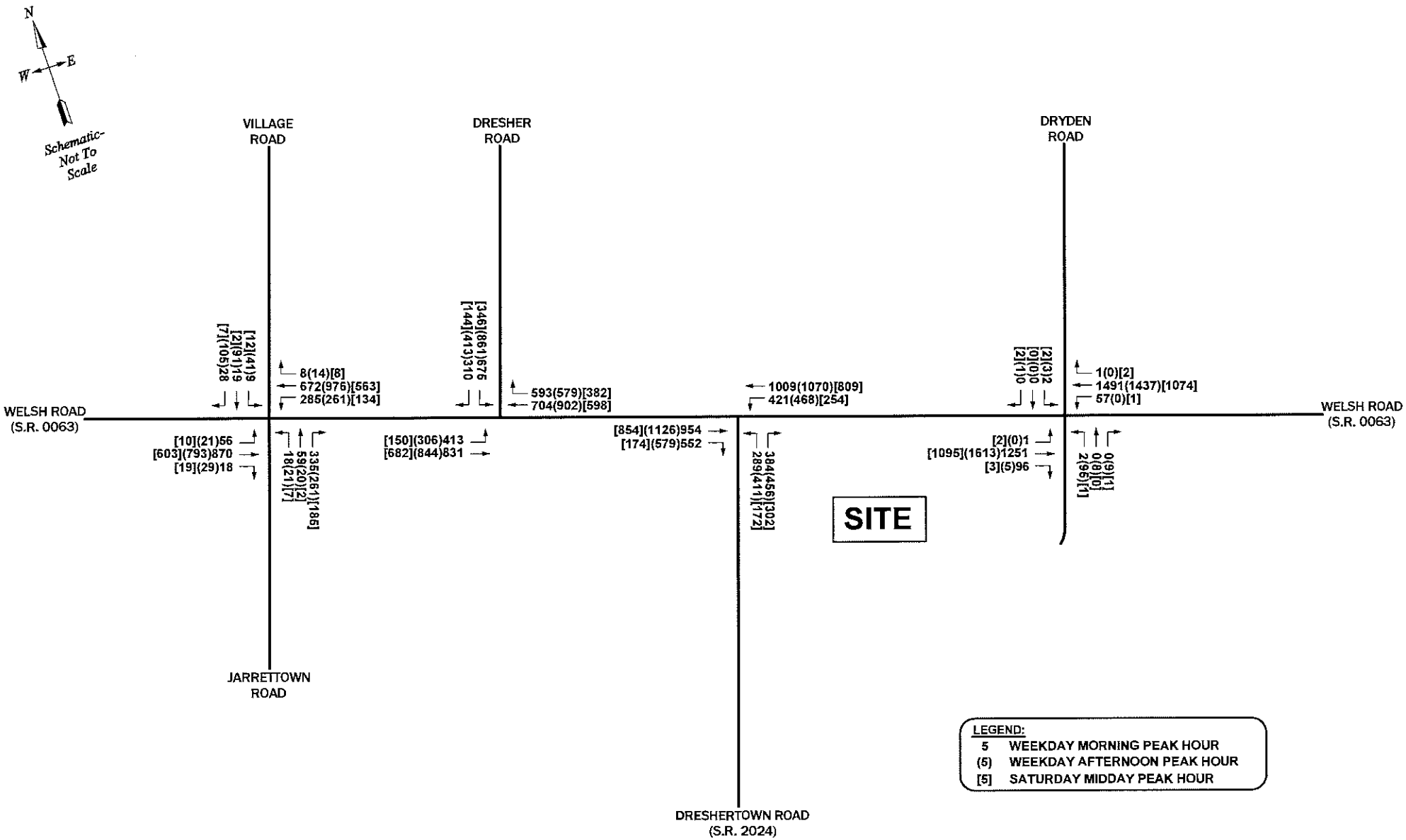


**FIGURE 5A**

2018 Future Peak Hour Traffic Volumes Without Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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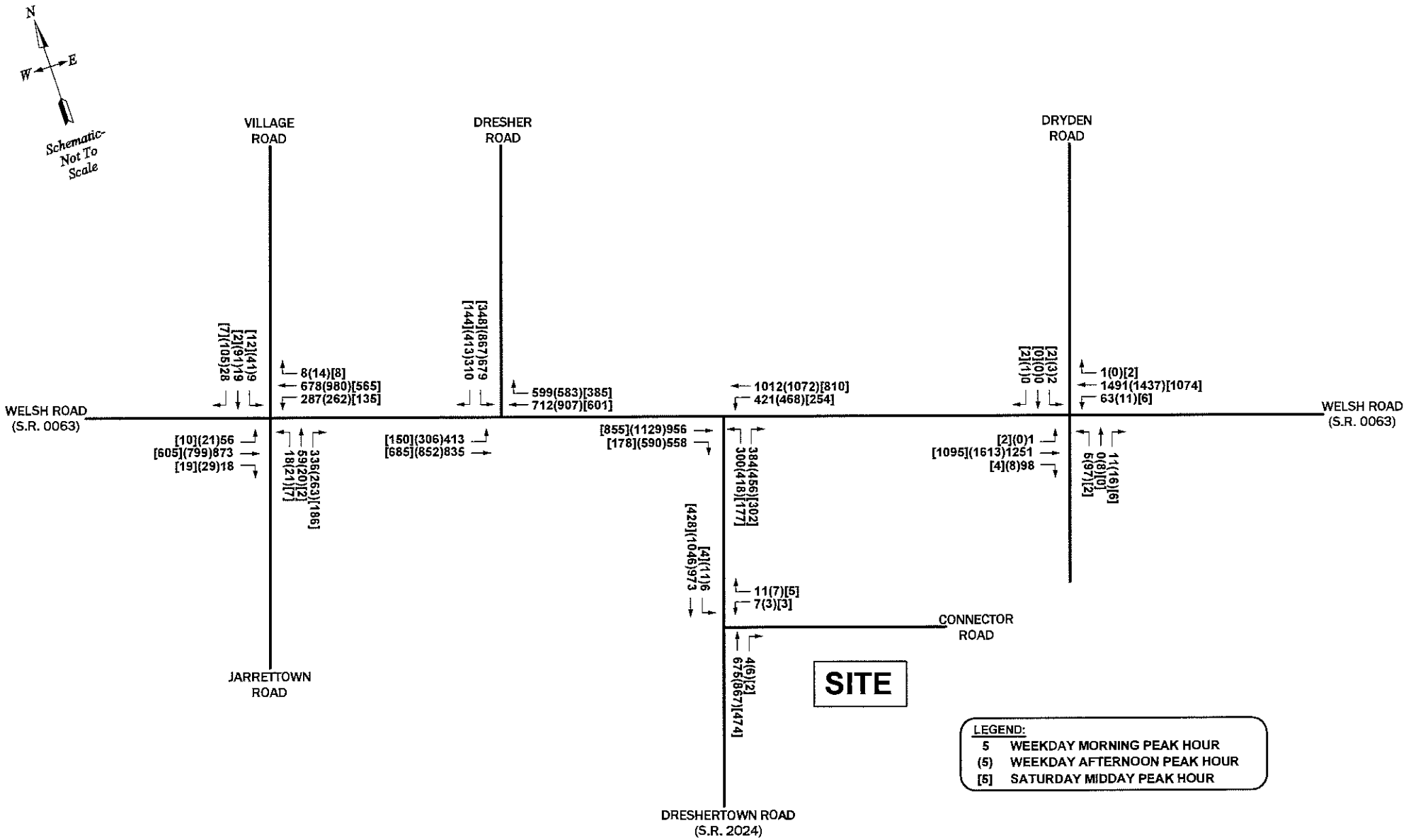


