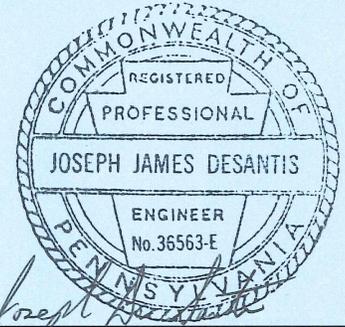
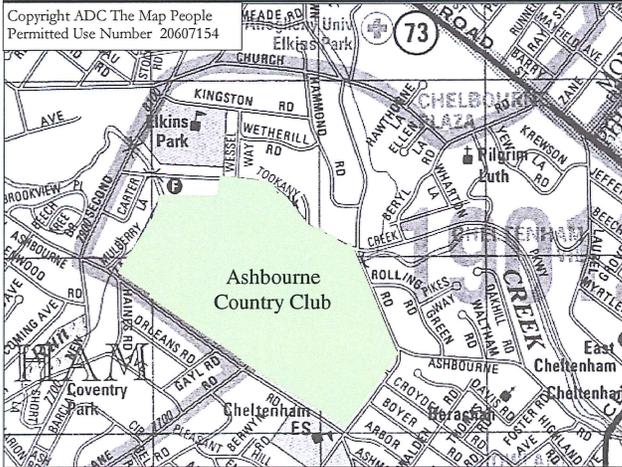


Traffic Impact Study for the Ashbourne Country Club

Cheltenham Township, Montgomery County, PA



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Prepared for
Matrix Development Group

Prepared by



March 2010

McMahon Project Number 809015.11

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Executive Summary

The Matrix Development Group proposes to redevelop a portion of the Ashbourne Country Club to provide a 240 unit age-restricted residential community. The existing country club facility, now closed, formerly provided an 18-hole golf course with a clubhouse for member golfers. The Ashbourne Country Club site is bordered by Ashbourne Road (S.R. 2025) to the south and east, and Tookany Creek Parkway and Jenkintown Road to the north in Cheltenham Township, Montgomery County, Pennsylvania. Access to the age-restricted community will be provided via the existing signalized access located along the south leg of Ashbourne Road (S.R. 2025) opposite Oak Lane Road, and a new unsignalized access also located along the northern leg of Ashbourne Road (S.R. 2025) opposite Boyer Road.

The scope of this traffic impact study includes an evaluation of the existing (2009) and future build-out (2013) conditions both without and with the proposed development for the weekday morning and weekday afternoon peak hour at the following study intersections:

- Ashbourne Road (S.R. 2025)/New Second Street (S.R. 2060),
- Ashbourne Road (S.R. 2025)/Oak Lane Road (S.R. 2062)/Ashbourne Country Club Access,
- Ashbourne Road (S.R. 2025)/Front Street/Ashmead Road/Arbor Road,
- Ashbourne Road (S.R. 2025)/Boyer Road,
- Ashbourne Road (S.R. 2025)/Jenkintown Road,
- Jenkintown Road/Tookany Creek Parkway, and
- New Second Street (S.R. 2060)/Tookany Creek Parkway.

The trip generation characteristics for the age-restricted dwelling units are based on data from the Institute of Transportation Engineers' publication entitled *Trip Generation, 8th Edition*, the industry standard for estimating trip values. The ITE data indicates that the age-restricted community can be expected to generate approximately 71 total (inbound and outbound) trips during the weekday morning peak hour and approximately 87 total (inbound and outbound) trips during the weekday afternoon peak hour within the surrounding area.

To mitigate the traffic impacts associated with the redevelopment of the Ashbourne Country Club, the following roadway/intersection improvements are proposed by the developer:

- **Ashbourne Road (S.R. 2025) and Oak Lane Road (S.R. 2062)/Site Access** – Widen the existing access to provide one 16-foot-wide egress lane and one 16-foot-wide ingress lane separated by a 12-foot-wide median. In addition, construct a separate westbound right-turn lane, 75 feet in length with a 75-foot bay taper, and modify the existing traffic signal timing to provide an advance westbound phase to better accommodate the existing left-turn movement from Ashbourne Road to Oak Lane Road.

- **Ashbourne Road (S.R. 2025)/Front Street/Ashmead Road/Arbor Road** – Construct a separate southbound right-turn lane along Ashbourne Road, 150 feet in length with a 75-foot bay taper; construct a separate eastbound left-turn lane on Ashbourne Road, 220 feet in length with a 75-foot bay taper; and modify the existing traffic signal timings.
- **Ashbourne Road (S.R. 2025) and Boyer Road/Site Access** – Provide one 14-foot-wide ingress lane and one 14-foot-wide egress lane for the access, with stop control provided along the access approach.

The traffic analysis, which is described in further detail herein, demonstrates that safe and efficient access can be provided for the proposed age-restricted residential community and that the recommended improvements will mitigate the development's impact.

Introduction

The Matrix Development Group proposes to redevelop a portion of the existing Ashbourne Country Club, which formerly provided an 18-hole golf course with clubhouse for member golfers, by proposing to construct a 240 unit age-restricted community. Access to the age-restricted community will be provided via the existing signalized access located along the south leg of Ashbourne Road (S.R. 2025) opposite Oak Lane Road, and a new unsignalized access located along the north leg of Ashbourne Road (S.R. 2025) opposite Boyer Road. The conceptual site plan of the proposed residential development is shown in **Figure 1**. The Ashbourne Country Club is bordered by Ashbourne Road (S.R. 2025) to the south and east, and Tookany Creek Parkway and Jenkintown Road to the north in Cheltenham Township, Montgomery County, Pennsylvania.

The purpose of this traffic study is to present an evaluation of the incremental traffic impacts of the proposed development within the study area in Cheltenham Township, as well as provide recommendations regarding the site access design in order to provide efficient access to the site for the anticipated increase in traffic volumes associated with the development.

Manual turning movement traffic counts were completed at seven intersections during the weekday morning peak period (7:00 AM to 9:00 AM) and the weekday afternoon peak period (4:00 PM to 6:00 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 redevelopment of the Ashbourne Country Club were projected utilizing an annual traffic growth rate to account for regional traffic growth. Based on conversations with the Township, it was determined that there are no other area developments in the vicinity of the site that would impact the study area intersections or roadways. The future traffic volumes were projected to the build-out (2013) at each of the study intersections. The future traffic volumes without development were then subjected to detailed capacity/level-of-service analysis.

Finally, the traffic generated by the redevelopment of the Ashbourne Country Club to include the 240 age-restricted units was established based on accepted methodologies published by the Institute of Transportation Engineers (ITE), and assigned to the roadway network and site accesses. The site-generated traffic volumes were added to future without-development traffic volumes, and subjected to detailed capacity/level-of-service analysis to assess the future traffic conditions with the development.

