



# Parking and Trip Generation in Multifamily Residential Developments in Fairfax County, VA

September 2016





# Let's Not Overpark: Parking and Trip Generation in Multifamily Residential Developments

## Table of Contents

<b>Introduction</b> .....	<b>4</b>
Study Purpose.....	4
<b>Methodology</b> .....	<b>5</b>
Property Selection Criteria .....	5
Property Outreach .....	6
Data Collection – Automatic Vehicle Counts .....	6
Data Collection – Intercept Survey .....	7
Statistical Considerations .....	9
<b>Overview of Selected Properties</b> .....	<b>10</b>
Transit-Oriented Developments .....	11
Urban Properties.....	14
Suburban Properties .....	16
Property Assessment.....	17
<b>Data and Results</b> .....	<b>19</b>
Mode Share .....	19
Vehicle Trip Generation .....	21
Comparison to ITE Estimates .....	21
Parking Occupancy .....	22
Comparison to Current Zoning Requirements.....	25
<b>Correlated Analysis</b> .....	<b>26</b>
Distance from Metro and Vehicle Trip Generation.....	26
Walk Score and Mode Share .....	27
Average Rent and Vehicle Trip Generation.....	28
Drive Alone Mode Share and Parking per Unit.....	28
Drive Alone Mode Share and Parking Cost.....	29
<b>Conclusion</b> .....	<b>30</b>

## Table of Figures

	<b>Page</b>
Figure 1 MioVision Scout Video Collection Unit and Pneumatic Tube Counter.....	7
Figure 2 Map of Study Locations.....	10
Figure 3 Neighborhood Characteristics.....	18
Figure 4 Building Characteristics.....	18
Figure 5 Building TDM Services Available.....	19
Figure 6 Average Mode Share for All Multifamily Properties.....	19
Figure 7 Average Mode Share for TOD Properties.....	20
Figure 8 Average Mode Share for Urban Properties.....	20
Figure 9 Average Mode Share for Suburban Properties.....	20
Figure 10 Transit Mode Share .....	21
Figure 11 Trip generation characteristics.....	21
Figure 12 Observed Vehicle Trip Generation Compared to ITE Standards .....	22

Parking and Trip Generation in Multifamily Residential Developments  
Fairfax County, VA

Figure 13 Average Observed Vehicle Trip Generation Compared to ITE Standards ..... 22

Figure 14 Parking Ratios and Construction Date..... 23

Figure 15 Minimum and Maximum Daily Multifamily Property Parking Utilization ..... 24

Figure 16 Maximum Daily Multifamily Property Parking Utilization Adjusted by Percentage of  
Occupied Units ..... 24

Figure 17 Maximum and Minimum Parking Occupancy by Urban Form..... 25

Figure 18 Graph of Zoning Required Parking with Maximum Parking Utilization..... 25

Figure 19 Table of Zoning Required Parking with Maximum Parking Utilization and Parking  
Supplied ..... 26

Figure 20 Relation between Weekly vehicle trips generated per bedroom and Distance to  
Metrorail (ft) ..... 27

Figure 21 Drive-alone share by Walk Score..... 27

Figure 22 Walk/Bike share by Walk Score ..... 28

Figure 23 Weekly vehicle trips generated/bedroom and Monthly rent ..... 28

Figure 24 Drive-alone share and Parking spaces/Unit ..... 29

Figure 25 Drive-alone share and Monthly cost of a parking space..... 29

## INTRODUCTION

Mixed-use activity centers are generally perceived to generate fewer vehicle trips and less demand for parking as compared to conventional, single-use developments. By reducing the distance between home and everyday destinations, residents can choose to travel via transit, walking, or bicycling instead of private car. However, there has been a lack of empirical data to estimate the trip generation and parking demands for activity centers in rapidly urbanizing suburban areas, particularly those involving multifamily residential units.

Fairfax County is an ideal location to study parking and trip generation, spanning just over 400 square miles with a mix of land uses, transportation services, and development patterns.

Development in the County ranges from lower density suburban areas to more urban town centers and transit-oriented mixed-use developments. There are 11 Metrorail stations in Fairfax County: West Falls Church, Dunn Loring, and Vienna on the Orange Line; Huntington on the Yellow Line; Van Dorn and Franconia-Springfield on the Blue Line; and the newly opened McLean, Tysons Corner, Greensboro, Spring Hill, and Wiehle-Reston East on the Silver Line. Metrobus and the Fairfax Connector provide local bus service, while commuter bus service is available to Tysons Corner, Arlington, and locations in Washington, DC. In addition, the County is actively studying opportunities to expand the countywide transit network and investing heavily in transportation options and transportation demand management.

Fairfax County is also one of the fastest growing counties in one of the fastest growing regions in the country. The area is continuing to attract new residents and development patterns are changing to accommodate the increased growth. As with many areas across the country, there is increasing interest from the public and from developers in creating walkable, mixed-use places. The Fairfax County Comprehensive Plan targets much of the area's future growth into infill development and redevelopment of properties within mixed-use activity centers. The Plan includes Community Business Centers and Transit Station Areas as areas for increased density.

These and other changes to the built environment mean new development in Fairfax County will be increasingly diverse, depending on the location and availability of transportation options. The results of this study can be used to ensure that new development supports the transportation and housing goals of the County and its residents.

### Study Purpose

Trip generation refers to all trips, regardless of mode of transportation, that are associated with a given land use. The industry standard is to rely on trip generation rates published by the Institute of Transportation Engineers (ITE). These are generally based on conventional suburban development patterns, perhaps imposing a burden on developers and jurisdictions to provide more roads and parking capacity than is necessary in more densely developed, mixed-use environments. Further, the current estimates only refer to vehicle trips and do not consider trips by other transportation modes, such as walking, bicycling, and transit.

At the same time, most jurisdictions impose parking minimums on new developments based on the assumption that the vast majority of trip making is accomplished using a private automobile. In Fairfax County, land uses have parking supply guidelines tied to the different types of land uses. Multifamily housing developments, for example, have a required parking minimum of 1.6 parking spaces per unit. Recently, some jurisdictions have begun to recognize that these minimums have resulted in an oversupply of parking, driving up development costs, housing

prices and rents, and wasting valuable land. Parking minimums may even induce more auto trips than might otherwise be made, as it lowers the barrier to increased driving.

The purpose of this study is to assess actual trip generation and parking demand rates in multifamily residential developments in order to provide a more accurate depiction of vehicle trips and parking needs. The data on trip-making gathered for this study will be compared to current local and national methods of calculating vehicle trip generation and parking supply.

## METHODOLOGY

The data collection procedures for this study include three primary components.



First, to assess parking demand and the number of vehicle trips generated by each property, automatic vehicle counts at the parking entrances or driveways to each property were used. Counts were conducted over the course of one week and reported at 15-minute intervals. This was accompanied by a manual count of vehicles parked on the property at the beginning and the end of the study period to determine parking occupancy at the site.



To complement the vehicle counts and in order to accurately calculate trips taken by other modes, an intercept survey was also conducted. Surveyors were positioned at entrances to the property with a counter to generate a full count of people arriving to and leaving from each site during peak periods. Surveyors asked residents and visitors to each site which travel mode they most recently used. With this information, we will be able to develop a mode split estimate based on responses to the intercept question about how people arrived and departed.



Finally, property managers were asked about transportation services offered at each site, such as a TDM program, the presence and use of bicycle racks, the quality and location of bus stops/shelters, proximity to Metro stations, and presence and connectivity of the surrounding sidewalk network.

## Property Selection Criteria

In order to capture the diversity of development patterns across the County, the study identified three urban design locations. Transit-oriented development (TOD) sites are located within  $\frac{1}{2}$  mile of Metrorail stations with good access to the station platform. “Urban” sites are located in more densely developed parts of the county with good walking and bicycling facilities and access to bus services. “Suburban” locations were identified as areas with limited transit services and little mix of land uses or destinations nearby. Walk Score and Transit Score (where available), land use maps, and the connectivity of the street grid surrounding potential multifamily properties were used to determine these development patterns.

A mix of TOD, urban, and suburban multifamily residential properties were selected in order to better understand the diversity of parking requirements and the impact location and transit services have on these needs. Factors evaluated to determine the property selection included:



- **Building Occupancy** – Properties were selected that have had time to complete initial lease-up and have lower vacancy rates.
- **Mix of Unit Sizes** – Since the number of the persons in the household and the number of trips generated is a function of the number of bedrooms, properties with a range of unit sizes available will be selected.
- **Building Age** – The age and condition of the building might impact the transportation services available onsite, property amenities, or site design, we will select a mix of older and newer properties.
- **Demographics** – Properties from different neighborhoods will be used to reflect the demographic diversity of the county.
- **Rent** – The study will include a mix of high, medium, and lower priced units to balance affordable vs. market rate housing.
- **Surface vs. structured parking** – Properties will have a mix of surface parking and structured parking.

It is important to note that multifamily properties in Fairfax County are increasingly mixed-use and often include some commercial land-uses on the ground floor of the building. While the county is supportive of this development trend, the properties selected for this study are limited to single use multifamily sites or mixed-use when the residential parking can be easily separated from commercial. This was done to facilitate data collection.

## Property Outreach

Fairfax County staff initially contacted each property to explain the goals of the study and the data collection procedures. At each location, the property manager gave permission to gather data on the property; otherwise, we considered a substitute site. To ensure the properties studied represented a range of neighborhood and property characteristics, the project team then confirmed each of the following:

- **Property conditions**, such as unit mix, pricing and number of affordable units, building occupancy, parking allocation and costs, and parking configuration.
- **Transportation supply factors**, such as the presence of bicycle racks, the quality and location of bus stops/shelters, proximity to Metro stations, presence and connectivity of sidewalks.

After approval, the project team conducted a virtual site survey to identify the location for data collection. This included an assessment of the number and location of all doors for the intercept survey. Survey personnel were stationed at every point of access and egress, hence every entrance must be known and accounted for. Doors with high pedestrian traffic may need two or more staff members to both count and survey those entering and exiting. Conversely, those with very low levels of traffic may need just one person who can both count and perform the intercept survey. Where there were any questions about the location and use of entrances, the property manager was consulted.

## Data Collection – Automatic Vehicle Counts

Automatic vehicle counters were positioned at each driveway entrance to the property. Figure 1 shows the types of automatic counting devices used for the study. The counters were installed at

all property entrances and left for one week. The data was tabulated in 15 minute increments of time.

Figure 1 MioVision Scout Video Collection Unit and Pneumatic Tube Counter



## Data Collection – Intercept Survey

Since there are many events that can impact travel choices, such as spring break, holidays, and severe weather, data collection periods are intended to be representative of typical travel periods and peaks. The intercept surveys were conducted mid-week, Tuesday through Thursday, and during the peak hours of travel, between 7:00 a.m. - 10:00 a.m. and 4:00 p.m. - 7:00 p.m.<sup>1</sup>

The intercept survey was conducted by field staff with a supervisor who is able to travel between count sites and answer questions and confirm the field staff are correctly soliciting and recording data. Prior to data collection, field staff were briefed on the overall goal of the study, and trained on how to approach and engage the survey subject, asking “How did you get here today (for those entering a site)/How are you getting to your next destination (for those leaving).” Field staff were provided a traffic safety vest as potential interviewees are more likely to feel comfortable answering questions from someone who they perceive as “official” in some way.

Depending on where they were, field staff each used one of three survey instruments for the intercept survey: one form for person counts only, one for the intercept survey, and a combined form for surveyors stationed at low-volume doors where they are responsible for both count and survey. These forms are also attached.

The intercept survey methodology is designed to be simple and thus easy to understand and replicate, while also providing good data. However, questions may arise as to what really counts

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<sup>1</sup> ITE's *Trip Generation Handbook* considers peak hour of street traffic to occur between 7:00 a.m. and 9:00 a.m. in the morning and 4:00 p.m. and 6:00 p.m. in the evening.



as a “trip.” To avoid potentially biasing judgment calls in the field, the methodology assumes that every person should be counted whenever they cross any entrance threshold of the building.

- Count all individuals, regardless of age
- Count all individuals entering and exiting a doorway. Keep a separate count of those entering and those exiting. All individuals entering and exiting includes people that may not seem like they are making a relevant trip, such as people:
  - taking a smoking break,
  - walking a dog,
  - delivering a package, or
  - going for a jog.
- For vehicles with one or more passengers, the counter should record the driver and the passengers in separate columns.<sup>2</sup>
- Counters should use only one of the three forms.

Interviewers attempted to survey as many people as possible.<sup>3</sup> As soon as one interview is complete, an interviewer attempted to engage the next person entering or exiting the doorway. For those entering a building, the interviewer focused on how the individual arrived at the site. For those exiting, interviewers focused on how the individual plans on getting to his or her next destination. Multiple persons in the same traveling party were not interviewed.

Consistent with the counting rules above, anyone crossing the threshold was asked the intercept question. Those not actually taking a trip (such as those going for a smoke or walking the dog) were approached, asked about their trip and then recorded as not making a trip on the survey sheet.

To maintain simplicity, field staff focused on an individual’s most immediate mode, barring the walk to a door from a car/bus/bicycle rack etc. This methodology assumed that most individuals will answer with their primary mode of transportation. For example, trips to Metrorail or bus should be noted (and would usually be reported) as trips attributable to these transit modes *rather* than as a walk trip. The walk portion of their trip is assumed as a component of accessing this mode.

