

Development Impact Fee Study

Submitted to:
Anne Arundel County, Maryland

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EXECUTIVE SUMMARY

Anne Arundel County, Maryland, retained TischlerBise, Inc. to update the development impact fees imposed on new development to meet the new demands generated for public facilities in the County. Anne Arundel County established school and transportation development impact fees in 1987 and established public safety development impact fees in 2000. This study presents the methodologies and calculations used to generate current levels of service and update maximum supportable development impact fees. Based on discussions with staff, this study includes two additional infrastructure components: (1) library and (2) parks and recreation. TischlerBise recommends separating the existing public safety development impact fees into separate fire development impact fees and police development impact fees. This update of Anne Arundel County's development impact fees includes the following infrastructure components:

1. Fire (previously public safety)
2. Library (new)
3. Parks and Recreation (new)
4. Police (previously public safety)
5. School
6. Transportation

Development impact fees are one-time payments used to construct system improvements needed to accommodate new development. A development impact fee represents new growth's fair share of capital facility needs. By law, development impact fees can only be used for capital improvements, not operating or maintenance costs. Development impact fees are subject to legal standards, which require fulfillment of three key elements: need, benefit, and proportionality.

1. First, to justify a fee for public facilities, it must be demonstrated that new development will create a need for capital improvements.
2. Second, new development must derive a benefit from the payment of the fees (i.e., in the form of public facilities constructed within a reasonable timeframe).
3. Third, the fee paid by a particular type of development should not exceed its proportional share of the capital cost for system improvements.

TischlerBise evaluated possible methodologies and documented appropriate demand indicators by type of development for the levels of service and fees. Local demographic data and improvement costs were used to identify specific capital costs attributable to growth. This report includes summary tables indicating the specific factors, referred to as level-of-service standards, used to derive the development impact fees.

The geographic area for all fees, except fire and police, is Anne Arundel County. Annapolis provides its own fire and police services; therefore, the geographic area for fire and police fees is unincorporated Anne Arundel County. Library fees, parks and recreation fees, and school fees are based on residential demand, while fire fees, police fees, and transportation fees are calculated for both residential and nonresidential development.

LEGAL BACKGROUND

Authorizing Legislation

The State Legislature authorized Anne Arundel County to impose impact fees in an Act of May 13, 1986, Ch. 350, 1986 Md. Laws 1365 (codified in the Anne Arundel County Code as § 17-11-213):

§ 17-11-213. State impact fee enabling legislation.

(a) By ordinance enacted by the County Council, and subject to any applicable express prohibition in the Anne Arundel County Charter, the County may fix, impose, and collect development impact fees for financing, in whole or in part, the capital costs of additional or expanded public works, improvements, and facilities required to accommodate new construction or development.

(b)(1) By ordinance enacted by the County Council, the County may grant exemptions from or credits against development impact fees for development by not-for-profit entities that have been in existence for at least 3 years.

(2) The ordinance shall:

- (i) set the amount of the exemptions or credits;
- (ii) establish the conditions of eligibility for the exemptions or credits; and
- (iii) adopt procedures for applying for the exemptions or credits.

The Editor's note to the County Code states that the original law was adopted in 1986. The Legislature amended the authorizing ordinance to include paragraph (b) in 2008.

Overview of Anne Arundel's Impact Fee Ordinance

In *Dabbs v. Anne Arundel County*, 157 A.3d 381 (Md. App. 2017), the Maryland Court of Special Appeals summarized the key features of the Impact Fee Ordinance:

Pursuant to the authority set forth in [the authorizing legislation], the County may impose impact fees for the purpose of requiring new development to pay its proportionate share of the costs for land and capital facilities necessary to accommodate development impacts on public facilities. § 17-11-202(1). Impact fees must be paid by any person who improves real property causing an impact on public facilities before a building permit for the improvement may be issued. §§ 17-11-203, 17-11-206.

Under § 17-11-209(a), all funds collected from impact fees must be used for eligible capital projects, that is, capital projects for the "expansion of the capacity" of roads and schools, and not for replacement, maintenance, or operations. The County has been divided into impact fee districts and impact fees generally must be used for capital improvements within the "district from which they are collected." § 17-11-209(d). The County Planning and Zoning Officer ("PZO") determines the extent to which capital projects are eligible for impact fee use.