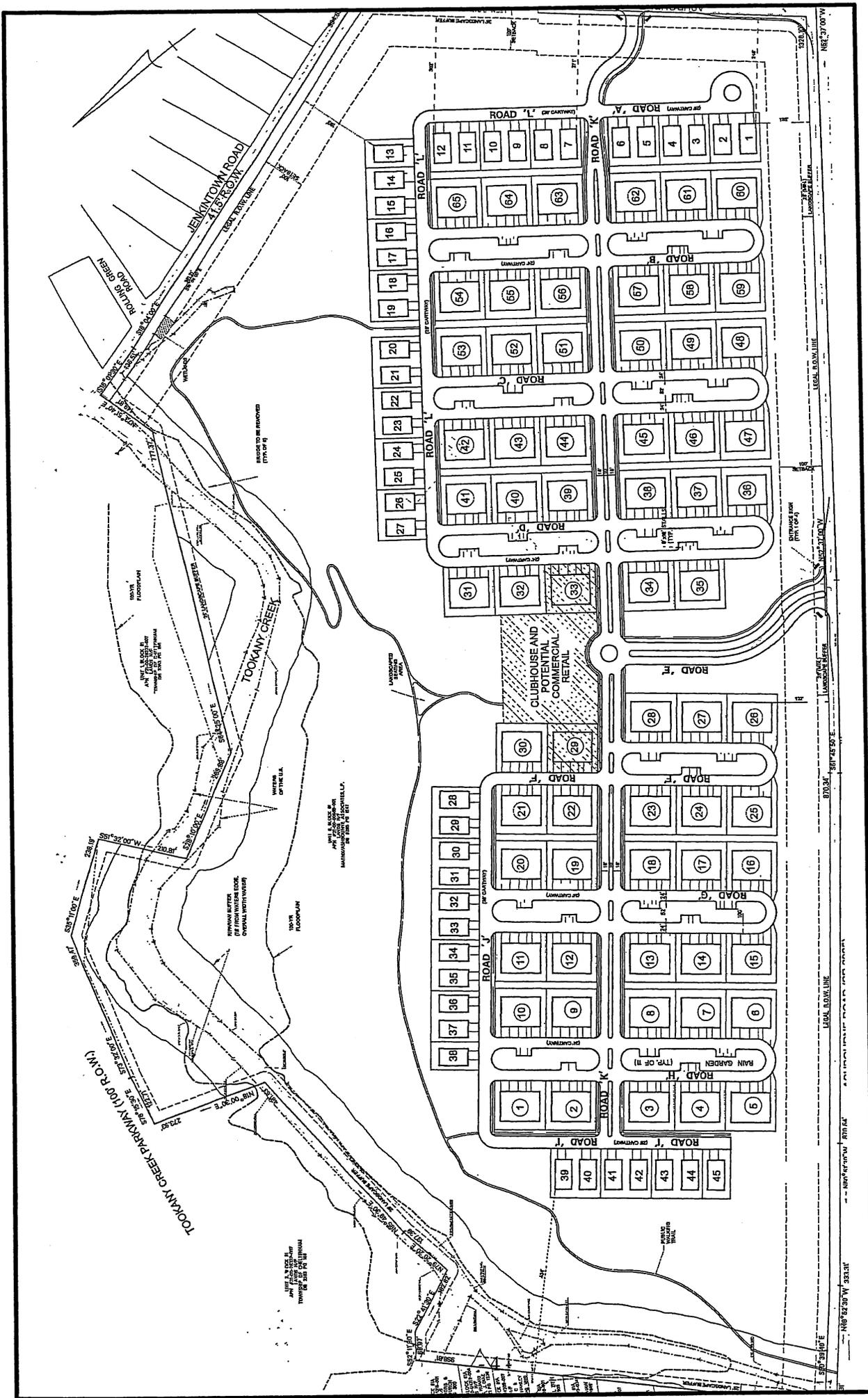


FIGURE 1
 Site Plan (last revised by Taylor Wiseman & Taylor, dated 2/19/2010)
ASHBOURNE COUNTRY CLUB - Age Restricted Community
CHELLENHAM TOWNSHIP, MONTGOMERY COUNTY, PA

Existing Transportation Setting

The Ashbourne Country Club is bordered by Ashbourne Road (S.R. 2025) to the south and east, Tookany Creek Parkway and Jenkintown Road to the north in Cheltenham Township, Montgomery County, Pennsylvania (**Figure 2**). 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 study area roadway network and characteristics are summarized below in **Table 1**.

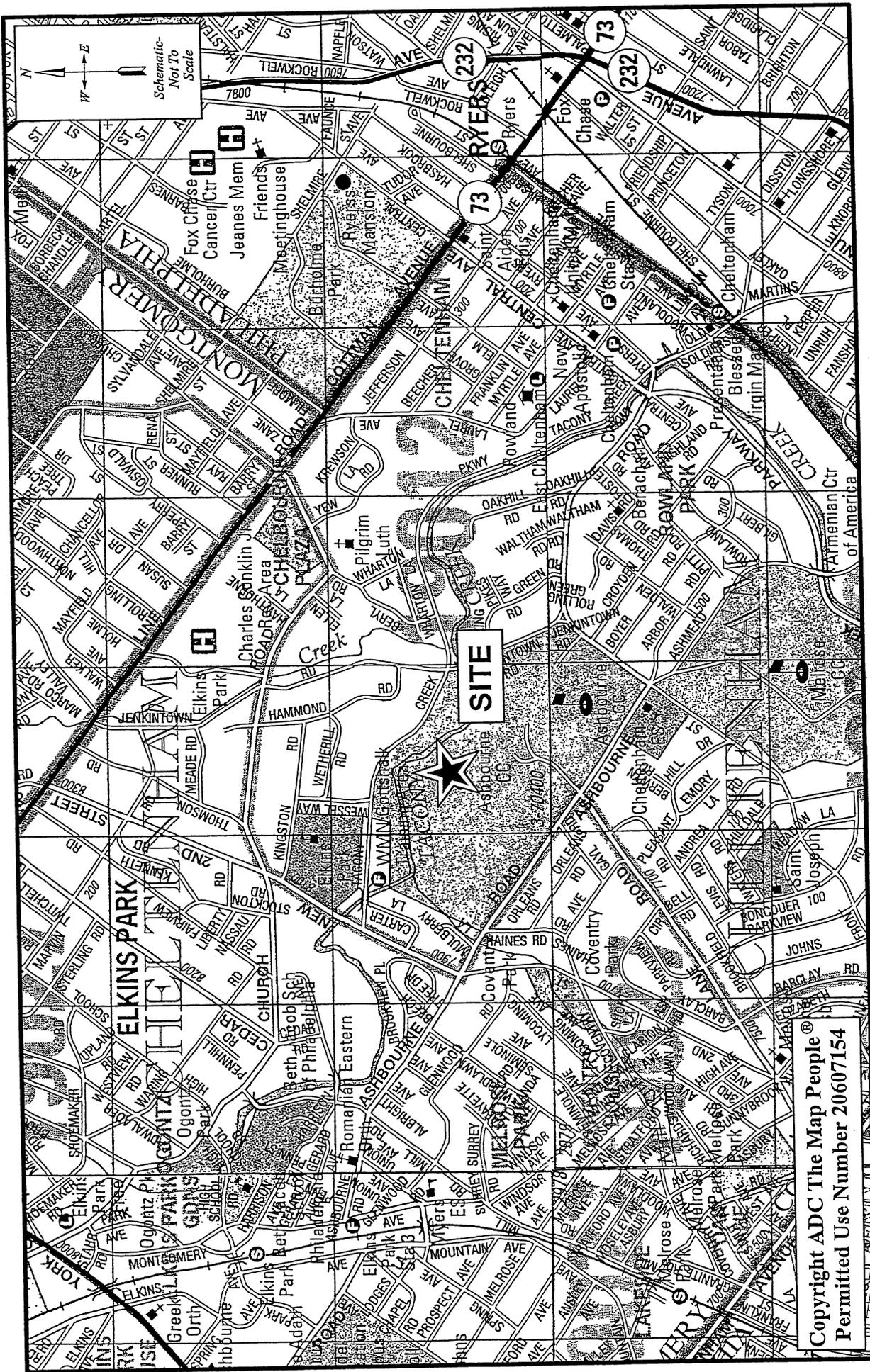
Table 1. Existing Roadway Characteristics

Roadway	Roadway Jurisdiction	Approximate Cartway Width	Travel Lanes (per direction)	Speed Limit
Ashbourne Road (S.R. 2025)	State	22 to 34 feet	One	35 to 40 mph
Oak Lane Road (S.R. 2062)	State	36 to 40 feet	One	35 mph
New Second Street (S.R. 2060)	State	32 to 36 feet	One	35 mph
Front Street	Township	32 to 34 feet	One	15 mph
Ashmead Road	Township	34 feet	One	25 mph
Arbor Road	Township	24 feet	One	25 mph
Boyer Road	Township	23 feet	One	Not Posted
Tookany Creek Parkway	Township	26 to 28 feet	One	35 mph
Jenkintown Road	Township	18 to 28 feet	One	25 mph

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

- Ashbourne Road (S.R. 2025)/New Second Street (S.R. 2060)
- Ashbourne Road (S.R. 2025)/Oak Lane Road (S.R. 2062)/Ashbourne Country Club Access
- Ashbourne Road (S.R. 2025)/Front Street/Ashmead Road/Arbor Road
- Ashbourne Road (S.R. 2025) and Boyer Road
- Ashbourne Road (S.R. 2025) and Jenkintown Road
- Jenkintown Road and Tookany Creek Parkway
- New Second Street (S.R. 2060) and Tookany Creek Parkway

The existing characteristics of the study intersections, including field sketches and photographs, are provided in **Appendix A**.