**FIGURE 5B**

2018 Future Peak Hour Traffic Volumes With Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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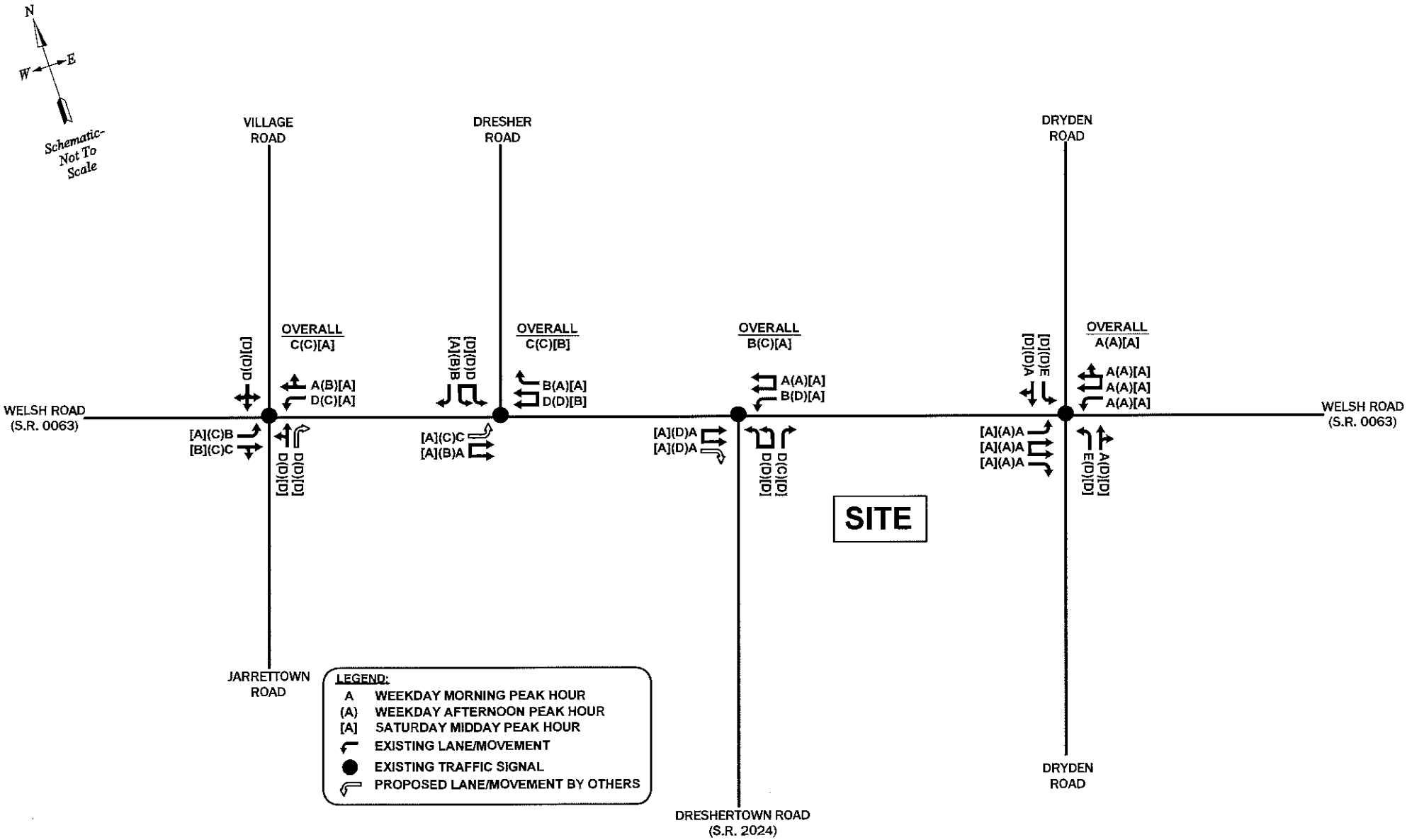