However, for those who used two modes, for example cycling to a bus, the interviewer should record the mode most recently used to access the site. If the bicycle is used between the site and the bus then the immediate mode is bike. If the person is traveling from the site by bus to access a Metro station then the immediate mode is bus.

Modes were marked as follows:

- **Drive Alone** – drove alone in a private vehicle
- **Carpool** – Driver or passenger in a private vehicle with one or more passengers
- **Walk** – Walked to/from the site from/to last location
- **Taxi** – traveled in a traditional Taxi

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<sup>2</sup> Separating these two allows a comparison of vehicle trips as well as an analysis of person trips in vehicles.

<sup>3</sup> This survey approach is a concession to field conditions. A preferred approach from a statistical perspective would be to collect a systematic sample in which the first person is selected at random and every kth person is interviewed after that.

- **Carshare** - traveled in a Transportation Networking Company vehicle such as Uber or Zipcar.
- **Bicycle** – Bicycled to/from the site from/to last location
- **Bus** –whether local, express or private
- **Shuttle** – passenger in a shuttle bus to metro or another location
- **Metro** – rode Metrorail to/from the site from/to last location
- **Other/No trip** – i.e. someone walking their dog who is not traveling to another destination

## Statistical Considerations

Developing trip generation models relies on statistical estimates and therefore requires that the data have been collected in a way that is consistent with the statistical requirements. The essential requirements for this type of work are that the subjects are randomly selected and independent from each other. It is essential that every subject and every trip has the same chance of being selected as any other subject or trip. Some possible problems include:

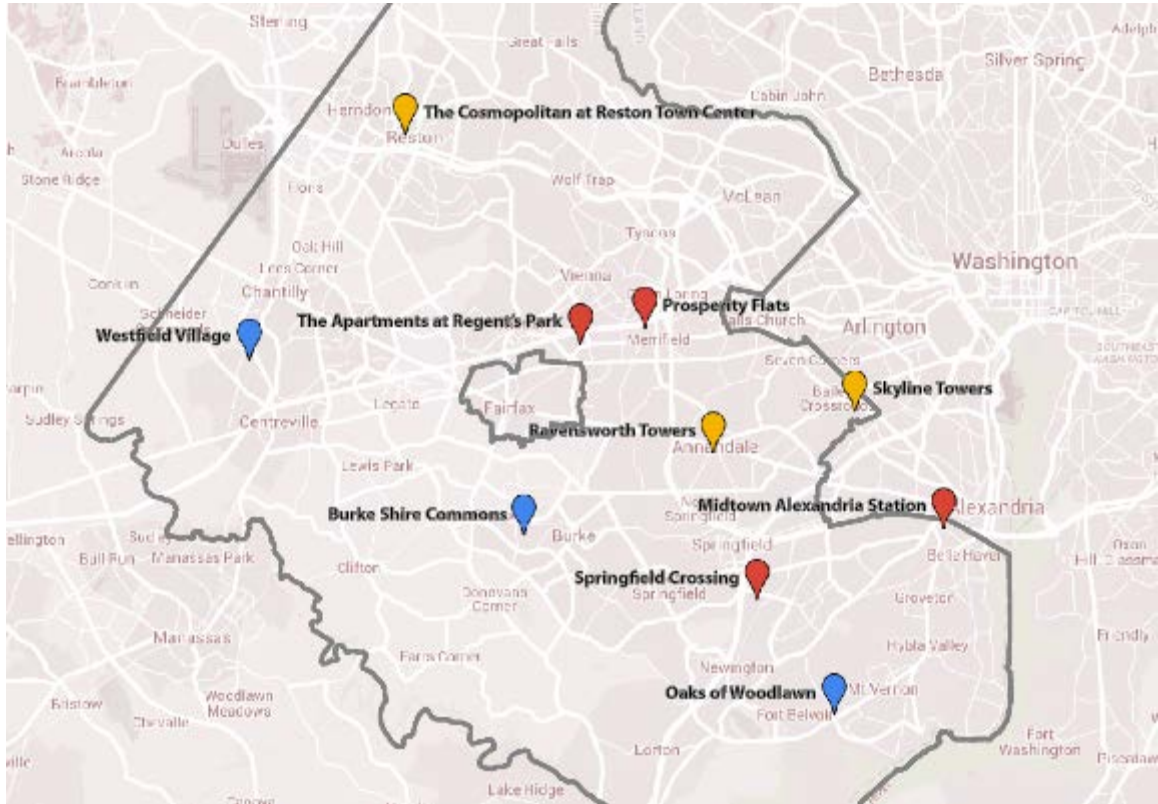
- **Deliberately or subconsciously preferencing a particular subset of the population.** Examples include preferring to approach only men or only women; preferring to approach people who have small children; avoiding people who are entering a particular store if surveying in a mixed-use development; avoiding people (or being drawn to people) who “seem like” bike riders (or some other group familiar to the surveyor). Every effort must be taken to ensure that the surveyors do not allow personal preferences to interfere with good data collection. Instructions must be clear that the surveyor is to approach the next person, not the next friendly/approachable looking person.
- **Surveying multiple persons within a single travel group** –if people are traveling together their responses are not independent. It is also important to note that some modes may accommodate groups better than others. For example, relative to a person traveling by bicycle, a person traveling by car is more likely to be with someone else. Therefore, a car trip is likely to be reported more frequently than it should simply because the same car trip is twice as likely to be selected. Ideally information on the travel party size would be collected but this may prove too difficult in one effort.
- **Imputing or guessing at a mode when the subject has not been approached or refused to answer.** Even when the surveyor sees a person unlocking and riding away on a bicycle, if they have not been surveyed or they were surveyed and refused to answer, this information must not be recorded. It will result in over counting the modes that are obvious. To further illustrate: a person walking may be walking all the way to the final destination, walking to a transit stop, or walking to a car that is parked nearby, thus their mode cannot be inferred and they cannot be recorded. In this fashion, more bicycle trips will be recorded than is warranted.

While there are some biases which cannot be controlled –for example, users of a particular mode may be more responsive, the field design is structured to eliminate as much bias as possible. In some cases though, we have recommend what is likely to be effective even when it implies a small sacrifice in the statistical correctness.

## OVERVIEW OF SELECTED PROPERTIES

Ten properties were selected for this study, as shown in Figure 2. The four TOD sites are shown in red, three walkable urban sites in yellow, and three suburban locations in blue. Further details about each property are included below.

Figure 2 Map of Study Locations



## Transit-Oriented Developments

<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="background-color: #0056b3; color: white; padding: 10px; width: 45%;"> <h3 style="margin: 0;">SPRINGFIELD CROSSING</h3> <p style="margin: 5px 0;">6704 Metropolitan Center Drive Springfield, VA 22150 <a href="http://www.springfieldcrossingapartments.com" style="color: white;">www.springfieldcrossingapartments.com</a></p> </div>  </div>	
Urban Form	Transit-Oriented Development (TOD) located 0.4 miles from the Springfield Metro Station
Construction Year	2001
Units	347 (99% occupied)
Unit Configuration	2 Bedroom: 208 3 Bedroom: 139
Rent Range	Income restricted. 2 bedroom, 1 bath from \$1,008-\$1,361 2 bedroom, 2 baths from \$1,008-\$1,364 3 bedroom from \$1,449 - \$1,570
TDM Measures	Free shuttle to Metro; visitor bike parking; sidewalks present
Parking Type	Surface Parking and Covered Garage
Parking Spaces	555
Parking Price	Each unit can request up to 2 surface parking passes for free. The covered garage parking spaces cost \$50/month.

<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="background-color: #0056b3; color: white; padding: 10px; width: 45%;"> <h3 style="margin: 0;">PROSPERITY FLATS</h3> <p style="margin: 5px 0;">2700 Dorr Ave Fairfax, VA 22031 <a href="http://www.prosperityflats.com" style="color: white;">www.prosperityflats.com</a></p> </div>  </div>	
Urban Form	Transit-Oriented Development (TOD) located 0.4 miles from the Merrifield Metro Station
Construction Year	2013
Units	327 (95% occupied)
Unit Configuration	1 bedroom: 210 1 bedroom + den: 22

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Fairfax County, VA

	2 bedroom: 74 2 bedroom + den: 21
Rent Range	1 bedroom: \$1,830 1 bedroom + den: \$2,065 2 bedroom: \$2,505 2 bedroom + den: \$2,560
TDM Measures	Offer one free \$70 metro card per move in. Bike/walk information is provided along with a secure bike room equipped with racks and repair stand.
Parking Type	Surface Parking and Covered Garage
Parking Spaces	423
Parking Price	\$50/month for the first uncovered space \$100/month second uncovered space \$75/month for the first covered space \$150/month second covered space \$200/month third covered space

## MIDTOWN ALEXANDRIA CONDOMINIUMS

2451 Midtown Ave, Alexandria, VA 22303  
[www.midtownalexandriacondos.com](http://www.midtownalexandriacondos.com)



Urban Form	Transit-Oriented Development (TOD) located 0.4 miles from Huntington Metro Station.
Construction Year	2007
Units	368 (100% occupied)
Unit Configuration	Studio: 14 1 Bedroom: 144 2 Bedroom: 210
Rent Range	Condominiums
TDM Measures	None
Parking Type	Garage Parking
Parking Spaces	582
Parking Price	Spaces are originally deeded with the units



## THE APARTMENTS AT REGENT'S PARK

9333 Clocktower Place, Fairfax VA, 22031  
www.regentsparkapartments.com



Urban Form	Transit-Oriented Development (TOD) located 0.4 miles from Vienna Fairfax Metro Station.
Construction Year	1997
Units	552 (96% occupied)
Unit Configuration	1 bedroom: 250 2 bedroom: 250 3 bedroom: 52
Rent Range	1 bedroom: \$1,586 2 bedroom: \$1,803 3 bedroom: \$2,251
TDM Measures	Covered bike racks are available for residents.
Parking Type	500 surface parking spaces 375 covered parking spaces 24 private garages
Parking Spaces	899
Parking Price	Free surface parking. Covered spaces are \$50/month, and private garages are \$150/month.

## Urban Properties

### SKYLINE TOWERS

5599 Seminary Rd., Falls Church, VA 22041

[www.equityapartments.com/virginia/alexandria-arlington-apartments/baileys-crossroads/skyline-towers-apartments](http://www.equityapartments.com/virginia/alexandria-arlington-apartments/baileys-crossroads/skyline-towers-apartments)



Urban Form	Urban – Bailey’s Crossroads area
Construction Year	1973
Units	939 (96% occupied)
Unit Configuration	Studio: 156 1 bedroom: 365 2 bedroom: 260 3 bedroom: 158
Rent Range	Studio: \$1,190 1 bedroom: \$1,290 2 bedroom: \$1,615 3 bedroom: \$2,150
TDM Measures	None.
Parking Type	Covered garage parking with surface parking spaces for visitors
Parking Spaces	1208
Parking Price	\$50 for first space and \$60 for second space

### RAVENSWORTH TOWERS

4327 Ravensworth Rd, Annandale, VA 22003

[www.ravensworthtowers.com](http://www.ravensworthtowers.com)



Urban Form	Urban – Annandale area
Construction Year	1974
Units	219 (99% occupied)
Unit Configuration	1 bedroom: 144 2 bedroom: 75
Rent Range	1 bedroom: \$1,274

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Fairfax County, VA

	2 bedroom: \$1,615
TDM Measures	None
Parking Type	Surface parking
Parking Spaces	326
Parking Price	Unassigned parking is \$15/month; reserved parking is \$40/month.

<div style="display: flex; align-items: center;"> <div style="background-color: #0072bc; color: white; padding: 10px; flex: 1;"> <p style="margin: 0;"><b>THE COSMOPOLITAN</b></p> <p style="margin: 0;">1855 Saint Francis Street, Reston, VA 20190 <a href="http://thecosmopolitanreston.com" style="color: white;">http://thecosmopolitanreston.com</a></p> </div>  </div>	
Urban Form	Urban – Reston area
Construction Year	2005
Units	289 (95% occupied)
Unit Configuration	Studio: 18 1 bedroom: 99 2 bedroom: 154 3 bedroom: 18
Rent Range	Studio: \$1846-2016 1 bedroom: \$2068-2365 2 bedroom: \$2583-3088 3 bedroom: \$3653
TDM Measures	Transit information is provided in the lobby and there is secure bike parking for residents.
Parking Type	Garage parking
Parking Spaces	469
Parking Price	1st space is free; \$100 for each additional space.

## Suburban Properties

### BURKE SHIRE COMMONS

5812 Chase Commons Court, Burke, VA 22015  
www.burkeshirecommonsapts.com



Urban Form	Suburban – Burke area
Construction Year	1986
Units	360 (96% occupied)
Unit Configuration	1 bedroom: 130 2 bedroom: 190 3 bedroom: 40
Rent Range	1 bedroom: \$1,529 2 bedroom: \$1629-\$3140 3 bedroom: \$2031-\$4161
TDM Measures	None.
Parking Type	Surface parking
Parking Spaces	627
Parking Price	\$15/month; \$30-\$50/month for reserved parking.

### OAKS OF WOODLAWN

8799 Old Colony Way, Alexandria, VA 22309  
www.oaksofwoodlawnapartments.com



Urban Form	Suburban – Mt. Vernon/Route 1 area
Construction Year	1985
Units	175 (92% occupied)
Unit Configuration	1 bedroom: 75 2 bedroom: 100
Rent Range	1 bedroom: \$1,375 2 bedroom: \$1,575
TDM Measures	None.