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FIGURE 2
 Site Location Map
ASHBOURNE COUNTRY CLUB - Age Restricted Community
 CHELTENHAM TOWNSHIP, MONTGOMERY COUNTY, PA

Existing Traffic Volumes

Daily traffic counts were conducted along Ashbourne Road (S.R. 2025) in the vicinity of the site, near its intersection with Oak Lane, in March 2009 and are provided in **Appendix B**. Based on the counts, the two-way daily traffic volume along Ashbourne Road (S.R. 2025) is approximately 8,350 vehicles per day (vpd) on a typical weekday.

Manual turning movement traffic counts, which are the basis of this study, were conducted at various periods in 2009 and 2010 during the weekday morning peak period (7:00 AM to 9:00 AM) and the weekday afternoon peak period (4:00 PM to 6:00 PM) at each of the study intersections. Copies of the 2009 and 2010 traffic count data, tabulated by 15-minute intervals, are provided in **Appendix C**. The four highest consecutive 15-minute peak intervals during these traffic count periods constitute the peak hours.

To establish base condition traffic volumes, the 2009 and 2010 peak hour traffic volumes were compared to each other and prior year traffic counts. For some movements, traffic volumes were slightly lower than in prior years. Therefore, to be conservative, the higher turning movement volume from either prior year counts or from the 2009 and 2010 counts were utilized at the study area intersections. The resultant peak hour traffic volumes are depicted in **Figures 3 and 4** for the weekday morning and weekday afternoon peak hours, respectively.

Planned Roadway Improvements

Through discussions with the Township and review of PennDOT's *Twelve Year Transportation Program*, there are no planned or proposed improvements on the study area roadways by the Township, PennDOT, or other area developers that would have a significant effect on area traffic operations.

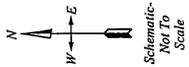
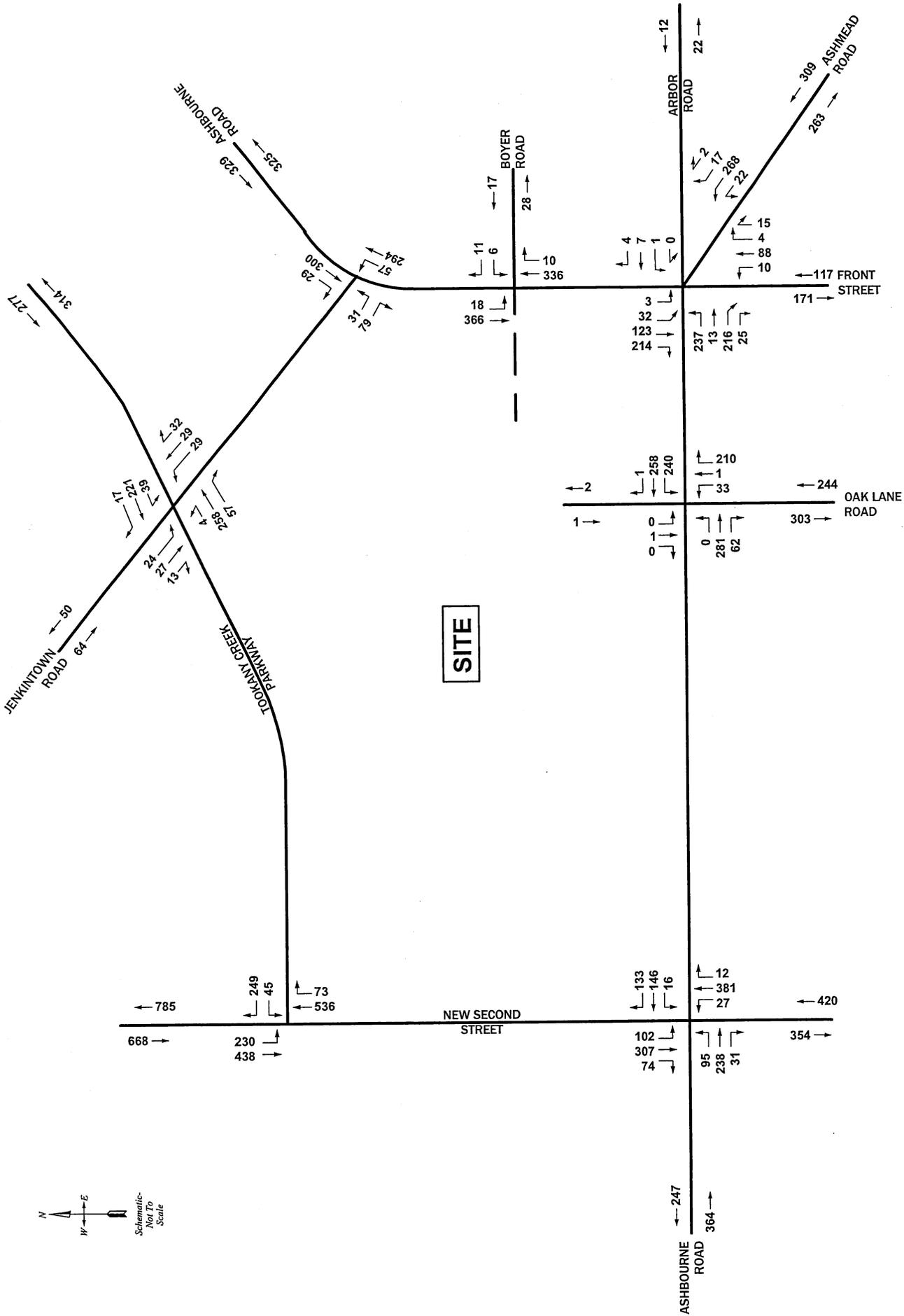


FIGURE 4
 Existing Weekday Afternoon Peak Hour Traffic Volumes
ASHBOURNE COUNTRY CLUB - Age Restricted Community
CHELLENHAM TOWNSHIP, MONTGOMERY COUNTY, PA



Future Traffic Volumes without Development

This section presents projected traffic volumes without the redevelopment of the Ashbourne Country Club for the future build-out (2013). The future year 2013 without-development traffic volumes were estimated by increasing the existing peak hour traffic volumes to account for regional and local traffic growth, as described below. The future year 2013 without-development traffic volumes for the weekday morning and weekday afternoon peak hours are illustrated in **Figures 5 and 6**, respectively.

Regional and Local Traffic Growth

To account for background traffic growth, the existing traffic volumes were increased by a compounded annual traffic growth rate of 0.89 percent. This regional traffic growth rate is consistent with the recommendations by PennDOT's Bureau of Planning and Research for similar urban roadways in Montgomery County. According to the Township, there are no other area developments within the study area that will impact traffic conditions. Therefore, the existing peak hour traffic volumes were increased by a total of 3.61 percent to obtain the base build-out (2013) peak hour traffic volumes.