**FIGURE 5C**

2018 Future Levels of Service without Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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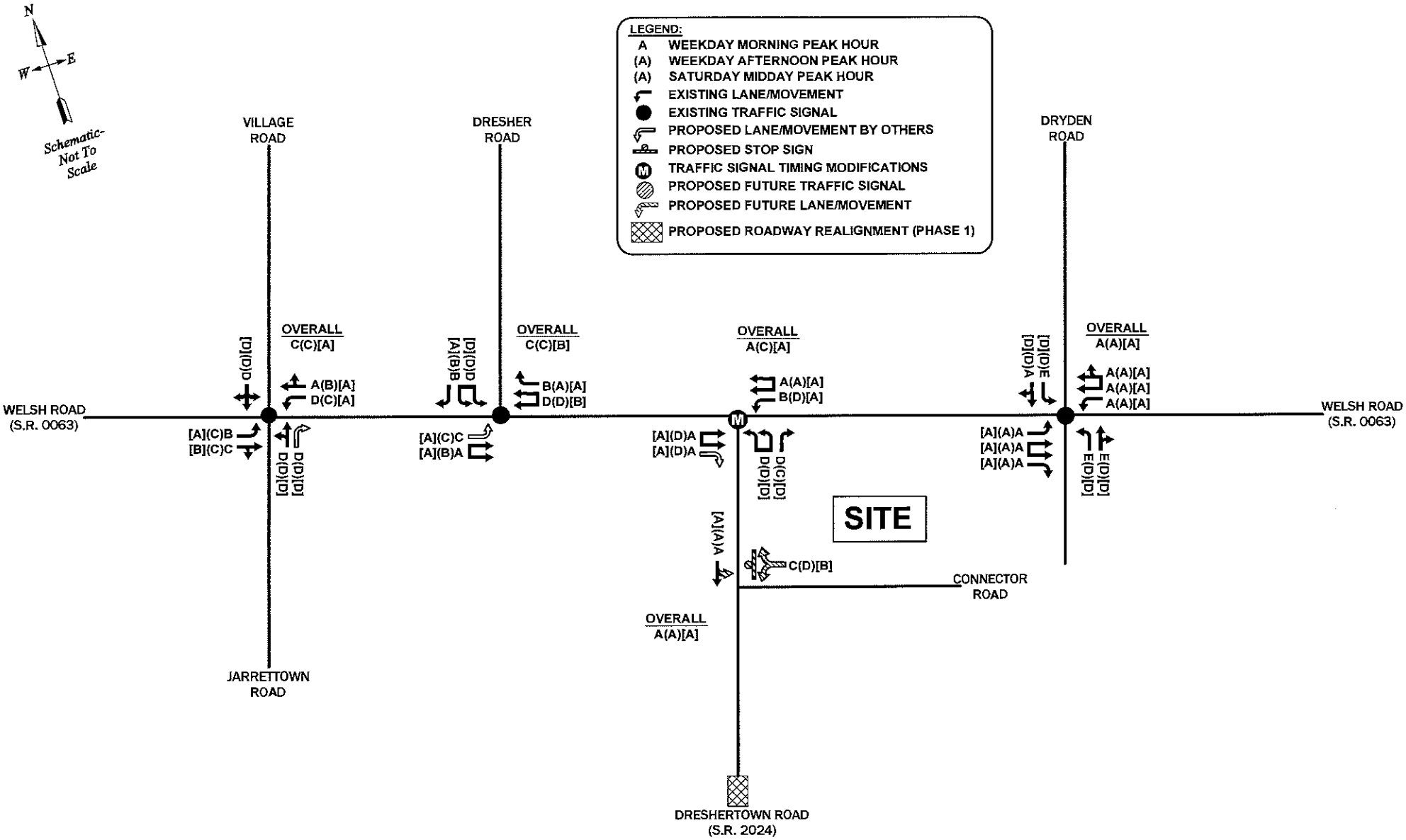