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Fairfax County, VA

Parking Type	Surface parking
Parking Spaces	298
Parking Price	Free

<div style="display: flex; align-items: center;"> <div style="background-color: #0072bc; color: white; padding: 10px; flex: 1;"> <p><b>WESTFIELD VILLAGE</b></p> <p>5115 Woodmere Drive, Centreville, VA 20120</p> <p><a href="http://livecentreville.com" style="color: white;">http://livecentreville.com</a></p> </div>  </div>	
Urban Form	Suburban – Centreville area
Construction Year	1988
Units	229 (98% occupied)
Unit Configuration	1 bedroom: 96 2 bedroom: 91 3 bedroom: 42
Rent Range	1 bedroom: \$1,325 2 bedroom: \$1,711 3 bedroom: \$2,213
TDM Measures	None.
Parking Type	Surface parking
Parking Spaces	355
Parking Price	Free

## Property Assessment

The selected properties were evaluated in terms of building specific characteristics, such as the date of construction, rent range, and number of units, as well as neighborhood characteristics, such as the distance to Metrorail, bus stops, highways, or bike facilities.

Unsurprisingly, TOD buildings are located closer to Metrorail stations and highways than buildings located in urban and suburban areas, while urban buildings are located closest to the bus network. On average, the highest Walk Scores were found in the buildings located in urban areas, the second highest in TOD areas, while the buildings in suburban areas had the lowest, most car-dependent scores.



Parking and Trip Generation in Multifamily Residential Developments  
Fairfax County, VA

**Figure 3 Neighborhood Characteristics**

	N	All	TOD	Urban	Suburban
Distance from bus stop (in feet)	10	1795	1716	1232	2464
Distance from highway (in feet)	10	5518	3366	6688	7216
Distance from Metrorail (in feet)	10	15417	1715	17777	31327
Distance from Nonmotorized Trail (in feet)	10	2867	1650	5773	1584
Walk Score	10	51	52	70	30

The TOD buildings were the newest construction, while urban and suburban properties were, on average, 20 years older.

Properties in urban areas were generally larger, with more units than those in TOD or suburban areas. The average number of units per building was 482 in urban areas, almost twice as the number of units in buildings located in suburban areas (255) and more than TOD buildings (399). Similarly, the number of bedrooms in urban properties were higher (710 rooms), than TOD buildings (565 rooms) or suburban (436 rooms).

The majority of the properties studied were market-rate. Two properties located in TOD areas were not; one property was income restricted and one was a condominium. Of the nine rental properties, the average rent for a two- bedroom apartment was \$1,914 across all areas, and was highest in urban areas. The average two-bedroom rent was \$2,022/month in the urban areas, 10% more expensive than renting a similar unit in a TOD building, and 7% more expensive than renting in the suburban areas.

**Figure 4 Building Characteristics**

	N	All	TOD	Urban	Suburban
Year Built	10	1993	2005	1984	1986
Total Units	10	381	399	482	255
Occupancy Rate	10	96%	97%	97%	95%
Total Bedrooms <sup>1</sup>	10	570	565	710	436
Average Two Bedroom Rent <sup>2</sup>	9	\$1,914	\$1,831	\$2,022	\$1,890
Parking Spaces	10	574	615	668	427
Parking Ratio	10	1.5	1.5	1.4	1.7

<sup>1</sup> - The calculation of number of bedrooms considered studio units to be one bedroom and dens to not be a bedroom. <sup>2</sup> - The average rent for a two bedroom apartment was for units without a den.

The property manager at each building was asked about transportation demand management services or incentives available to residents. All of the TOD buildings reported offering at least one type of bike parking amenity onsite. One of the three urban properties offered secure bike parking and no suburban properties offered bike amenities.

Three of the ten buildings offer transit amenities or incentives, two TOD and one in an urban area. Springfield Crossing provides a free shuttle to Metro, Prosperity Flats offers bike/walk information and \$70 metro card per move in, and the Cosmopolitan at Reston Town Center provides transit information.

Figure 5 Building TDM Services Available

	N	All	TOD	Urban	Suburban
Bike Parking or Amenities	10	5	4	1	0
Transit Incentives or Amenities	10	3	2	1	0

## DATA AND RESULTS

### Mode Share

Based on the intercept survey and person count, on average 66.1% of residents and visitors to the selected multifamily residential properties during peak periods drove alone. Conversely, 33.9% of trips generated by the properties were completed by other means, with 13.7% carpooling; 11.9% using transit; 6.4% walking; 0.5% biking; and the remaining 1.5% by shuttle, taxi, or carshare.

Figure 6 shows the average observed mode share across all multifamily properties.

Figure 6 Average Mode Share for All Multifamily Properties

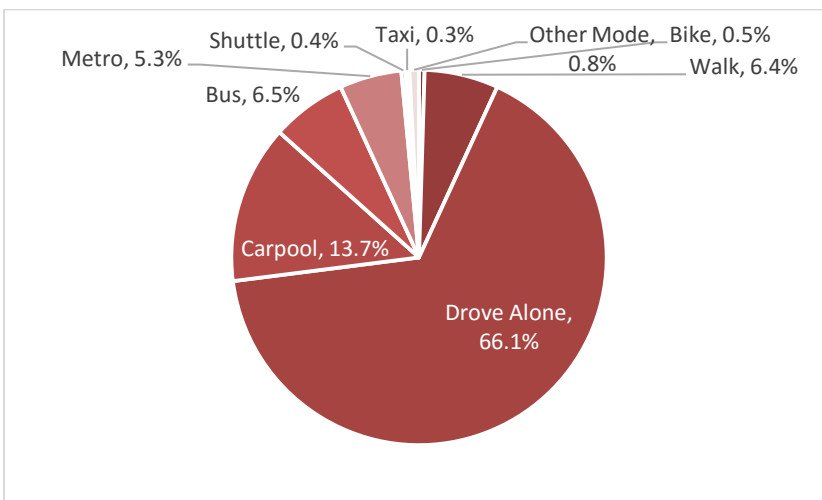


Figure 7 through Figure 9 shows the average observed mode share for properties in each of the three urban form locations. Drive-alone mode share is similar in TOD and suburban locations, and is ten points lower in urban areas. Walk share is 12% in urban areas and 4-5% in TOD and Suburban areas.

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Fairfax County, VA

Figure 7 Average Mode Share for TOD Properties

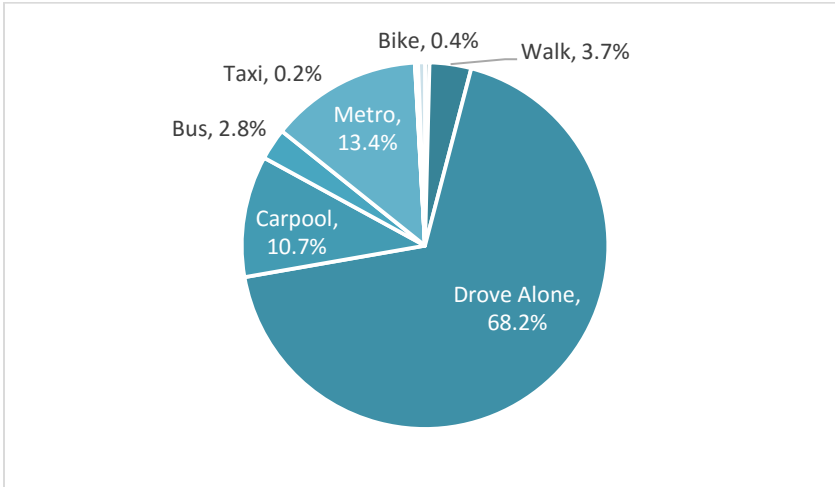


Figure 8 Average Mode Share for Urban Properties

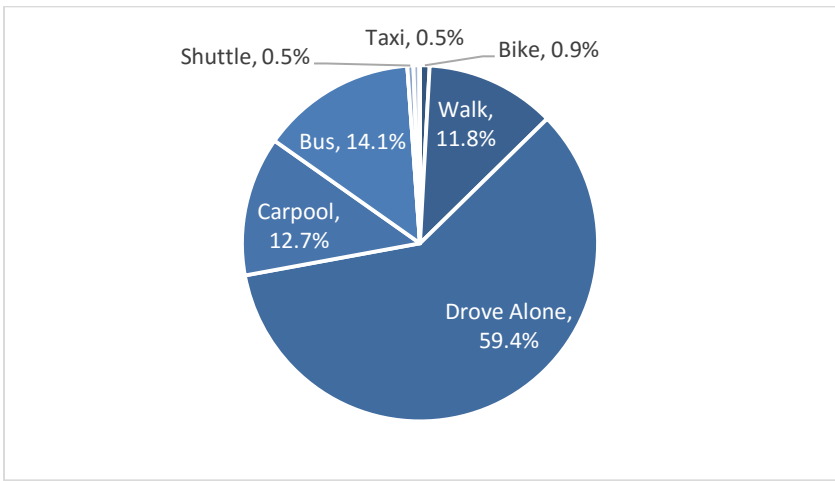
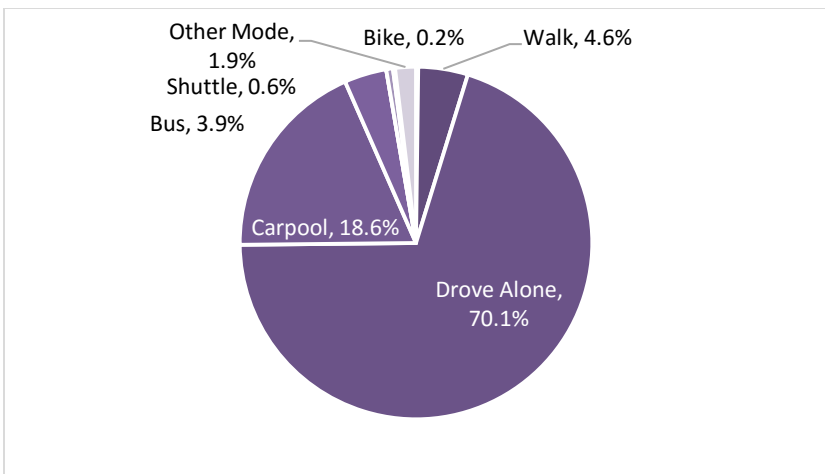


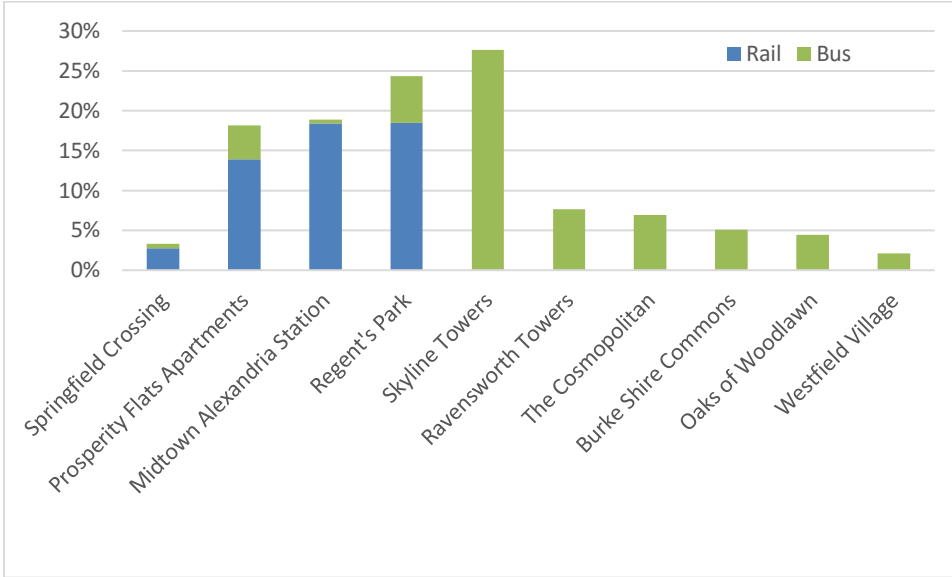
Figure 9 Average Mode Share for Suburban Properties



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Fairfax County, VA

As expected, the mode share for transit is highest for TOD properties, Bus and Walk Trips in Urban properties, and carpool trips in Suburban properties. Figure 10 shows the bus and Metrorail mode share for each property.

Figure 10 Transit Mode Share



## Vehicle Trip Generation

Weekly vehicle trip generation is significantly higher in suburban buildings than in TOD or urban buildings, with 45.4 weekly vehicle trips per unit in comparison to 28.0 weekly vehicle trips per unit in TOD buildings and 30.4 in buildings in urban areas.

Figure 11 Trip generation characteristics

	N	All	TOD	Urban	Suburban
Total Weekly vehicle trips	10	12,360	11,198	14,677	11,591
Total Weekly vehicle trips/Unit	10	32.4	28.0	30.4	45.4

## Comparison to ITE Estimates

The actual vehicle trip generation of the selected multifamily residential properties was compared to predicted trip generation based on Institute of Transportation Engineers (ITE) trip rates for Apartments (code 220) or Condominiums (230). The ITE rates are given in terms of the number of residential units or on the estimated number of adult residents. The actual observed vehicle trip generation uses the automatic vehicle count data for the garage entrances and exits.