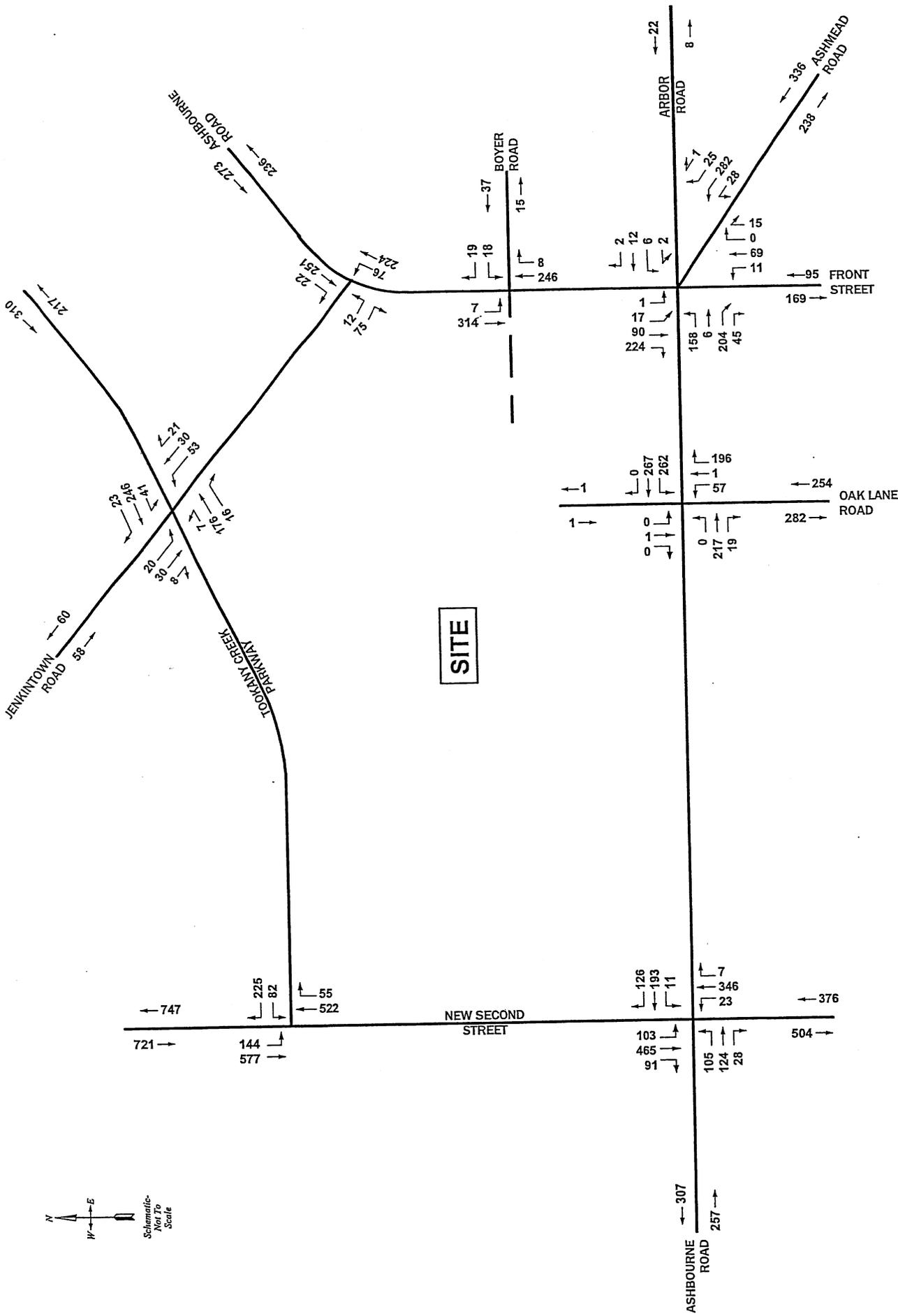


FIGURE 5
 2013 Future Weekday Morning Peak Hour Traffic Volumes without Development
 ASHBOURNE COUNTRY CLUB - Age Restricted Community
 CHELTENHAM TOWNSHIP, MONTGOMERY COUNTY, PA



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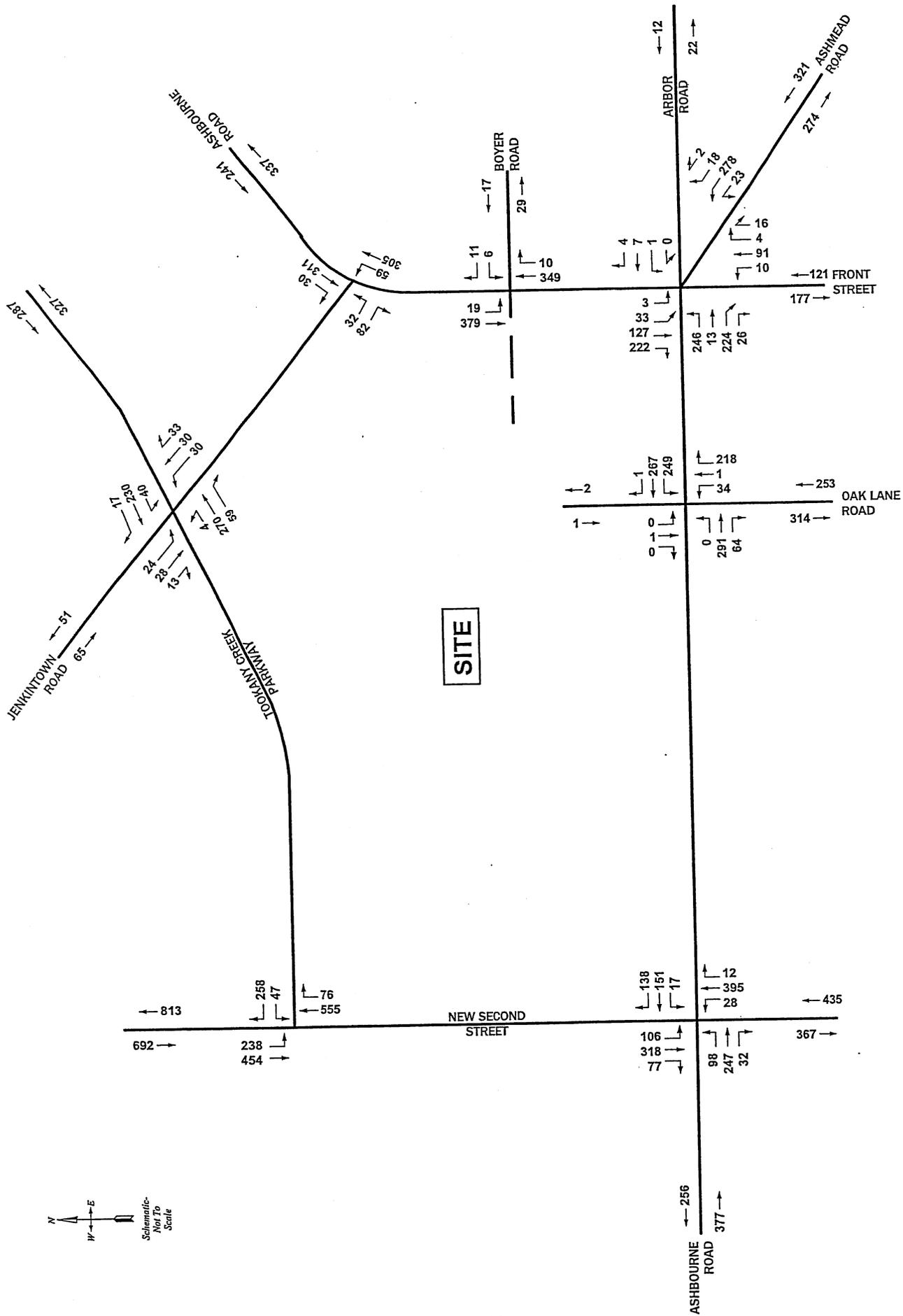


FIGURE 6
 2013 Future Weekday Afternoon Peak Hour Traffic Volumes without Development
ASHBOURNE COUNTRY CLUB - Age Restricted Community
 CHELTENHAM TOWNSHIP, MONTGOMERY COUNTY, PA



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Future Traffic Volumes with Development

Evaluation of the redevelopment of the existing Ashbourne Country Club for the age-restricted residential development is based upon the incremental increase in traffic volumes generated by the development during the peak hours, as described below.

Trip Generation

Traffic volumes generated by the existing land use and proposed development was prepared based on data compiled in the Institute of Transportation Engineers' publication, *Trip Generation, 8th Edition*. The Institute of Transportation Engineers is an international educational and scientific association of transportation professionals that facilitates the application of technology and scientific principals related to the research, planning, design, implementation, operation, and management of any mode of transportation. The *Trip Generation* is a multi-volume report that provides a summary of the trip generation data that has been collected and then presents rates and/or equations that can then be utilized for a particular land use code to estimate its trip generation characteristics.

The anticipated trip generation characteristics for the age-restricted residential development are based upon Land Use Code 251 – Senior Adult Detached Housing. This land use code consists of detached independent living developments that includes gated age-restricted housing developments with residents who are generally active and includes residents who may or may not be retired. **Table 2** presents the anticipated vehicular trip generation characteristics for the existing site and the proposed development.