**FIGURE 5D**

2018 Future Levels of Service with Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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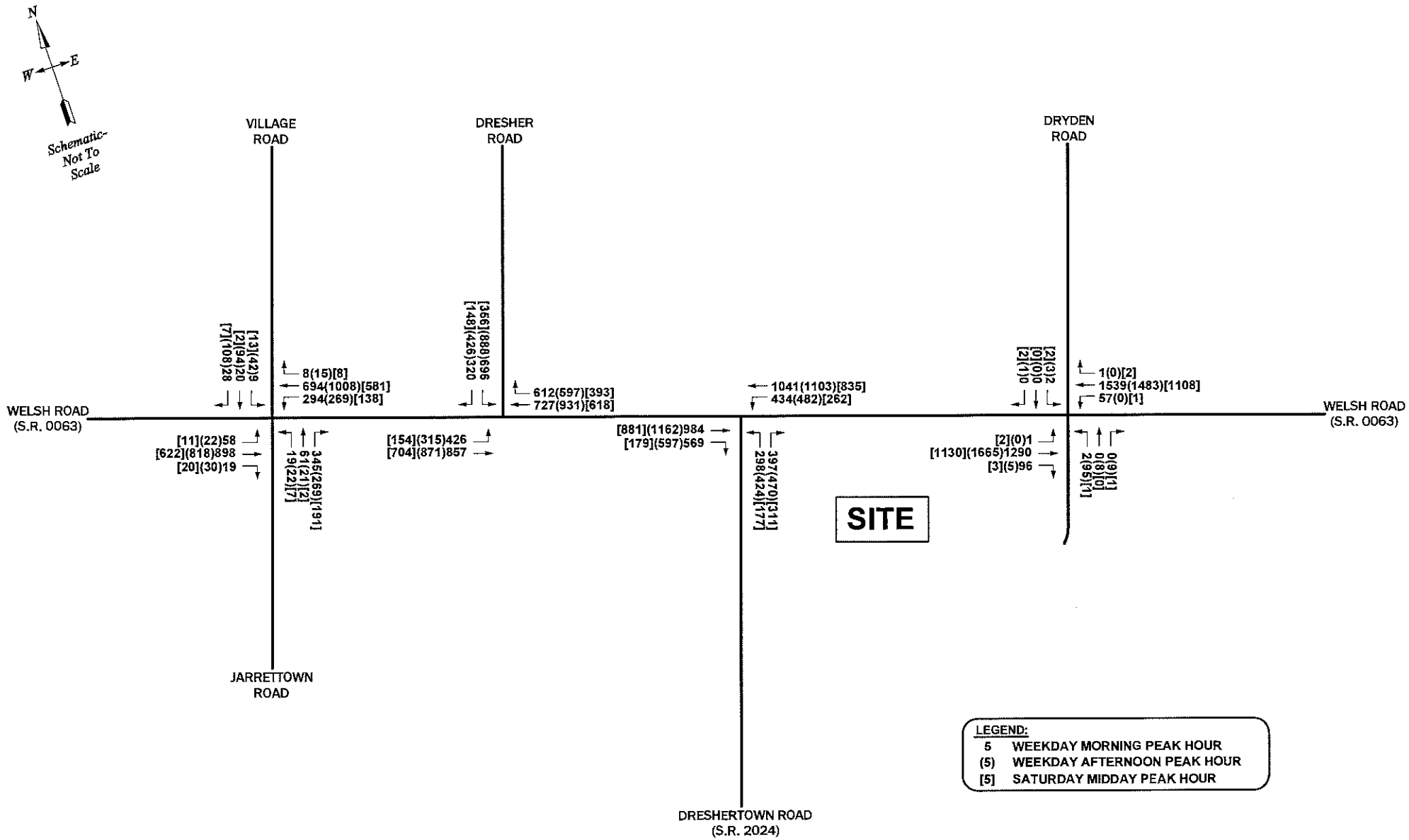