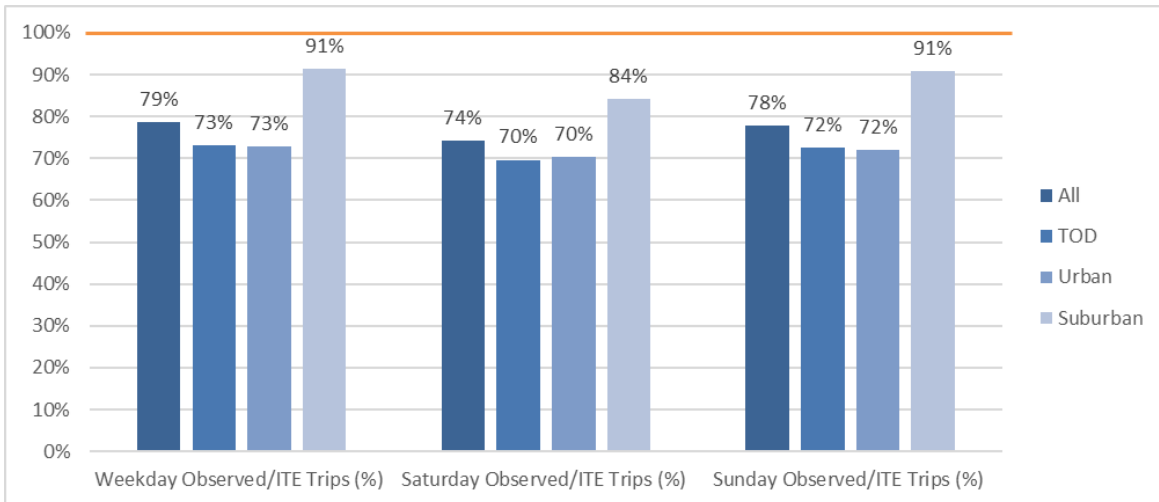
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Fairfax County, VA

Figure 12 Observed Vehicle Trip Generation Compared to ITE Standards

Property	Weekday AM Peak	Weekday PM Peak	Weekday	Saturday	Sunday
Springfield Crossing	103%	106%	125%	125%	124%
Prosperity Flats Apartments	62%	47%	47%	45%	44%
Midtown Alexandria Station	63%	86%	75%	66%	73%
Regent's Park	47%	55%	46%	43%	49%
Skyline Towers	52%	60%	71%	68%	71%
Ravensthorpe Towers	106%	101%	105%	105%	102%
The Cosmopolitan	50%	44%	43%	39%	42%
Burke Shire Commons	101%	96%	101%	97%	111%
Oaks of Woodlawn	75%	77%	74%	70%	73%
Westfield Village	94%	81%	99%	86%	88%

The vehicle trip generation rates are on average 23% lower than the ITE rates corresponding to the same building category for both weekdays, Sundays and Saturdays. Comparing different areas, rates are about 10% lower in Suburban Areas and 30% in TOD and Urban Areas.

Figure 13 Average Observed Vehicle Trip Generation Compared to ITE Standards



## Parking Occupancy

Parking ratios varied across the selected multifamily residential properties. The lowest parking space per unit was at 1.29 spaces per unit at Prosperity Flats near the Merrifield Metro station. One of the newest properties surveyed in the study, this building also has a robust TDM program in place, offering residents a \$70 pre-loaded SmarTrip card upon move in. Figure 14 shows the construction date and parking ratio for each of the properties included in this study. Note that



Parking and Trip Generation in Multifamily Residential Developments  
Fairfax County, VA

Prosperity Flats Apartments, Skyline Towers, and Midtown Alexandria Station have approved parking reductions from the Fairfax County Board and Ravensworth Towers and Westfield Village were approved under a required parking ratio of 1.5 spaces/unit which was the requirement prior to 8/4/1987.

Figure 14 Parking Ratios and Construction Date

Property	Construction Date	Parking Ratio (spaces/unit)
Prosperity Flats Apartments	2013	1.29
Skyline Towers	1973	1.29
Ravensworth Towers	1974	1.49
Westfield Village	1988	1.55
Midtown Alexandria Station	2007	1.58
Springfield Crossing	2001	1.60
The Cosmopolitan at Reston Town Center	2005	1.62
The Apartments at Regent's Park	1997	1.63
Oaks of Woodlawn	1985	1.70
Burke Shire Commons	1986	1.74

Note that Prosperity Flats Apartments, Skyline Towers, and Midtown Alexandria Station have approved parking reductions from the Fairfax County Board and Ravensworth Towers and Westfield Village were approved under a required parking ratio of 1.5 spaces/unit which was the requirement prior to 8/4/1987.

Utilization of the parking areas at each multifamily residential property varied based on the time of day and on weekdays versus weekends. The average parking occupancy across all properties was 57%, with the average highest parking occupancy at 80% and the lowest at 28%. The maximum parking occupancy across all properties was 80%. Occupancy was generally lower midweek and higher Friday through Monday across all the buildings. Overnight utilization of the spaces was higher than midday. Figure 15 shows the minimum and maximum parking utilization observed at each multifamily property.

Figure 16 shows the maximum daily parking occupancy adjusted by the percentage of occupied units on the property at the time of the study, as the properties were between 90% and 100% occupied at the time of the survey.

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Fairfax County, VA

Figure 15 Minimum and Maximum Daily Multifamily Property Parking Utilization

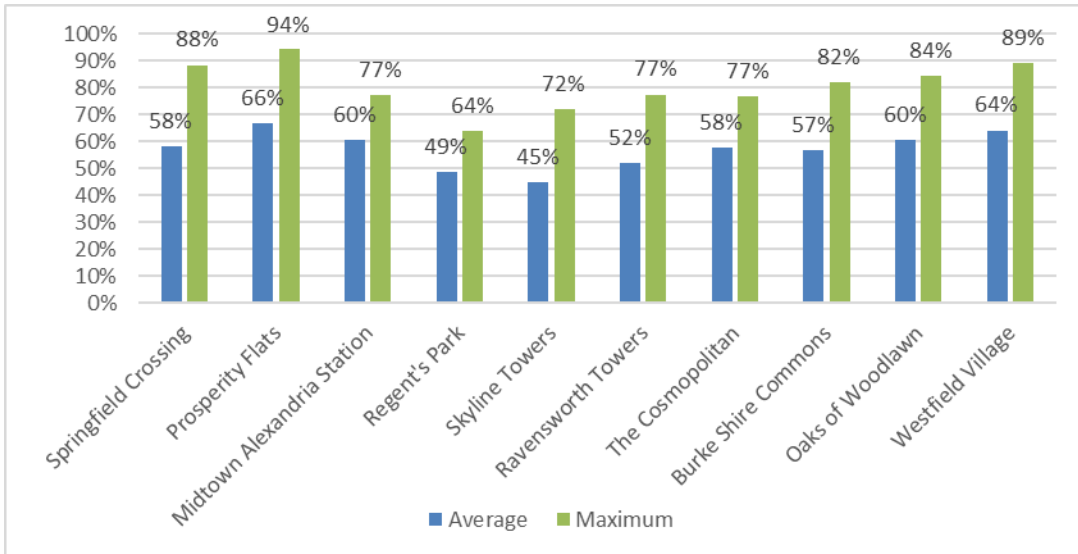


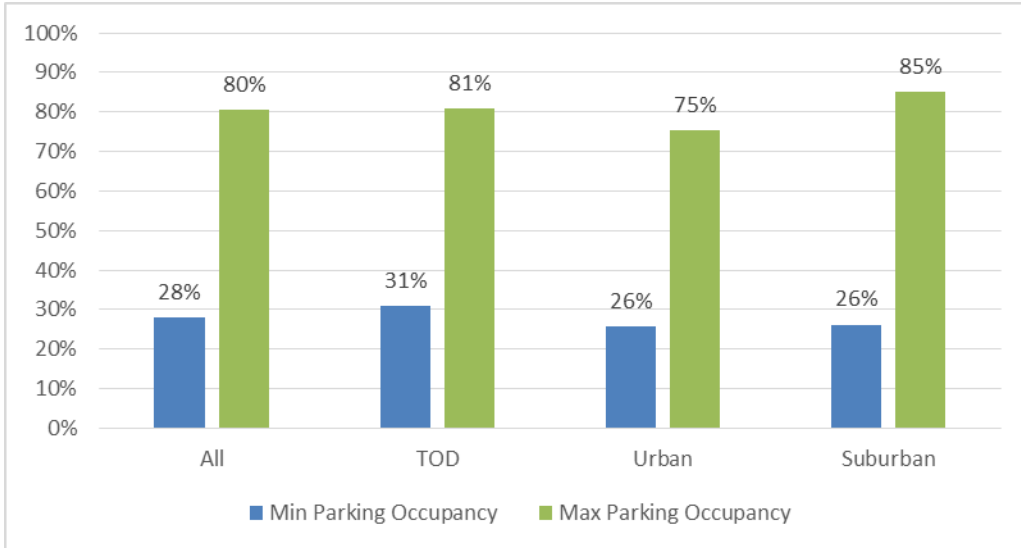
Figure 16 Maximum Daily Multifamily Property Parking Utilization Adjusted by Percentage of Occupied Units

Property	% Maximum Parking Occupancy	% Units Occupied	Adjusted Max Parking Utilization
Springfield Crossing	88%	99%	89%
Prosperity Flats	94%	95%	100%
Midtown Alexandria Station	77%	100%	77%
Regent's Park	64%	96%	67%
Skyline Towers	72%	96%	75%
Ravenworth Towers	77%	99%	78%
The Cosmopolitan	77%	95%	81%
Burke Shire Commons	82%	96%	86%
Oaks of Woodlawn	84%	92%	92%
Westfield Village	89%	97%	92%

The parking occupancy varied only slightly between the different types of urban form. On average, daily parking occupancies are higher in TOD and Suburban areas. However, focusing only in the lowest parking occupancy rates, suburban and urban areas have 26% and TOD with 31%.

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Fairfax County, VA

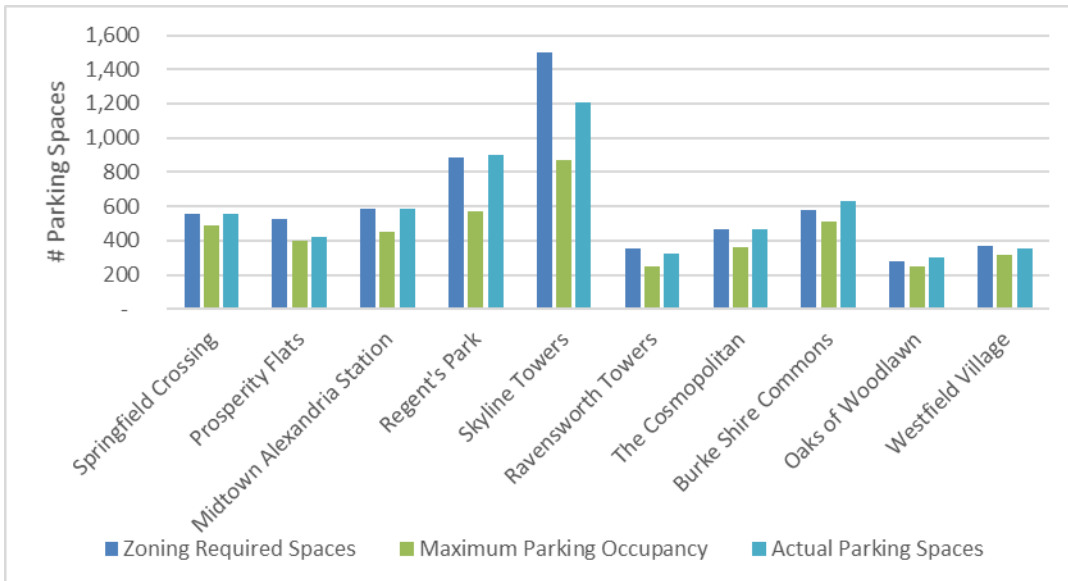
Figure 17 Maximum and Minimum Parking Occupancy by Urban Form



### Comparison to Current Zoning Requirements

The observed parking utilization of the selected multifamily residential properties was compared to the parking requirements in the current Fairfax County Zoning Ordinance. The current ordinance requires multifamily residential properties to provide 1.6 parking spaces per unit. The ordinance is intended to ensure developments provide adequate parking for residents onsite and to avoid impacts on surrounding areas and on-street parking. Figure 18 compares maximum parking occupancy at each property with the required parking under the current zoning ordinance and actual parking provided. There is the greatest difference - and potential excess parking - provided at the TOD and urban properties, as shown in Figure 19.