Table 2. Vehicular Trip Generation for Age-Restricted Homes

Land Use	Size (units)	Daily	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
			In	Out	Total	In	Out	Total
Proposed: Age-restricted Homes	240	1,140	25	46	71	53	34	87

As shown, the ITE data indicates the proposed age-restricted community would, on average, generate approximately 71 total trips (inbound and outbound) during the morning peak hour and approximately 87 total trips (inbound and outbound) during the afternoon peak hour. It should be noted that this site was previously a golf course with a country club, but as the site has been inoperational for the past few years, no trips credits were assumed for the previous on-site use.

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 access. The detailed distribution percentages for the anticipated directions of approach and departure are illustrated in **Figure 7** for the age-restricted homes. Application of the percentages, illustrated in **Figure 7** to the peak hour trips contained in **Table 2** for the age-restricted homes, provides an estimate of site traffic to be added to the study area. The trip assignment has been illustrated in **Figure 8** for the age-restricted homes.

The site-generated traffic volumes were then added to the future without-development traffic volumes to result in total future peak hour traffic volumes with development for each peak hour. The 2013 future traffic volumes with development are illustrated in **Figures 9 and 10** for the weekday morning and weekday afternoon peak hours, respectively.

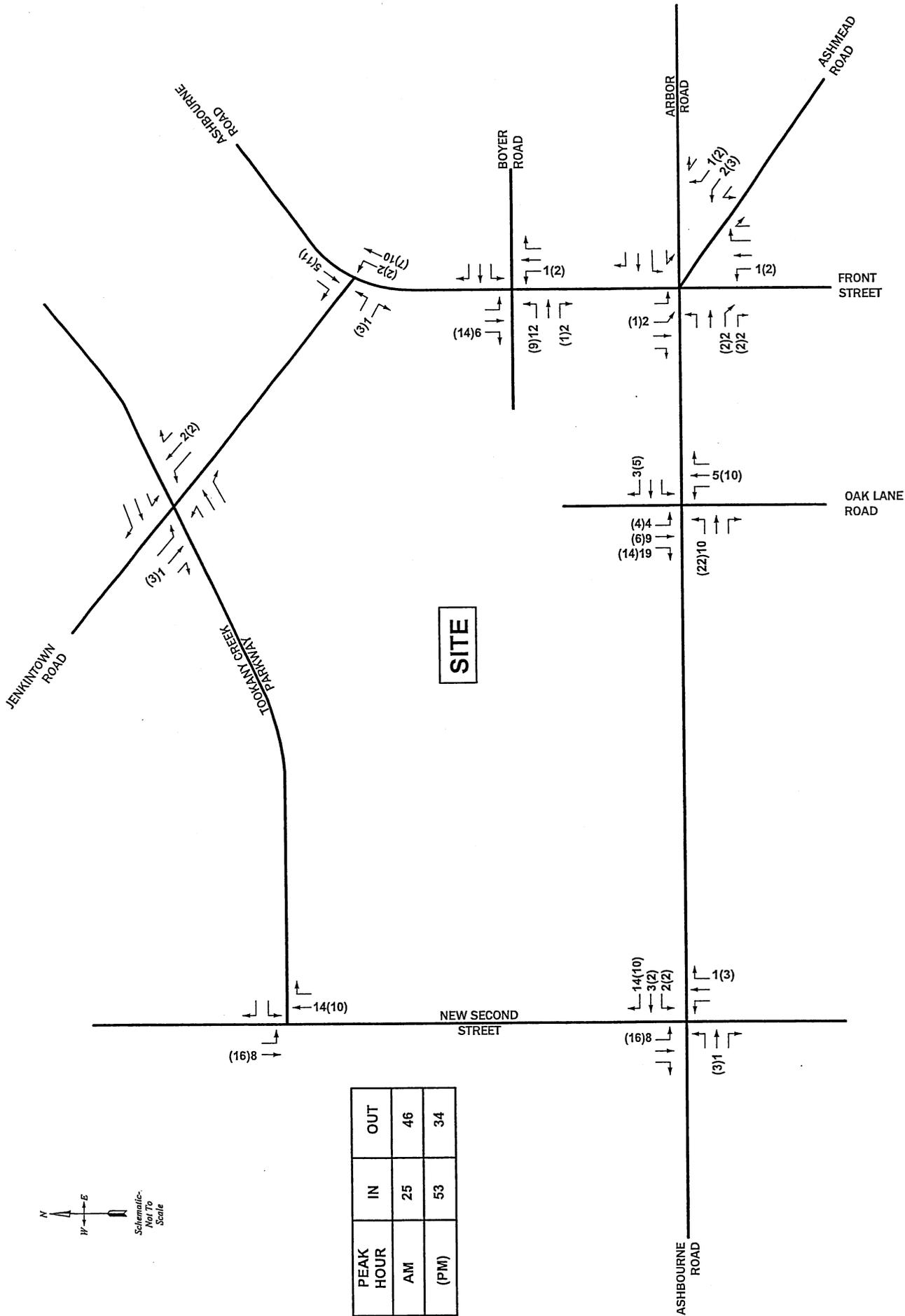


FIGURE 8
 New Trip Assignment
ASHBOURNE COUNTRY CLUB - Age Restricted Community
CHELLENHAM TOWNSHIP, MONTGOMERY COUNTY, PA