157 A.3d at 384. The Ordinance also provided for a refund of impact fee payments that were not “expended or encumbered” within six fiscal years. *Id.* The Ordinance authorized the Planning and Zoning Office to extend the period for up to three years “only on a written finding that within a three-year period certain capital improvements are planned to be constructed that will be of direct benefit to the property against which the fees were charged.” *Id.*

Timeline of Impact Fee Ordinance and Amendments

The Anne Arundel County Council adopted the Impact Fee Ordinance on August 5, 1987. *Herron v. Mayor and City Council of Annapolis*, 388 F.Supp.2d 565 (D. Md. 2005). “The County began imposing impact fees in [fiscal year (FY)] 1988.” *Dabbs v. Anne Arundel County*, 157 A.3d 381, 385 (Md. App. 2017). The County adopted several amendments that significantly affected the Impact Fee Ordinance:

On December 20, 2001, the County Council enacted Bill No. 96–01, which, effective February 3, 2002, authorized the County to use impact fees for temporary structures (classrooms) provided they expanded the capacity of the schools to serve new development.

Then, on May 22, 2007, the County Council enacted Bill No. 27–07, which codified the procedures which the County had utilized to count impact fee expenditures and encumbrances for purposes of determining impact fee refunds under § 17–11–210(b). Because Bill No. 27–07 did not effect a substantive change in policy, the County Council made Bill No. 27–07 retroactive to fees collected in FYs 1988–1996.

On November 6, 2008, the County Council enacted Bill No. 71–08 and repealed, prospectively, the impact fee refund provisions previously set forth in § 17–11–210. The repeal was effective on January 1, 2009, and barred claims that were not ripe as of the effective date of the repeal; that is, the repeal barred claims for refunds of fees collected after FY 2002.

157 A.3d at 385.

COURT OPINIONS ON ANNE ARUNDEL COUNTY'S IMPACT FEE ORDINANCE

The opinions of the Maryland Courts on Anne Arundel County's Impact Fee Ordinance have primarily interpreted various aspects of the refund requirement. Therefore, particular aspects of the accounting and encumbrance of funds and the refund requirement have received the greatest portion of the courts' attention. This section will discuss the courts' opinions organized by topic, including impact fee funds and eligible expenses, impact fee districts and benefits, the rational nexus/rough proportionality requirement, refunds of unused or unencumbered funds, standing, vested rights and retroactive changes to the impact fee ordinance, and entitlement to credits. Note that some of these topics may not have been central to the courts' final holdings (i.e., were "dicta"), but may be instructive nonetheless for County purposes.

Impact Fee Funds and Eligible Expenses

Planning practice generally allocates impact fees collections to separate government funds supporting the particular public facility category the impact fee is designed to support. Anne Arundel's Impact Fee Ordinance follows this general framework.

The court has stated the County's authority to impose impact fees is "for the purpose of requiring new development to pay its proportionate share of the costs for land and capital facilities necessary to accommodate development impacts on public facilities." *Dabbs v. Anne Arundel County*, 157 A.3d 381, 384 (Md. App. 2017). In addition, impact fee funds must be used for expansion of facilities: "all funds collected from impact fees must be used for eligible capital projects, that is, capital projects for the 'expansion of the capacity' of roads and schools, and not for replacement, maintenance, or operations." *Id.* The courts also have ruled the County has the authority itself to define eligible expenditures consistent with the enabling legislation. In *Dabbs v. Anne Arundel County*, 157 A.3d 381 (Md. App. 2017), for example, the court interpreted the eligibility of capacity expansion of schools using mobile units and stated:

... there is nothing in the State definition of [State Rated Capacity] that prohibits the County from applying a definition of capacity for purposes of determining the *scope of its use of impact fees* broader than the definition used by [Maryland State Department of Education] for *school finance purposes*. The County's definition of capacity is consistent with the enabling law for the impact fees..., and it is the County, not the State, that determines the scope of its Impact Fee Ordinance.

157 A.3d at 395 (emphasis in original).

The enabling legislation provides that the County "may fix, impose, and collect development impact fees for financing, in whole or in part, the capital costs of additional or expanded public works, improvements, and facilities required to accommodate new construction or development." § 17-11-213.

Impact Fee Districts and Benefits

Planning practice generally includes impact fee districts from which impact fees are collected and spent, based on the geography of the benefits that result from the expansion of the particular infrastructure category. These districts define where impact fee revenue collected in the district can be used to ensure that the person who pays the fee receives a proportionate benefit and may include the entirety of a jurisdiction or a portion thereof. Indeed, the *Dabbs* court noted "[t]he County has been divided into

impact fee districts and impact fees generally must be used for capital improvements within the ‘district from which they are collected.’” *Dabbs v. Anne Arundel County*, 157 A.3d 381, 384 (Md. App. 2017).

However, at least one court cited the failure to identify benefited properties sufficiently as a deficiency in Anne Arundel County’s practice, noting when it had extended certain expenditure periods the County “failed to identify the properties that would be directly benefitted by the planned improvements, as required by AACC § 17-11-210(e). The County issued similar extension decisions with the same deficiencies in the years following.” *Halle Development, Inc. v. Anne Arundel County* at 5 (Md. App. 2017) (unreported).