**FIGURE 6A**

2023 Future Peak Hour Traffic Volumes Without Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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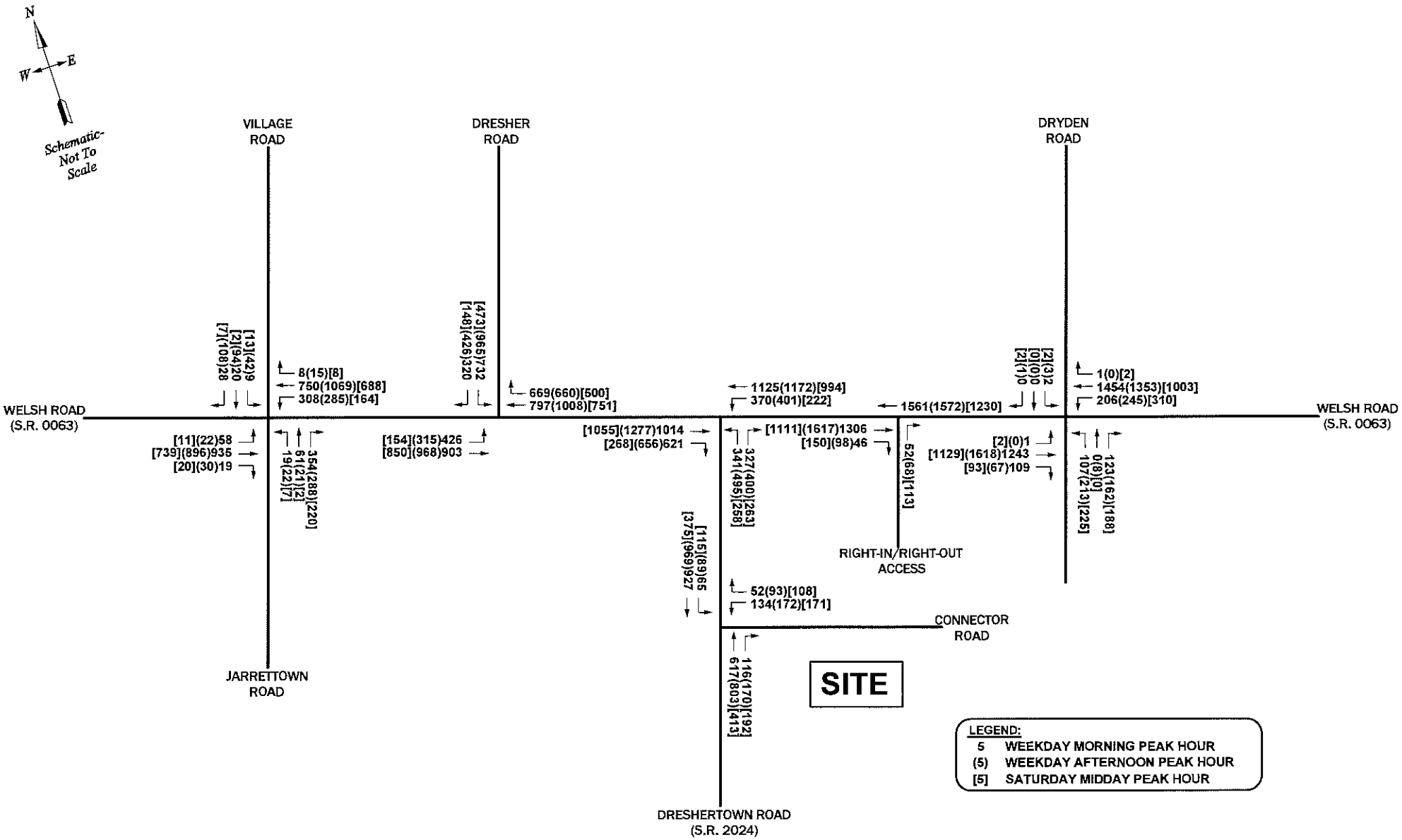