Figure 18 Graph of Zoning Required Parking with Maximum Parking Utilization



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Fairfax County, VA

Figure 19 Table of Zoning Required Parking with Maximum Parking Utilization and Parking Supplied

	Actual Parking Spaces	Zoning Required Spaces	Maximum Parking Occupancy	Zoning minus Max Occupancy	% Potential Excess Parking
Springfield Crossing	555	555	490	65	12%
Prosperity Flats	423	523	399	124	24%
Midtown Alexandria Station	582	589	449	140	24%
Regent's Park	899	883	574	309	35%
Skyline Towers	1,208	1,502	869	633	42%
Ravenworth Towers	326	350	252	98	28%
The Cosmopolitan	469	462	360	102	22%
Burke Shire Commons	627	576	514	62	11%
Oaks of Woodlawn	298	280	251	29	10%
Westfield Village	355	366	316	50	14%

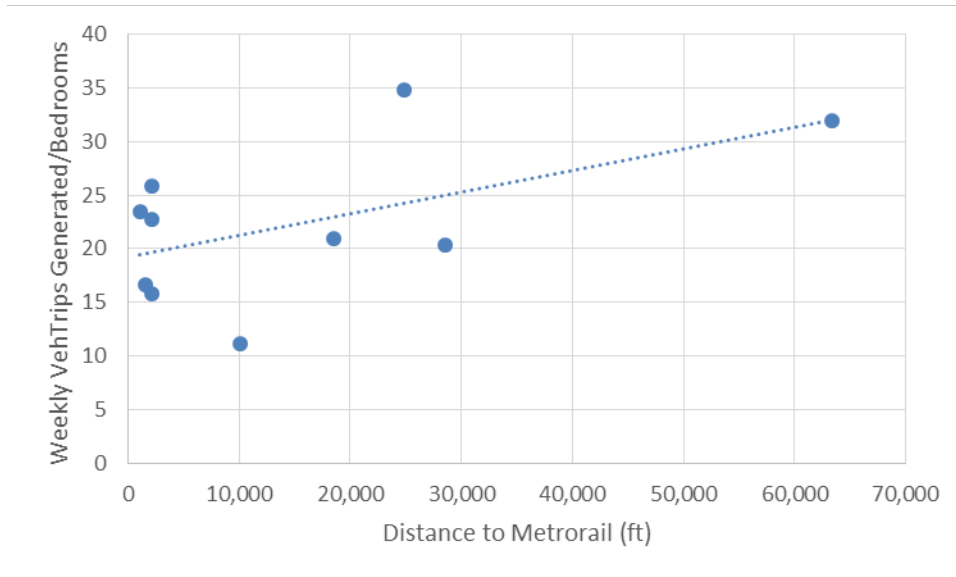
## CORRELATED ANALYSIS

Using the property characteristics, urban form, and observed travel patterns, this section will draw conclusions about parking and trip generation.

### Distance from Metro and Vehicle Trip Generation

The number of weekly vehicle trips generated per bedroom in the buildings is directly correlated to the distance to a Metrorail station. Multifamily developments located closer to a Metrorail station generated fewer weekly vehicle trips per bedroom. Suburban properties generated 26 weekly vehicle trips per bedroom, while urban properties generated 22.3 and TOD generated 19.6.

Figure 20 Relation between Weekly vehicle trips generated per bedroom and Distance to Metrorail (ft)



## Walk Score and Mode Share

Drive-alone mode share is inversely related to Walk Score and directly related to the walking and biking mode share. Walk Score is an imperfect measure of urban form and the number of destinations that are walkable to a location, but the results seem to confirm that overall it can be a general predictor of mode shifts.

Figure 21 Drive-alone share by Walk Score

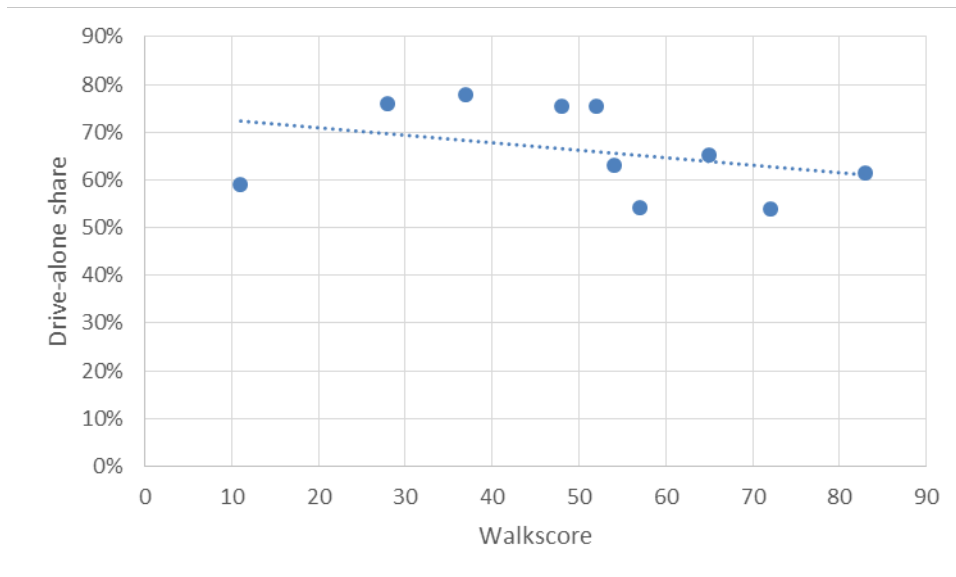
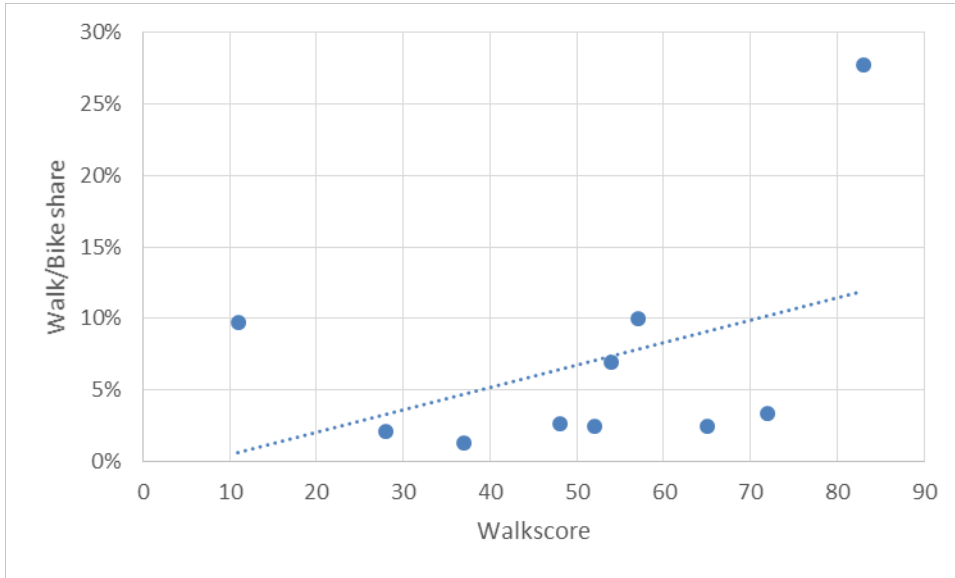




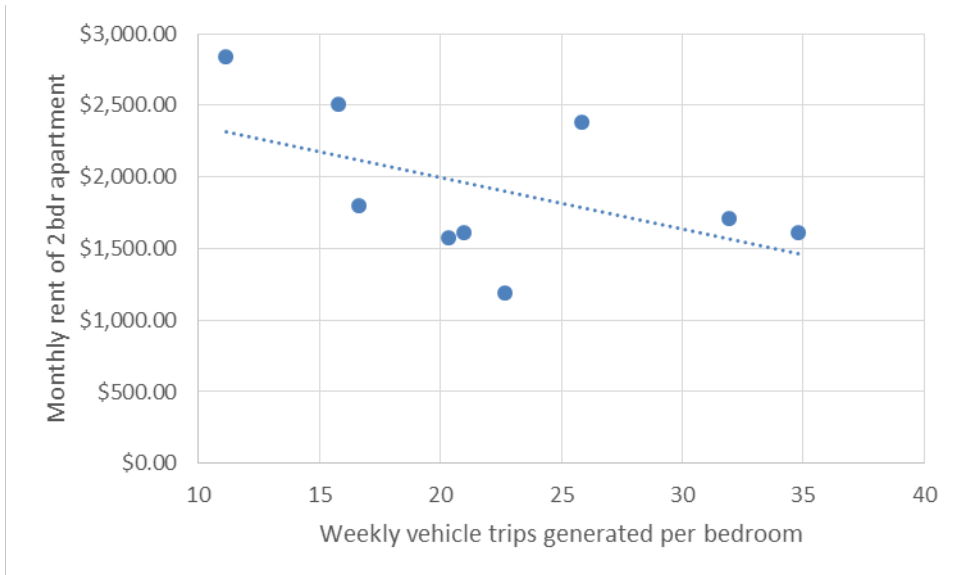
Figure 22 Walk/Bike share by Walk Score



### Average Rent and Vehicle Trip Generation

The average rent for a two bedroom apartment is negatively related to weekly vehicle trips per bedroom generated at the property. Properties with higher rents could indicate that residents are more likely to combine commute and non-commute trips. At lower priced properties, residents might work non-traditional schedules causing them to make more vehicle trips.

Figure 23 Weekly vehicle trips generated/bedroom and Monthly rent

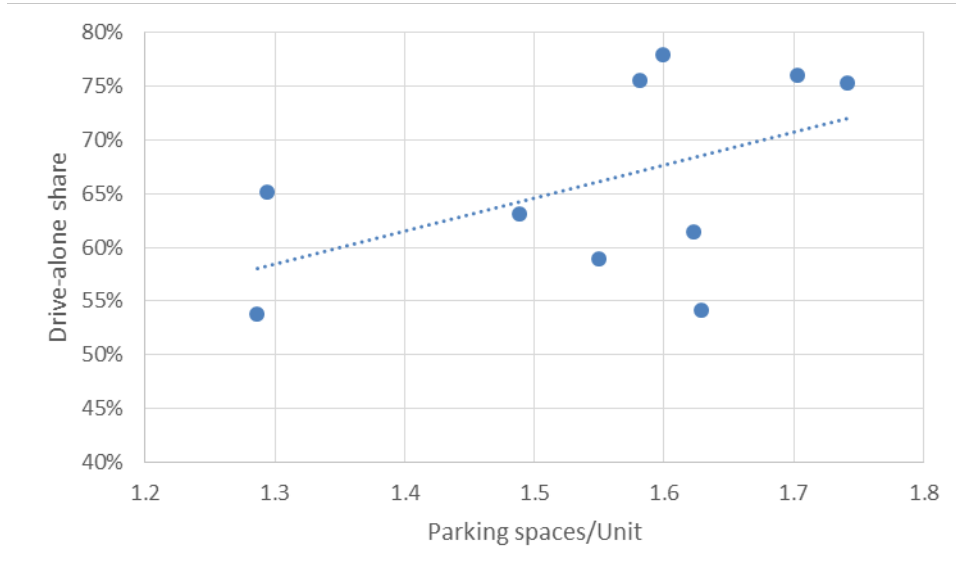


### Drive Alone Mode Share and Parking per Unit

The use of a private vehicle is directly related to number of parking spaces per unit at the property. Multifamily properties with more parking spaces have a higher drive alone mode share.

This could be because residents are confident that a parking space will be available for them when they return to the building.

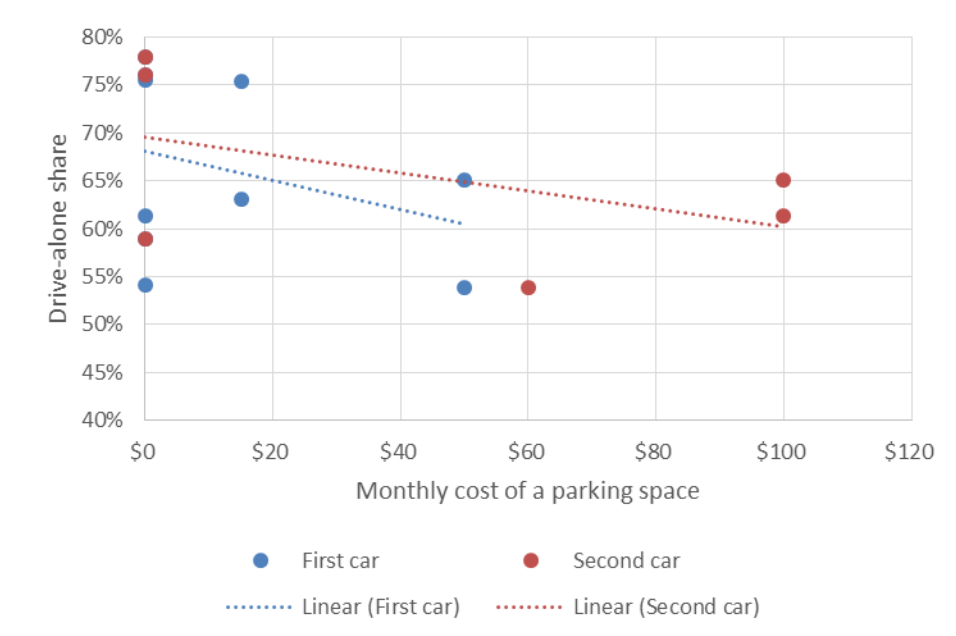
Figure 24 Drive-alone share and Parking spaces/Unit



### Drive Alone Mode Share and Parking Cost

Drive alone mode share is negatively related to the price of parking at the multifamily development. The more expensive is the rent a space to park a car in the building, the lower is the drive-alone share, for both the first and the second car. However, since many of the properties reported not charging for parking, these results are not conclusive without a larger sample size.

Figure 25 Drive-alone share and Monthly cost of a parking space



## CONCLUSION

This transportation study evaluated the actual vehicle trip generation, mode share, and parking utilization at ten multifamily residential properties in Fairfax County, VA. The properties are located in a range of urban environments from transit-oriented to more suburban locations and with varying access to a transportation services.

Traditionally, traffic impact studies estimate vehicle impacts on the transportation network using ITE trip generation rates. ITE rate data are predominantly collected from single-use sites which tend to be in auto-oriented locations. The findings of this study show that vehicle trip generation rates at the study locations regardless of the urban form context are less than the ITE-predicted total trips for both daily and peak periods.