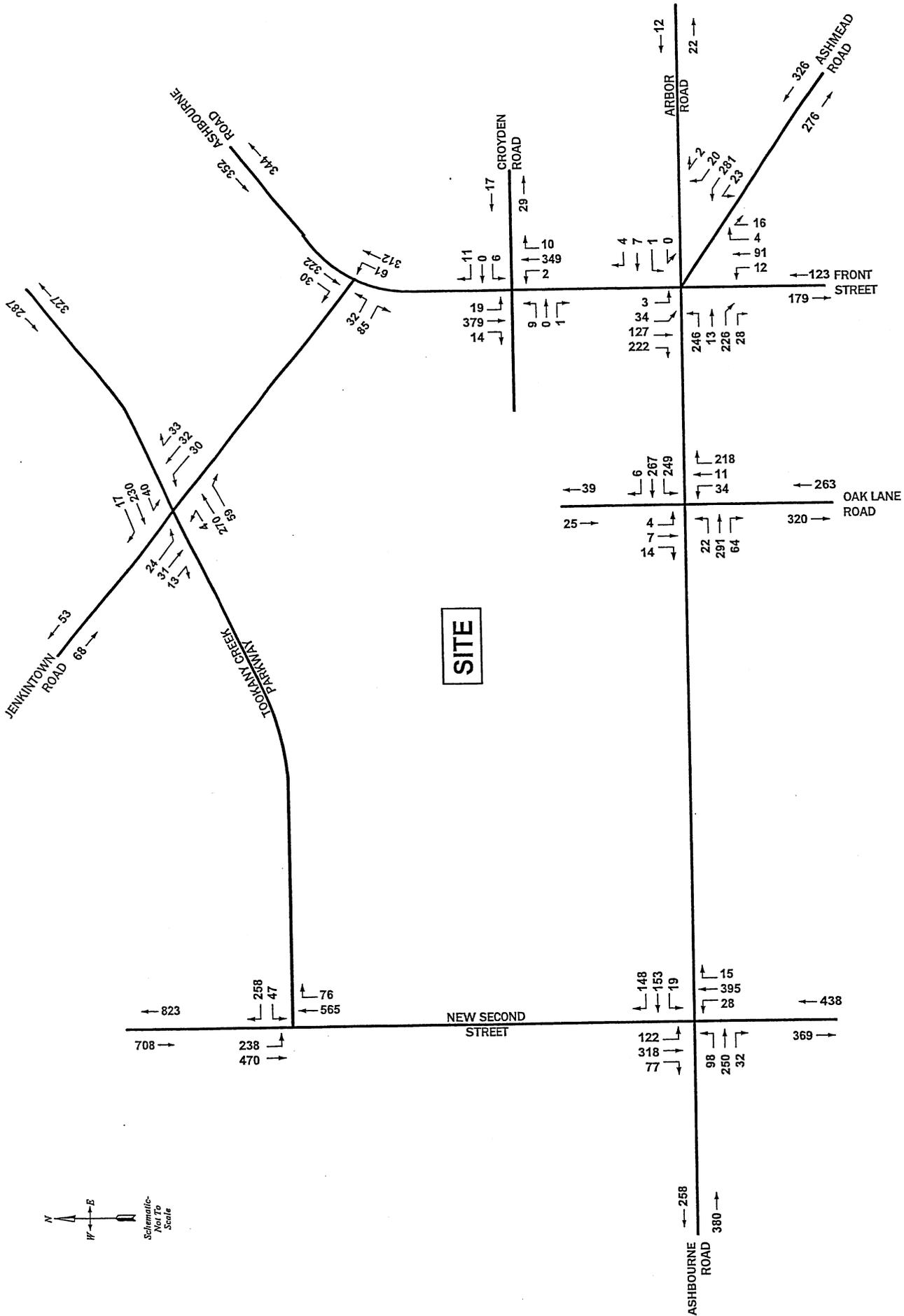


FIGURE 10
 2013 Future Weekday Afternoon Peak Hour Traffic Volumes with Development
ASHBOURNE COUNTRY CLUB - Age Restricted Community
CHELTENHAM TOWNSHIP, MONTGOMERY COUNTY, PA



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Site Access

Access to the age-restricted homes will be provided via the existing signalized intersection at Ashbourne Road (S.R. 2025) and Oak Lane Road (S.R. 2062) and a new unsignalized access along Ashbourne Road opposite Boyer Road. This section summarizes the recommended design for these two accesses associated with the redevelopment of the Ashbourne Country Club.

Design Criteria

The proposed recommendations for the proposed access designs, including the traffic control and geometric design, are based on criteria and guidelines accepted by PennDOT contained in the *Pennsylvania Code, Chapter 441, Access to and Occupancy of Highways by Driveways and Local Roads*, PennDOT's *Publication 282 Highway Occupancy Permit Handbook*, as well as local PennDOT District policies. Since both accesses are on a State highway, Ashbourne Road (S.R. 2025), any modifications to the existing access servicing the Ashbourne Country Club, as well as the design of the new unsignalized access, will require the review and approval of PennDOT.

Based on Section 441.8 of PennDOT access code, both access driveways would be classified as low-volume driveways, since there will be less than 750 trips per day utilizing each driveway. The design criteria for a two-way, low-volume driveway is based upon the roadway speed (Ashbourne Road is posted 35 miles per hour), and the anticipated design vehicle that will be using the site. Since, the residential development will need to accommodate moving vehicles, it is recommended that the driveways be designed to accommodate combination trucks. The design criteria, as documented in *Chapter 441* for the low-volume driveway conditions for these two accesses, are to provide a minimum cartway width of 22 feet with a minimum curb radius of 35 feet.

Although an approach for the Ashbourne Country Club is currently provided at the intersection of Ashbourne Road (S.R. 2025)/Oak Lane Road (S.R. 2062), it will be realigned and widened in conjunction with the redevelopment. The following improvements, which meet or exceed the minimum design guidelines for a low-volume driveway, are planned by the applicant for this access:

- Provide a single 16-foot-wide ingress lane and a single 16-foot-wide egress lane that will be separated by a 12-foot wide landscaped median.
- Provide 35-foot curb radii (at a minimum).
- Provide a separate 14-foot-wide right-turn lane along Ashbourne Road (S.R. 2025), 75 feet in length and a 75-foot bay taper.
- Modify the traffic control signal permit to include the proposed right-turn lane and provide an advance westbound phase to better accommodate the left-turn movement to Oak Lane.

The unsignalized access for the age-restricted development will be located along Ashbourne Road (S.R. 2025) directly opposite Boyer Road. Since the daily trips will be split between this access and the signalized access, it too will be classified as a low-volume driveway by PennDOT and would

be subject to the same design criteria. The following improvements are planned by the applicant for this driveway, which meet or exceed the design criteria for a low-volume driveway:

- Provide a single 14-foot-wide ingress lane and a single 14-foot-wide egress lane.
- Provide 35-foot curb radii (at a minimum).
- Provide stop-control along the access approach.

Copies of the auxiliary lane warrant worksheets for the proposed unsignalized access are provided in **Appendix D**, which show that auxiliary turn lanes are not warranted at this access based upon the anticipated peak hour traffic volumes.

Sight Distance

Sight distance field measurements were performed at the proposed new, unsignalized full-movement access on Ashbourne Road (S.R. 2025) for the age-restricted homes. Generally, the posted speed limit, roadway grades and profiles, and the number of travel lanes play a role in determining the required safe sight distances for egress and ingress movements. The sight distances were measured in the field and compared to PennDOT's desirable and minimum safe stopping sight distance (SSSD) requirements for two-lane roads, which are contained in *Tables 1 and 5 of the Pennsylvania Code, Chapter 441, Access to and Occupancy of Highways by Driveways and Local Roads, and Pub 282, Highway Occupancy Permit Handbook*.

Table 3 provides a summary of the field measured distances, along with the minimum and desirable distances, per current PennDOT policy. While the desirable distances are achievable for egress vehicles looking to the right and for left-turn ingress vehicles looking ahead or approaching from behind, the desirable is not available for egress vehicles looking to the left due to the spacing of the signalized intersection. However, the minimum safe sight distance requirements are met for all ingress and left-turn ingress movements.

Table 3. Sight Distance Criteria for Age-Restricted Access opposite Boyer Road

Movement	Direction	Approach Grade	Sight Distance (feet)		
			Desirable ⁽¹⁾	Minimum ⁽¹⁾	Available
Exiting	Looking Left	-2%	440	256	434 ⁽²⁾
	Looking Right	+3%	350	239	≥600
Left turn Entering	Looking Ahead	-2%	300	256	434 ⁽²⁾
	From the Rear	+3%	300	239	≥600

(1) Based on the posted speed of 35 miles per hour.

(2) Distance to signal at Front Street/Ashmead Road/Arbor Road.

Capacity/Level-of-Service Analyses

The peak hour traffic volumes were analyzed to determine the existing operating conditions and future operating conditions, both without and with redevelopment of the Ashbourne Country Club, in accordance with the standard techniques contained in the current *Highway Capacity Manual (2000)*. These standard capacity/level-of-service analysis techniques, which calculate total control delay, are more thoroughly described in **Appendix E** for both signalized and unsignalized intersections, as well as the correlation between average total control delay and the respective level-of-service criteria for each intersection type.

In the surrounding area, PennDOT District 6-0, as well as many local municipalities, considers LOS A through D acceptable operating conditions, while LOS E represents conditions approaching capacity and LOS F indicates that traffic volumes have exceeded available capacity. PennDOT's *Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permit*, dated January 28, 2009, does allow for a 10 second variance for any drop in the overall level-of-service at an intersection prior to requiring mitigation; however, PennDOT still reserved the right to require mitigation for individual movements on a case-by-case basis. For example, if the overall level-of-service under without-development conditions is LOS D with 52.4 seconds of delay per vehicle, the overall with-development level-of-service can drop to LOS E, and not require any mitigation measures, as long as the overall delay does not exceed 62.4 seconds. If the overall increase in the delay exceeds the 10 second variance, then improvements are required to mitigate the delay back to the without-development condition.