In *Herron v. Mayor and City Council of Annapolis*, 388 F.Supp.2d 565 (D. Md. 2005), a case regarding the collection of Anne Arundel County’s impact fees in the City of Annapolis, the court addressed a property owner’s claim that an allocation of school impact fees collected within the City was impermissible where it was used for three different high school feeder systems in the County system (out of seven school impact fee districts in Anne Arundel County), which included some, but not exclusively all, of the students in the City. The court analyzed the district allocations as follows:

Although impact fees from Annapolis residents may have been spent outside the Annapolis High Feeder System-and only some Annapolis residents attend the schools benefitted-such an arrangement may be reasonable. The County must have some flexibility in the administration of its school system and, the decision to spend funds to benefit three feeder systems does not appear to offend the Constitutional requirement of “rough proportionality.”

Id. at 571. Therefore, as with eligible expenditures, it appears the courts will leave it to the discretion of local government to establish appropriate impact fee districts, based on the nature of the public facility and its operational range of benefit.

Rational Nexus/Rough Proportionality

The impact fee practice and the cases addressing it, have established a two-pronged “test” to ensure those paying fees bear no more than their proportionate share of the burden their development puts on infrastructure and, conversely, receive a proportionate benefit from the expansion of infrastructure resulting from impact fee expenditures. This framework is referred to by many names, including dual rational nexus, proportionality, fair share, and others.

It appears Anne Arundel County has followed this framework as well, through its Ordinance, in part by maintaining earmarked County funds and defined impact fee districts. The court have interpreted these connections to be within the authority of the enabling legislation, as discussed in the section on Impact Fee Funds, above. See *Dabbs v. Anne Arundel County*, 157 A.3d 381 (Md. App. 2017).

Nonetheless, a line of cases in Maryland have referred to impact fees as “impact taxes,” which may implicate the outer limits of authority to adopt an impact fee framework. In any case, it certainly introduces a lack of clarity for the established impact fee practitioner. That discussion follows.

Rational Nexus / Rough Proportionality Analysis

In *Dabbs v. Anne Arundel County*, 182 A.3d 798 (Md. 2018), the Maryland Court of Appeals held that the rough proportionality/rational nexus standards did not apply to the Anne Arundel County Impact Fee Ordinance. The court's holding, however, reflected an ongoing inconsistency among the courts nationally regarding impact fees and exactions, in general. While it is important to monitor and be aware of this developing aspect of takings law, a conservative impact fee practitioner would prepare a Maryland impact fee study with the rough proportionality/rational nexus standards in mind.

In general, many exactions are subject to what is commonly referred to as the "rational nexus/rough proportionality" test adopted in a line of Supreme Court cases, including *Dolan v. City of Tigard*, 512 U.S. 374 (1994) and *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987), which dealt with exactions of property made as a condition of individual development application approvals. Then, in 2013, in *Koontz v. St. Johns River Water Management. District*, 570 U.S. 595 (2013), the U.S. Supreme Court appeared to expand this level of review to monetary exactions, again in the context of a particular, "ad hoc" development approval.

In fact, in *Dabbs*, the court held *Koontz* (and *Nollan/Dolan*) did not apply to the County's impact fees since they are adopted and imposed legislatively, not *ad hoc* as a discretionary condition of development approval. 182 A.3d at 807-14. Therefore, the court distinguished the Anne Arundel County Impact Fee Ordinance because it "applied on a generalized district-wide basis, making no determination as to whether an actual permit will issue to a payor individual with a property interest," 182 A.3d at 811, and stated: "[w]e re-affirm our holding in *Waters Landing*, and, thus, conclude that *Koontz* is inapplicable to the Impact Fee Ordinance in this case. Impact fees imposed by legislation applicable on an area-wide basis are *not* subject to *Nollan* and *Dolan* scrutiny. *Id.* at 812-13 (emphasis in original). In the same case, the Special Court of Appeals reached a similar conclusion for similar reasons. *See Dabbs v. Anne Arundel County*, 157 A.3d 381 (Md. App. 2017).

Nonetheless, in the *Herron* case, 388 F.Supp.2d 565 (D. Md. 2005), which preceded this holding in *Dabbs*, the court found that Anne Arundel County's school impact fee did meet the rough proportionality test, established in the *Nollan* and *Dolan* cases. This illustrates not only the "judicial confusion" the cases since *Nollan* have created, but perhaps too the reality that the principles of proportionality applicable to *ad hoc* and legislative exactions conflate and in practice are the same.

Unfortunately, the purported distinctions between these two approval processes has been further muddled by inconsistent decisions and rationales in the "tax versus fee" line of cases.

LEGAL CONCLUSION AND KEY POINTS

Based on Anne Arundel County's Development Impact Fee Ordinance and litigation construing its application, TischlerBise can distill some relatively straightforward guidance.