Like many places across the country, Fairfax County has minimum parking requirements in place for different types of land uses. These requirements in the zoning code are intended to limit any possible spillover effects from resident's parking in nearby areas by ensuring enough parking is provided onsite. The results of the study show that maximum parking utilization at the study locations are less than the required parking minimums. Parking utilization trends were generally consistent across all the buildings. The parking areas were generally 80% occupied overnight and dropped to about 20% occupancy during the mid-day period.

An analysis of the actual trip generation and parking garage utilization at 10 multifamily residential properties compared with the building's location, transportation options, the price of parking, unit mix, and other factors found that locations near transit, walking, and biking facilities had fewer vehicle trips than properties located in areas without transportation options.

# Appendix A Study Outreach Flyer



## EVALUATION OF PARKING & TRIP GENERATION IN FAIRFAX COUNTY MULTIFAMILY DEVELOPMENTS

### PROJECT OBJECTIVE

Fairfax County is working with multifamily properties across the county to measure how people drive, park, walk, bike, or ride each day. Why? Too often we get it wrong using national estimates that cannot account for our region's mix of uses, density, transit, and great walking & biking. By counting people entering and exiting existing multifamily properties, we can better predict parking needs for future developments and build the right amount of roads, parking, sidewalks, bike lanes, and transit. Help us continue to make Fairfax County a great place to live!

### WHAT WE WILL DO

This project cannot happen without help from you! Ten multifamily properties throughout the county have been identified for the study. For each, our data collectors will conduct the following:

#### A) Person Counts:

- Counts of all people entering and exiting a site by any mode during morning and evening peak periods of activity
- Automated driveway counts and in-person clipboard counts at every entry/exit door

#### B) Mode of Travel Surveys:

- Fifteen-second intercept surveys of entering/exiting people
- Survey asks about travel mode for both arriving at and leaving the site if individual agrees to interview

#### C) Factors Affecting Demand

- Interviews with property management regarding occupancy, unit mix, availability of bicycle parking, ridesharing, shuttles, etc.

### What Do We Need From You?

#### A) Permission for Building Access

- Our data collectors will need to be on-site between 7AM and 10AM, and again between 4PM and 7PM.
- We need to post 1-2 people at each entry used regularly by building occupants.

#### B) Permission to Interview Travelers

- Our short intercept survey will take 5 seconds:
- "How will you travel to your next destination?" (or, "How did you travel to get here?")
    - Auto driver  Auto passenger
    - Walk  Bus
    - Rail  Bicycle
  - "If you drove, where did you park?"
    - On-site  On the street  Other

#### C) A Brief Interview with Building Management

- We need 5 minutes to answer questions such as:
- Who pays for parking? How? How much?
  - Are transit passes sold here? Are they subsidized?
  - Do you have bicycle parking? Lockers? Showers?
  - Do you have a shuttle? Carpool spaces? Ridesharing? Car sharing? etc.



Parking and Trip Generation in Multifamily Residential Developments  
Fairfax County, VA

**Door Count ONLY form – ENTERING OR EXITING**

*For high-traffic locations where one person is ONLY counting people, NOT interviewing them.*

Please tally the number of people going in and out in the boxes below. If you are watching two doors, please indicate which in the box that says "Door:"

Location: \_\_\_\_\_ Counter: \_\_\_\_\_ Date \_\_\_\_\_ Start Time: \_\_\_\_\_ : \_\_\_\_\_ am/pm

Time	Direction	Door	Door	Door
:00 to :15	<b>In</b>			
	<b>Out</b>			
:15 to :30	<b>In</b>			
	<b>Out</b>			
:30 to :45	<b>In</b>			
	<b>Out</b>			
:45 to :00	<b>In</b>			
	<b>Out</b>			

### Vehicle Count ONLY form – ENTERING OR EXITING

*For counting vehicles entering or exiting a parking lot or garage.*

If the vehicle has only one occupant, make a tally under “Driver.”

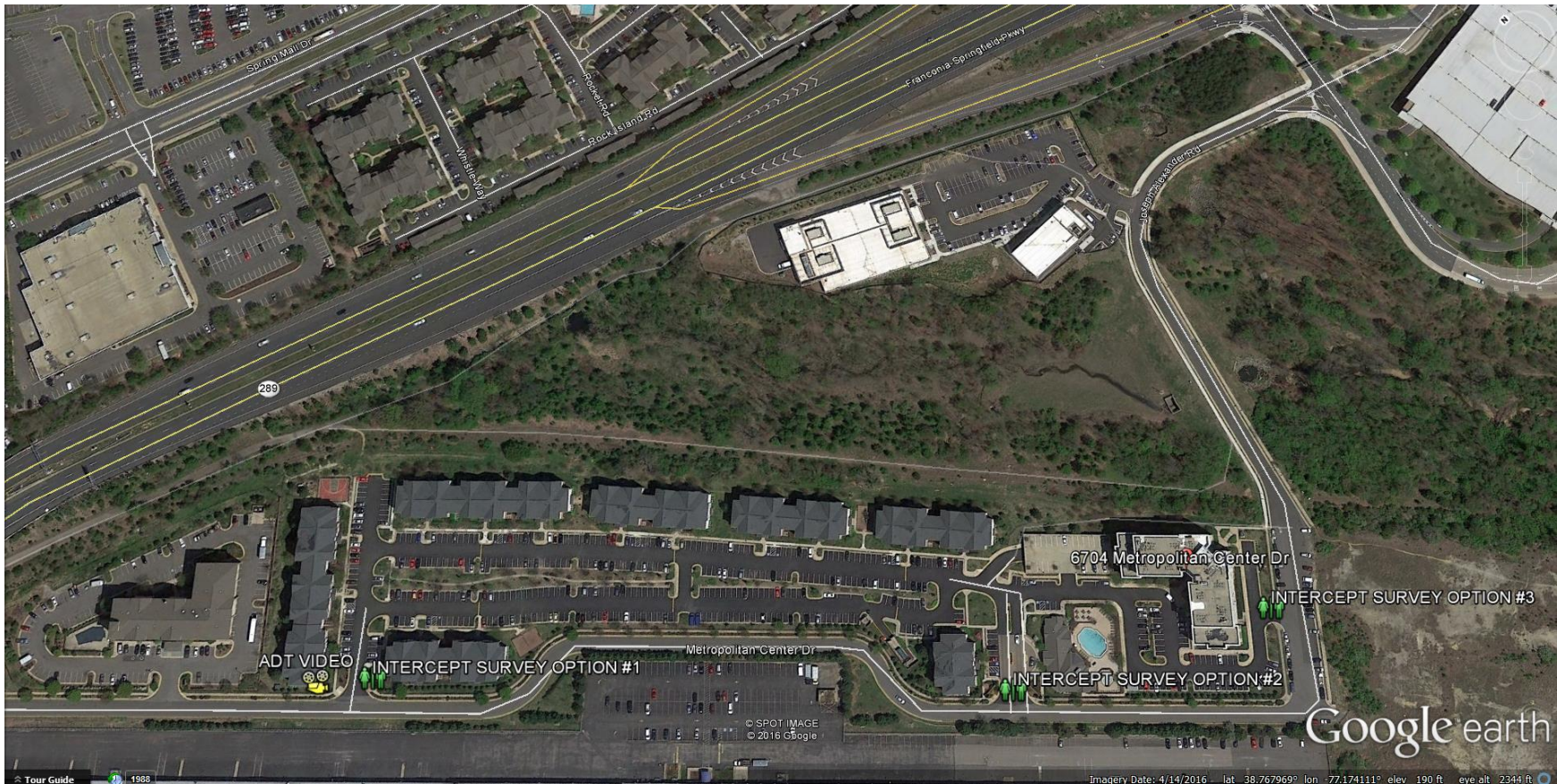
If the vehicle has multiple occupants, make one tally for the driver, then one tally for each adult passenger and child (under 16) passenger.

Location: \_\_\_\_\_ Counter: \_\_\_\_\_ Date \_\_\_\_\_ Start Time: \_\_\_\_\_ : \_\_\_\_\_ am/pm

Time	Direction	Drivers	Passengers	
			Adults	Children (under 16)
:00 to :15	In			
	Out			
:15 to :30	In			
	Out			
:30 to :45	In			
	Out			
:45 to :00	In			
	Out			



# **Appendix C Data Collection Locations**



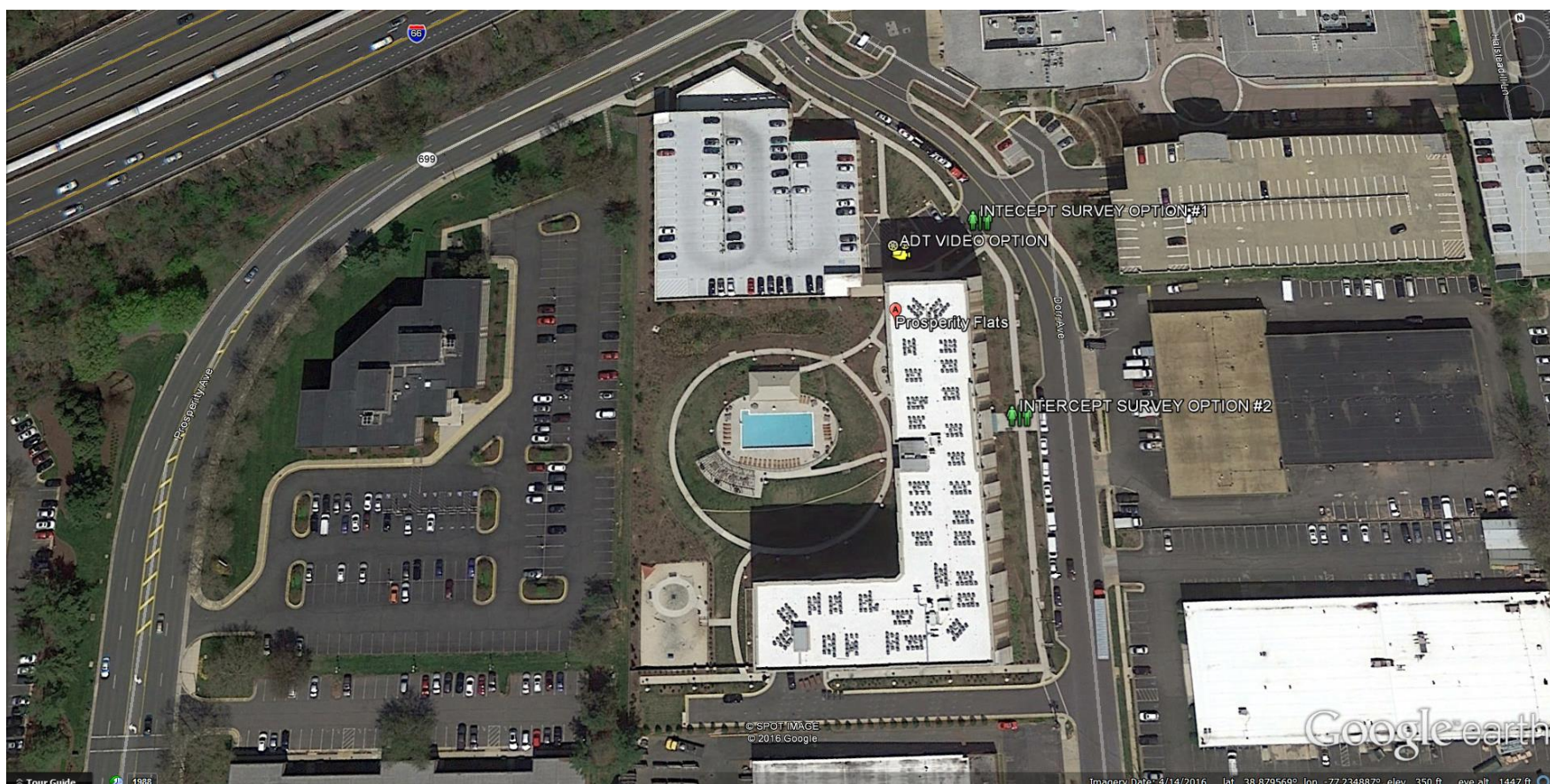
Springfield Crossing

6704 Metropolitan Center Drive, Springfield, 22150

866-692-9627

[www.springfieldcrossingapartments.com/features.html](http://www.springfieldcrossingapartments.com/features.html)