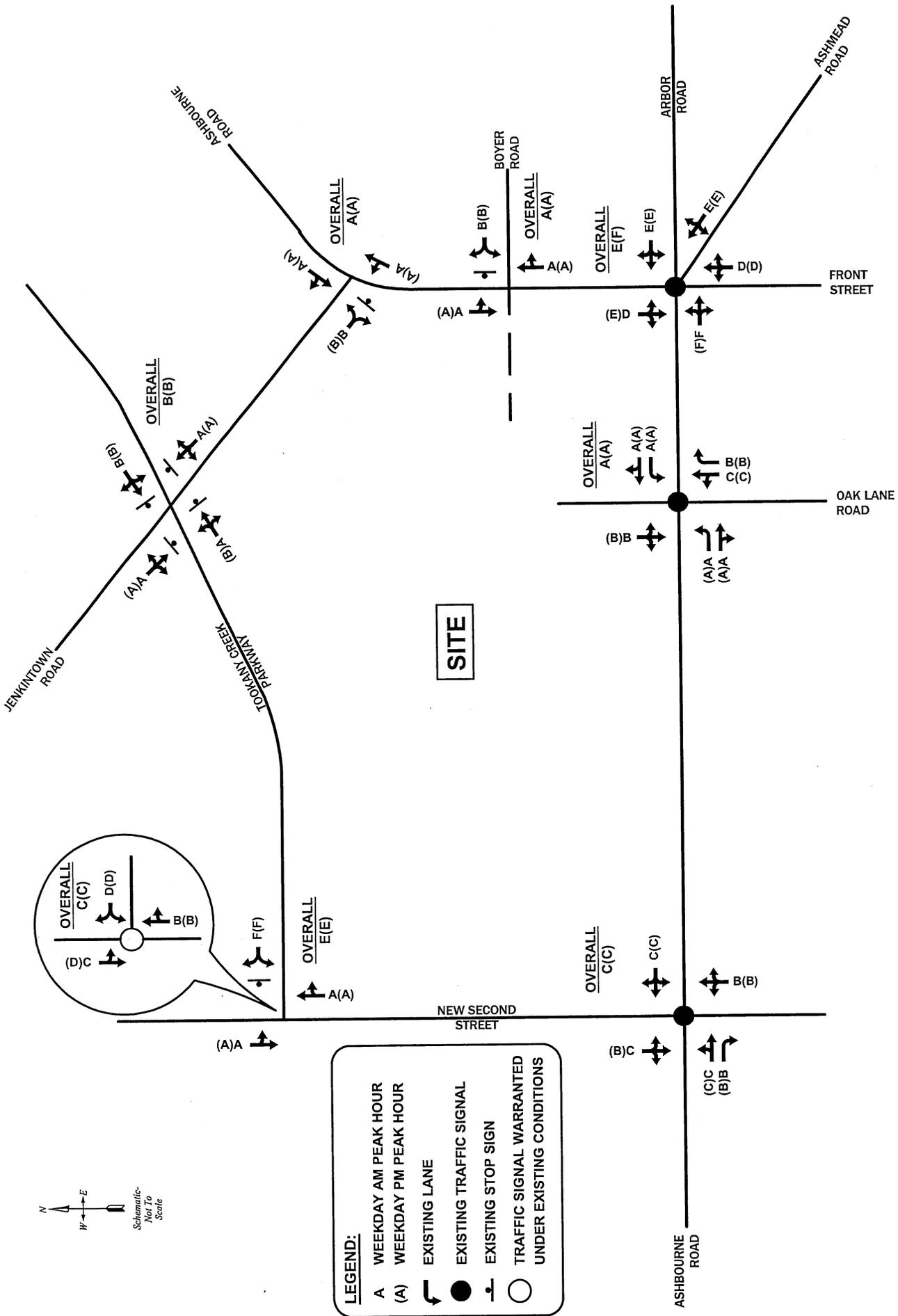
The results of the capacity/level-of-service analyses are illustrated in **Figures 11 through 13** for the existing, future build-out (2013) without development and with development, respectively. Additionally, detailed capacity/level-of-service analysis worksheets are contained in **Appendix F, G, and H** for the existing and future build-out (2013) without and with development, respectively. The analysis results are summarized below for each study intersection.

Ashbourne Road (S.R. 2025) and New Second Street (S.R. 2060)

Under existing and 2013 future without-development conditions, this intersection operates at overall LOS C during the weekday morning and weekday afternoon peak hours, with all movements operating at LOS D or better during both peak hours. Under 2013 future with-development conditions, this intersection will continue to operate at the same overall levels of service as without-development conditions and the movements will operate at LOS D or better during both peak hours.

Ashbourne Road (S.R. 2025) and Oak Lane Road (S.R. 2062)/Site Access

Under existing and 2013 future without-development conditions, this intersection operates at overall LOS A during both the weekday morning and weekday afternoon peak hours, with all



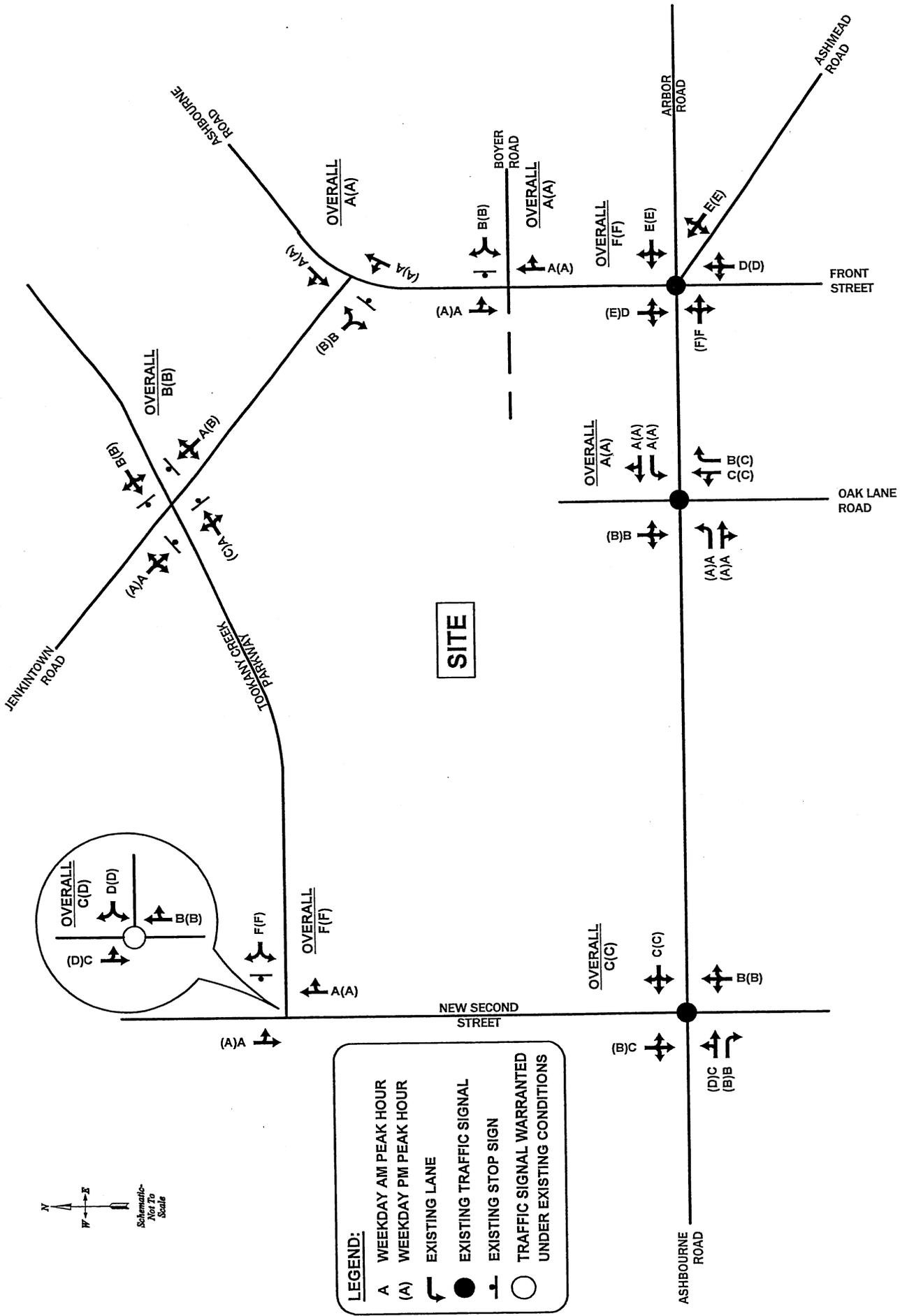


FIGURE 12
 2013 Future Levels of Service Without Development
ASHBOURNE COUNTRY CLUB - Age Restricted Community
 CHELTENHAM TOWNSHIP, MONTGOMERY COUNTY, PA

movements operating at LOS C or better during both peak hours. With development of the site, it is recommended that the existing access driveway to the Ashbourne Country Club be realigned and widened to provide one ingress lane and one egress lane, which is consistent with PennDOT's design standards for a low-volume driveway. Additionally, a separate right-turn lane along the westbound approach of Ashbourne Road (S.R. 2025) is also proposed, along with traffic signal timing modifications that includes the provision of an advance westbound phase to better accommodate the heavy left-turn movement from Ashbourne Road (S.R. 2025) to Oak Lane Road (S.R. 2062).