**FIGURE 6B**

2023 Future Peak Hour Traffic Volumes With Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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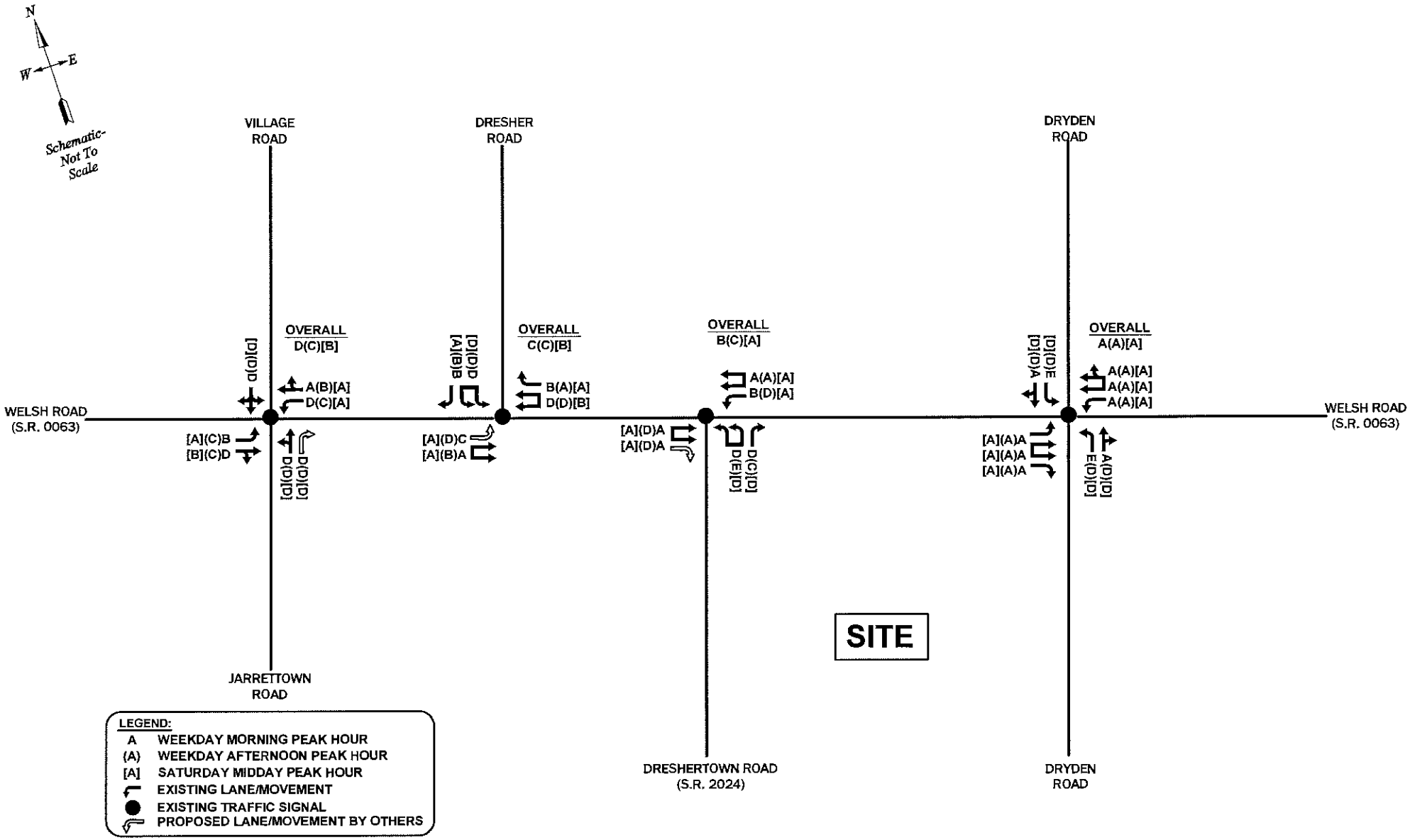