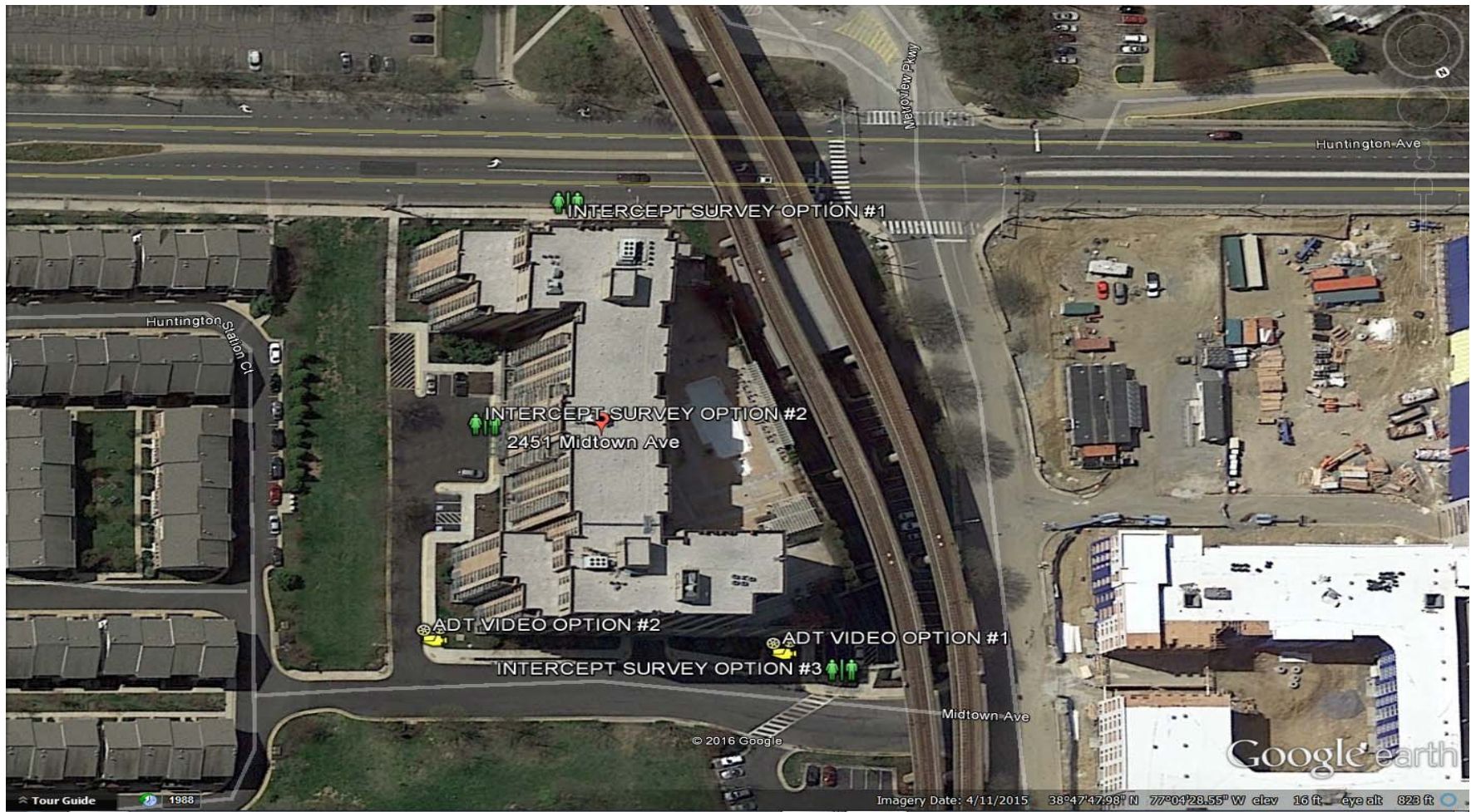


## Prosperity Flats Apartments

2700 Dorr Ave Apt 5492-1, Fairfax VA, 22031

[www.prosperityflats.com](http://www.prosperityflats.com)





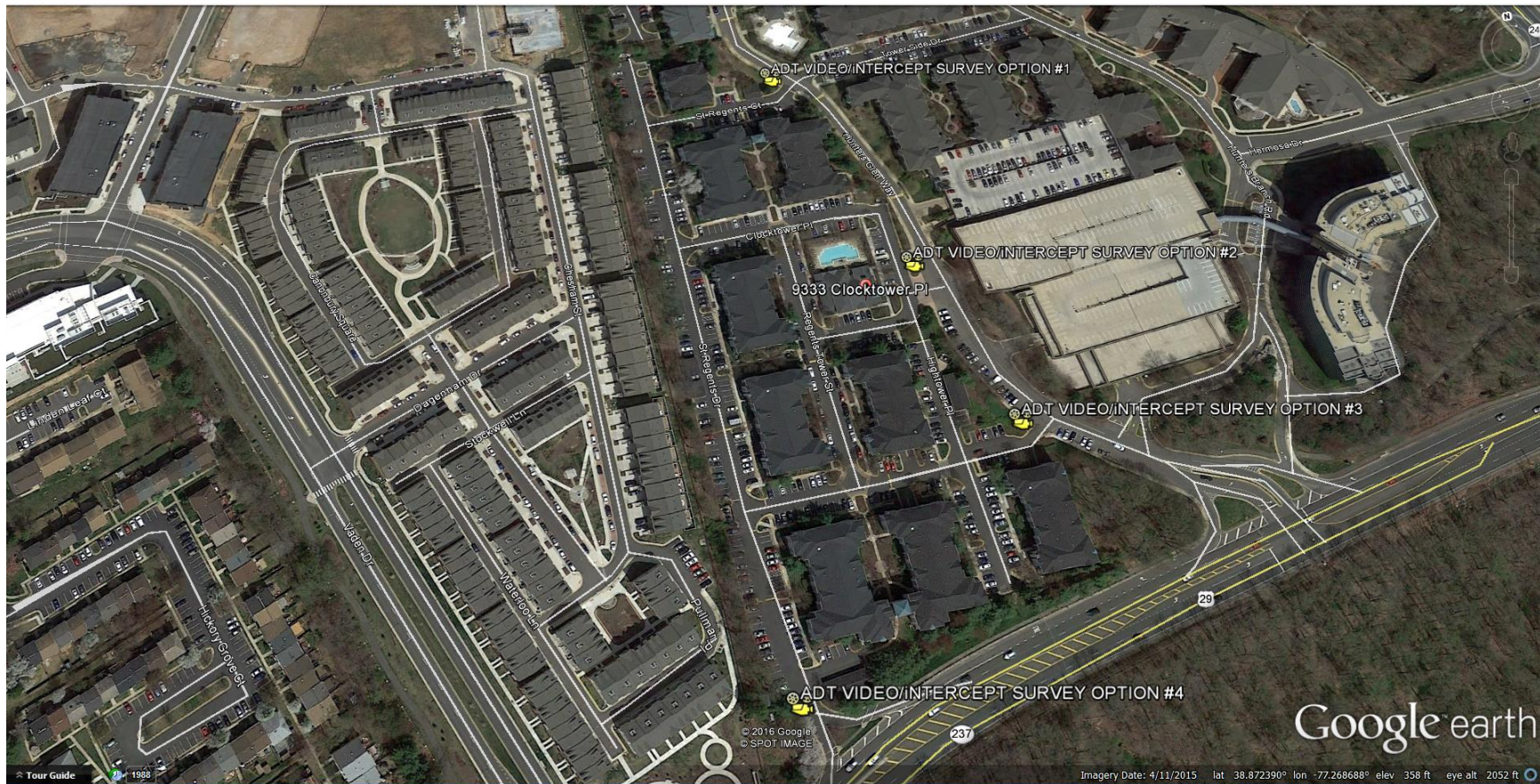
## Midtown Alexandria Station

2451 Midtown Ave, Alexandria, VA 22303

703-329-4080

[www.midtownalexandriacondos.com](http://www.midtownalexandriacondos.com)





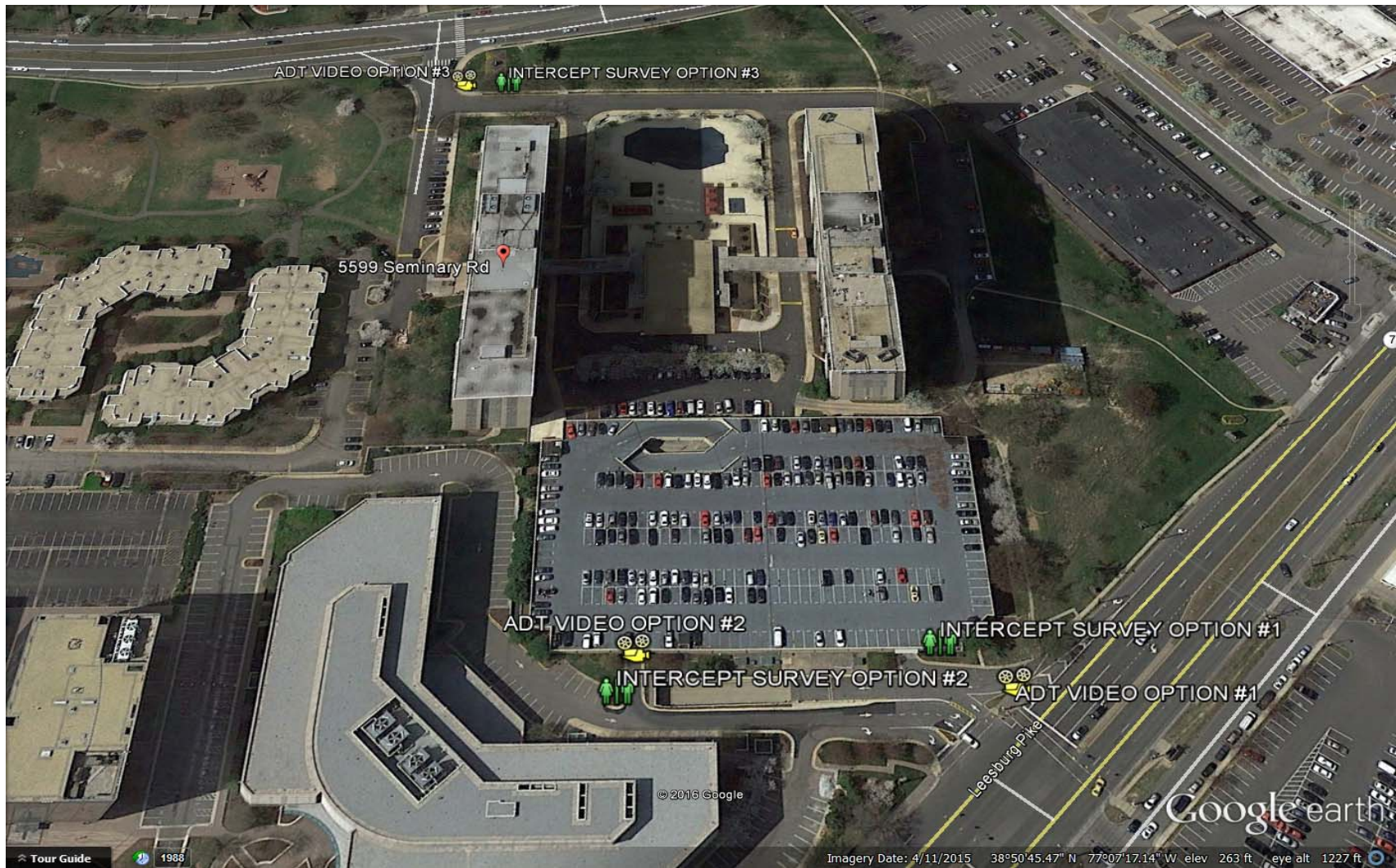
## The Apartments at Regent's Park

9333 Clocktower Place, Fairfax VA, 22031

888.377.0838

[jsamantar@bozzuto.com](mailto:jsamantar@bozzuto.com)