With these improvements, the intersection will operate at overall LOS B during the weekday morning and weekday afternoon peak hours with all movements operating at LOS C or better during both peak hours. However, it should be noted that the applicant would not be required to complete these improvements based on PennDOT's current mitigation requirements, which allows for a drop in the overall level of service from without-to with-development conditions of 10 or less seconds per vehicle.

Ashbourne Road (S.R. 2025) and Front Street/Ashmead Road/Arbor Road

Under existing conditions, this intersection operates at overall LOS E during the weekday morning peak hour and at overall LOS F during the weekday afternoon peak hour, with several movements operating with delay (LOS E and F) during both peak hours. Under 2013 future without-development conditions, this intersection will operate at overall LOS F during both the weekday morning and weekday afternoon peak hours, only with several movements continuing to operate with delay (LOS E and F) during both peak hours.

With development of the site, the installation of a southbound right-turn lane along Ashbourne Road (S.R. 2025) and an eastbound left-turn lane along Ashbourne Road (S.R. 2025) is recommended along with traffic signal timing modifications to mitigate the impact of the development. With these improvements, the intersection will operate at overall LOS D or better during the weekday morning and weekday afternoon peak hours, with all of the lane groups and approaches also operating at LOS D or better conditions. It should be noted that in order to meet PennDOT's mitigation requirements, the applicant would only be required to provide the southbound right-turn lane along with the signal timing modifications. Therefore, it can be concluded that the applicant has more than met the minimum requirements for mitigation at this location.

Ashbourne Road (S.R. 2025) and Boyer Road

Under existing and 2013 future conditions both without- and with-development of the age-restricted homes, this intersection will operate at LOS C or better for all movements during the weekday morning and weekday afternoon peak hours. Therefore, no improvements are recommended.

Ashbourne Road (S.R. 2025) and Jenkintown Road

Under existing and 2013 future without- and with-development conditions, this intersection operates at LOS B or better for all movements during the weekday morning and weekday afternoon peak hours. Therefore, no improvements are recommended.

Jenkintown Road and Tookany Creek Parkway

Under existing and 2013 future without- and with-development conditions, this all-way stop-controlled intersection operates at LOS B overall with all movements also operating at LOS C or better conditions during the weekday morning and weekday afternoon peak hours. Therefore, no improvements are recommended.

New Second Street (S.R. 2060) and Tookany Creek Parkway

Under existing and 2013 future without- and with-development conditions, this intersection operates with delay (LOS F) on the minor street approach during the weekday morning and weekday afternoon peak hours. A comparison of the overall increase in delay at the intersection from without- to with-development conditions shows that the increase in delay is less than 10 seconds per vehicle, which is permitted under PennDOT's current policy prior to requiring mitigation measures. It should also be noted that the proposed development will increase traffic at this intersection by less than 1.6 percent during both peak hours, which is less than 26 vehicles per hour, i.e. one additional vehicle every two minutes.

A traffic signal warrant was conducted based upon the 2002 and 2009 existing volumes from the manual turning movement counts, which is provided in **Appendix I**. According to the warrants, the installation of a traffic signal is warranted based on the peak hour and four-hour warrants for the 2002 traffic volumes, but only the peak-hour warrant with 2009 traffic volumes, since there has been a slight reduction in area traffic volumes based on recent data. With signalization, this intersection would operate at overall LOS D or better during the weekday morning and weekday afternoon peak hours, with all movements operating at LOS D or better during both peak hours under existing and 2013 future without- and with-development conditions.

Supplemental Analysis – Market Value Carriage Homes

At the request of the Township Engineer, a supplemental analysis has been completed assuming the trip volumes for the age-restricted community were more similar to market-value carriage homes. This alternative methodology was completed to address concerns regarding the potential for fewer retired versus non-retired residents living in the age-restricted section of the development, due to current economic conditions. Therefore, for this analysis, the trip generation for the 240 units was established based on data from the Institute of Transportation Engineers' publication entitled *Trip Generation, 8th Edition* for a combination of Single-Family Detached Homes (Land Use Code 210) and Residential Condominium/Townhouse (Land Use Code 230).

Trip Generation

Table 4 provides a comparison of the trip generation characteristics for the two different methodologies. As can be seen, the alternative trip generation methodology results in an additional 58 (total inbound and outbound) trips during the weekday morning peak hour and an additional 68 (total inbound and outbound) trips during the weekday afternoon peak hour.

Table 4. Vehicular Trip Generation Comparison

Land Use	Size (units)	Daily	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
			In	Out	Total	In	Out	Total
Method 1: Age-restricted Homes	240	1,164	25	46	71	53	34	87
Method 2: Residential Condominium/ Townhouse	195	1,150	15	73	88	70	34	104
<u>Single Family Homes</u>	<u>45</u>	<u>499</u>	<u>10</u>	<u>31</u>	<u>41</u>	<u>32</u>	<u>19</u>	<u>51</u>
Total	240	1,649	25	104	129	102	53	155
Difference (Method 2 less Method 1)			0	58	58	49	19	68

Capacity/Level-of-Service Analyses

The site-generated traffic volumes, utilizing Residential Condominium/Townhouse and Single-Family Home trip generation characteristics for the entire site, were then added to the 2013 future without-development traffic volumes to result in total future peak hour traffic volumes with development for each peak hour. These peak hour traffic volumes were then analyzed to determine the future operating conditions for the build-out year 2013, with redevelopment of the Ashbourne Country Club, in accordance with the standard techniques contained in the current

Highway Capacity Manual (2000). The resultant level-of-service figure, as well as the trip assignment, weekday morning and weekday afternoon peak hour traffic volume figures are provided in **Appendix J** along with the detailed capacity/level-of-service analysis worksheets.

Despite the increase in traffic associated with this alternative trip generation methodology, no additional roadway or intersection improvements would be required over those that were already recommended in conjunction with this development. Therefore, it can be concluded, based upon the traffic analysis, which is described in further detail herein, that safe and efficient access can be provided for the proposed development with either the age-restricted or a combination of single-family homes/townhomes as the previously recommended improvements will continue to mitigate the development's impact.

Conclusions and Recommendations

In conjunction with the redevelopment of the Ashbourne Country Club that will result in 240 age-restricted homes, the following roadway/intersection improvements are proposed by the developer, which will mitigate the traffic impacts and provide safe and efficient flow in the area:

- **Ashbourne Road (S.R. 2025) and Oak Lane Road (S.R. 2062)/Access** – Widen the existing access to provide one 16-foot-wide egress lane and one 16-foot-wide ingress lane separated by a 12-foot-wide median. In addition, construct a separate westbound right-turn lane, 75 feet in length with a 75-foot bay taper, and modify the existing traffic signal timings to provide an advance westbound phase for traffic turning left from Ashbourne Road to Oak Lane Road.
- **Ashbourne Road (S.R. 2025)/Front Street/Ashmead Road/Arbor Road** – Construct a separate southbound right-turn lane along Ashbourne Road, 150 feet in length with a 75-foot bay taper; construct a separate eastbound left-turn lane on Ashbourne Road, 220 feet in length with a 75-foot bay taper; and modify the existing traffic signal timings.
- **Ashbourne Road (S.R. 2025) and Boyer Road/Access** – Provide one 14-foot-wide ingress lane and one 14-foot-wide egress lane for the access, with stop control provided along the access approach.

Preliminary Concept Plans 1 through 3 detailing these intersection improvements are provided in the back of this study. The traffic analysis, as completed herein, reveals that safe and efficient access can be provided for the proposed age-restricted homes and that the recommended improvements will mitigate the development's impact.