**FIGURE 6C**

2023 Future Levels of Service without Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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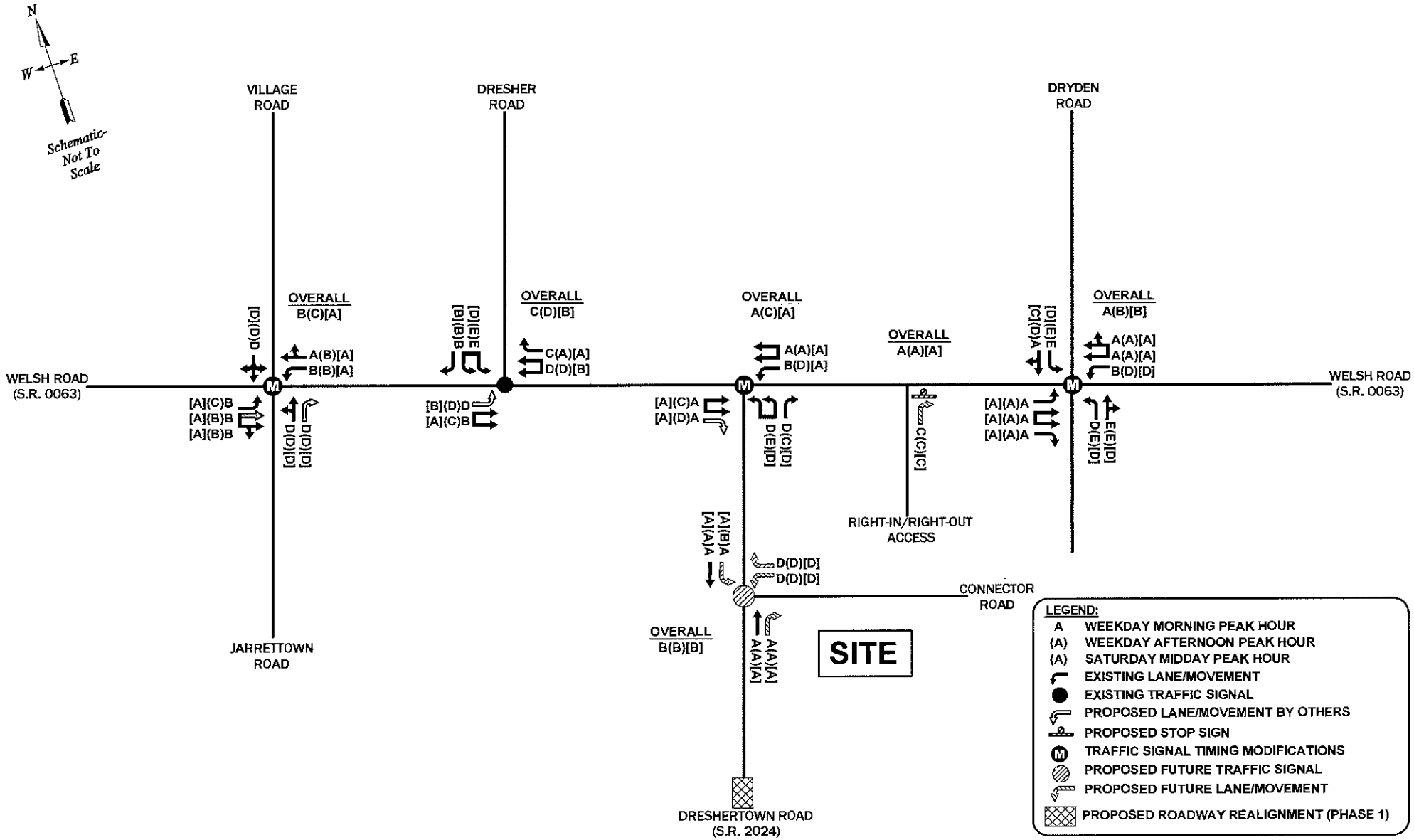


**FIGURE 6D**

2023 Future Levels of Service with Development

# THE PROMENADE AT UPPER DUBLIN

## UPPER DUBLIN TOWNSHIP, MONTGOMERY COUNTY, PA

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