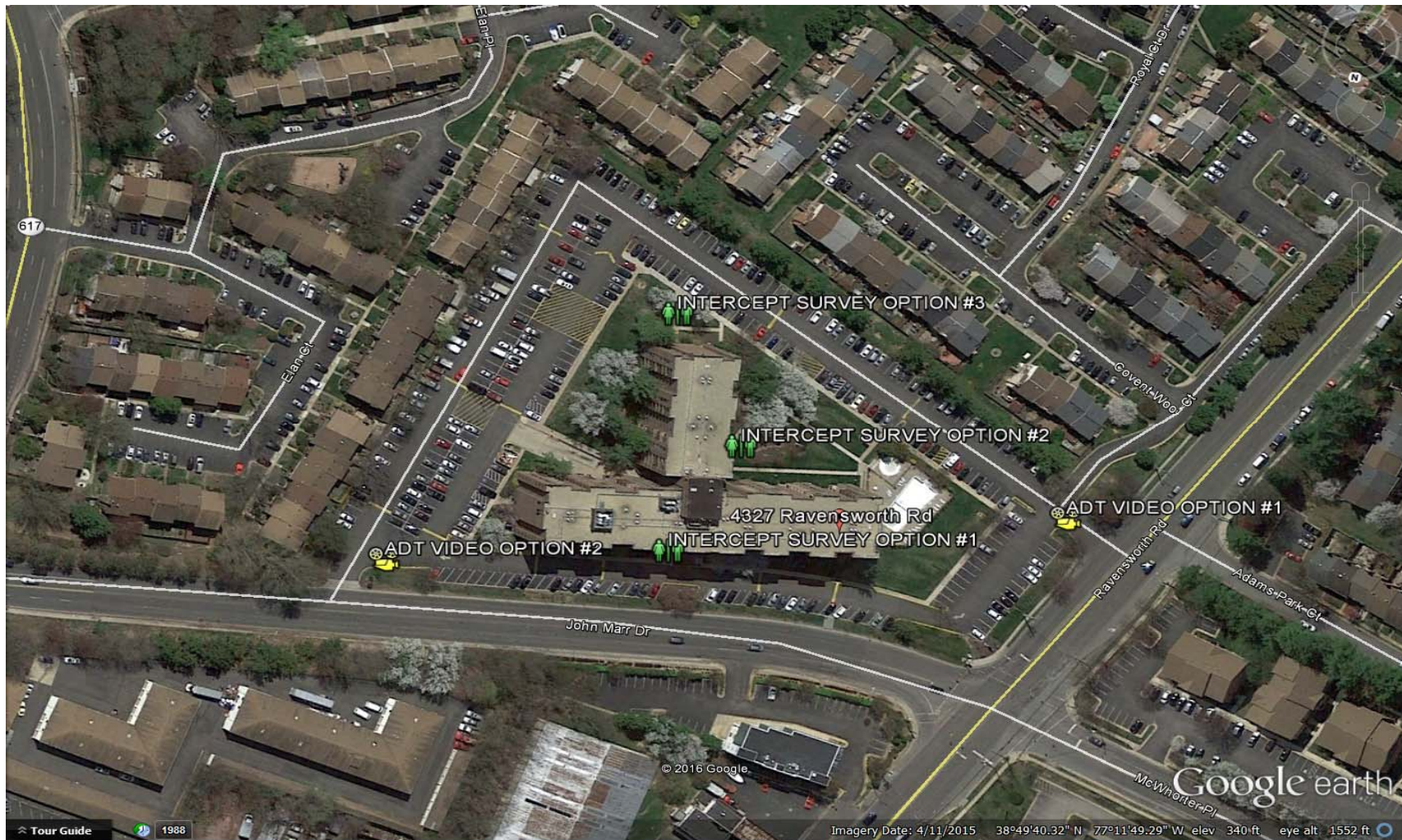


**Skyline Towers Apartments**

5599 Seminary Rd., Bailey's Crossroads, 22041

(888) 457-6047





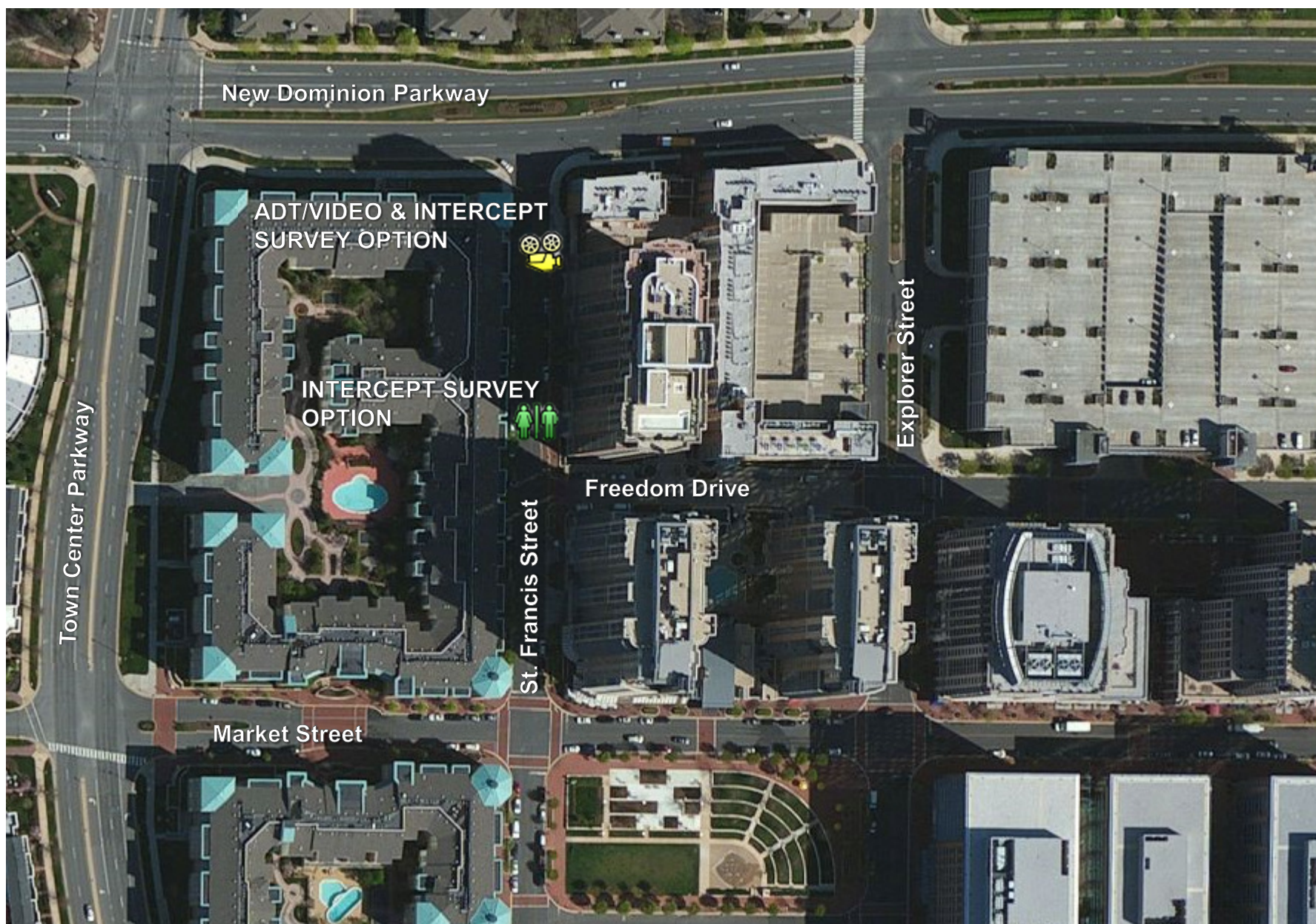
**Ravensworth Towers**

4327 Ravensworth Rd, Annandale, 22003

703-828-1661

[www.ravensworthtowers.com/](http://www.ravensworthtowers.com/)



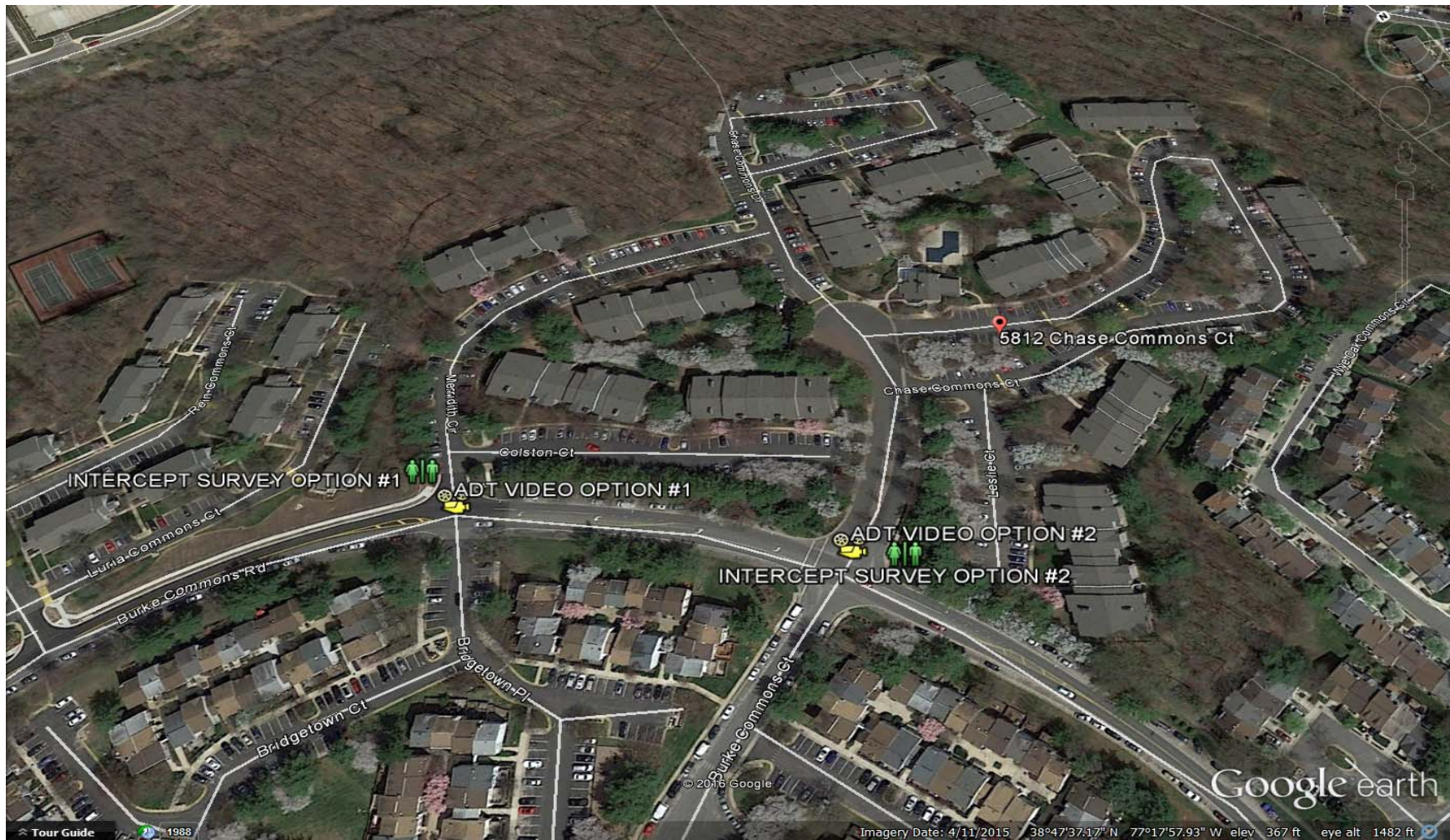


**The Cosmopolitan at Reston Town Center**

1855 Saint Francis Street, Reston, 20190

<http://thecosmopolitanreston.com/>





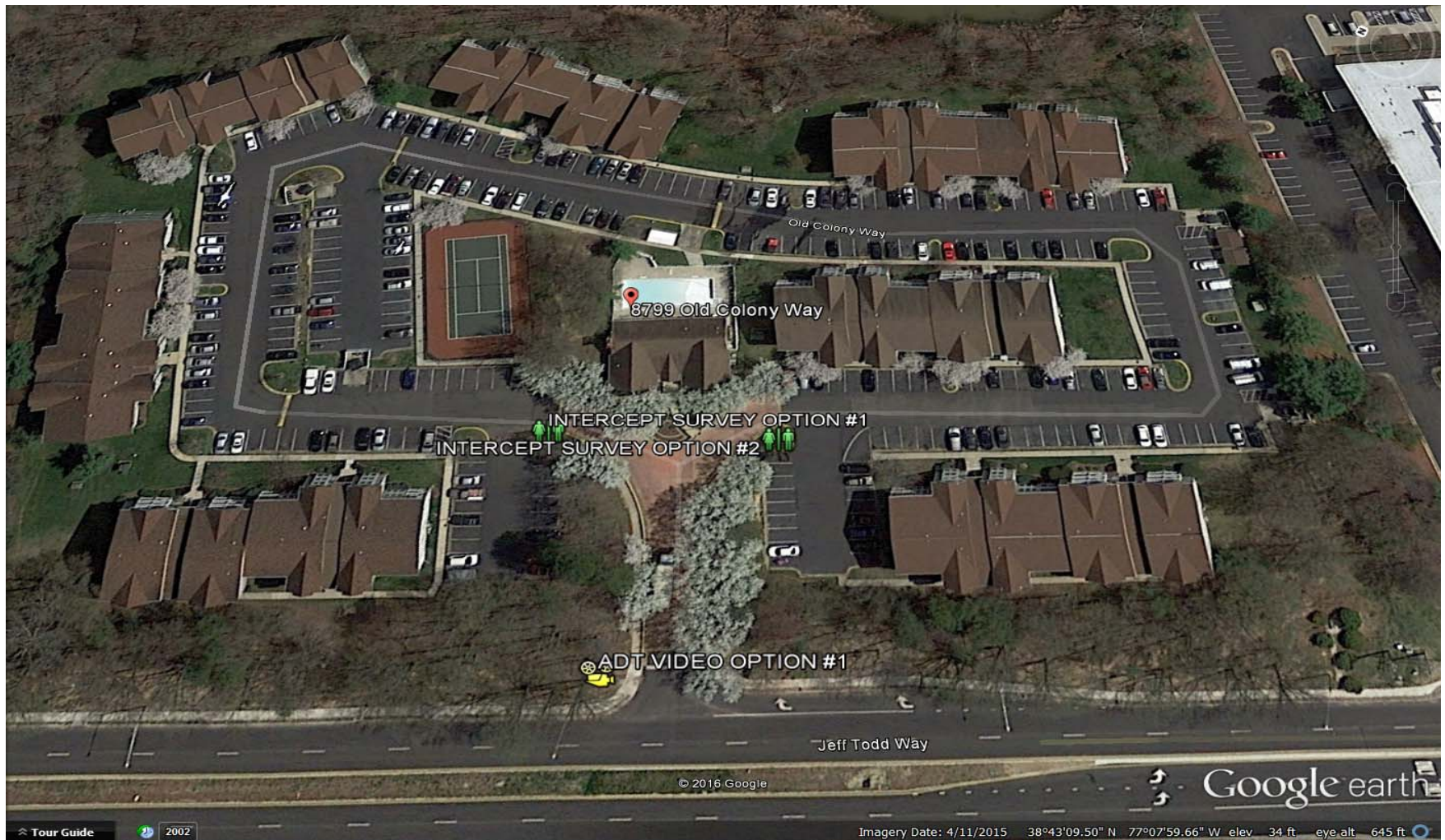
**Burke Shire Commons Apartments**

5812 Chase Commons Court, Burke Centre, 22015

703-272-4112

[www.burkeshirecommonsapts.com/](http://www.burkeshirecommonsapts.com/)





### Oaks of Woodlawn Apartments

8799 Old Colony Way, Woodlawn, 22309

703-360-1023

[www.oaksofwoodlawnapartments.com/](http://www.oaksofwoodlawnapartments.com/)





**Westfield Village**

5115 Woodmere Drive, Centreville, VA 20120

866.958.3669

<http://livecentreville.com/gallery/community/>