- Anne Arundel County is authorized to define what it means by eligible expenditures, within the bounds of the authorizing legislation and the principles of proportionality. The courts appear reluctant to second guess local government on these determinations.
- Similarly, within the bounds of the authorizing legislation and proportionality principles, the County appears to also have reasonable discretion to establish appropriate development impact fee collection and expenditure districts, based on geographical extent and the operational nature of the particular public facility category and its capital improvement plans. Again, it appears that a transparent and logical rationale, consistent with general development impact fee practice, is unlikely to be second guessed by the court.
- While the “rough proportionality” standards of *Nollan*, *Dolan*, and *Koontz*, appear not to apply to legislatively adopted and generally applicable development impact fees, generally-accepted standards of proportionality developed in the development impact fee practice over the last 40 years provide clear guides for an development impact fee ordinance. The cases interpreting the Development Impact Fee Ordinance generally recognize the proportionality concepts that are included in it, and these standards should continue to be applied in updating Anne Arundel County's development impact fees. In other words, the applicability of proportionality would apply to development impact fee calculations in Maryland regardless of the applicability of *Nollan*, *Dolan*, and *Koontz*.
- The mechanism for “encumbering” development impact fees collected within the timeframes set forth by the Ordinance should include, at a minimum, a codified definition of the term, consistent with GAAP guidelines and adopted County procedures to a “purchase order or contract [] effective as an executory contract,” or similar commitment of funds by the County.
- The Ordinance may provide for an administrative appeal procedure, including as to refunds, based on the *Halle Development* Court's holding. Such a procedure would provide an administrative remedy that an application would have to follow before seeking relief from a court.
- The applicable interest rates for refunds of development impact fees should be set out clearly by ordinance and be consistent with County accounting protocols. Where relevant and logical to do so, consistency between the study and the implementing ordinance in this respect would be recommended, too.
- The Ordinance should specify categories of persons who may apply for development impact fee refunds, and the County should be able to implement refund procedures consistent with and documented through its accounting records.
- Credits (a.k.a. offsets) against development impact fee obligations should be expressly addressed by Ordinance to clarify the conditions and procedures through which credits will and will not be awarded.

CONCEPTUAL DEVELOPMENT IMPACT FEE CALCULATION

In contrast to project-level improvements, development impact fees fund growth-related infrastructure that will benefit multiple development projects, or the entire service area (usually referred to as system improvements). The first step is to determine an appropriate demand indicator for the particular type of infrastructure. The demand indicator measures the number of service units for each unit of development. For example, an appropriate indicator of the demand for parks is population growth and the increase in population can be estimated from the average number of persons per housing unit. The second step in the development impact fee formula is to determine infrastructure improvement units per service unit, typically called level-of-service (LOS) standards. In keeping with the park example, a common LOS standard is improved park acres per thousand people. The third step in the development impact fee formula is the cost of various infrastructure units. To complete the park example, this part of the formula would establish a cost per acre for land acquisition and/or park improvements.

METHODOLOGIES AND CREDITS

Development impact fees can be calculated by any one of several legitimate methods. The choice of a particular method depends primarily on the service characteristics and planning requirements for each facility type. Each method has advantages and disadvantages in a particular situation, and to some extent can be interchangeable, because each method allocates facility costs in proportion to the needs created by new development.

Reduced to its simplest terms, the process of calculating development impact fees involves two main steps: (1) determining the cost of development-related capital improvements and (2) allocating those costs equitably to various types of development. In practice, though, the calculation of development impact fees can become quite complicated because of the many variables involved in defining the relationship between development and the need for facilities. The following paragraphs discuss three basic methods for calculating development impact fees, and how each method can be applied.

Plan-Based Fee Method. The plan-based method allocates costs for a specified set of improvements to a specified amount of development. Facility plans identify needed improvements, and land use plans identify development. In this method, the total cost of relevant facilities is divided by total demand to calculate a cost per unit of demand. Then, the cost per unit of demand is multiplied by the amount of demand per unit of development (e.g., housing units or square feet of building area) in each category to arrive at a cost per specific unit of development (e.g., single family detached unit).

Cost Recovery or Buy-In Fee Method. The rationale for the cost recovery method is that new development is paying for its share of the useful life and remaining capacity of facilities already built or land already purchased from which new growth will benefit. This methodology is often used for systems that were oversized such as sewer and water facilities.

Incremental Expansion Fee Method. The incremental expansion method documents the current level of service (LOS) for each type of public facility in both quantitative and qualitative measures, based on an existing service standard (such as square feet per student). This approach ensures that there are no existing infrastructure deficiencies or surplus capacity in infrastructure. New development is only paying its proportionate share for growth-related infrastructure. The level-of-service standards are determined

in a manner similar to the current replacement cost approach used by property insurance companies. However, in contrast to insurance practices, the fee revenues would not be for renewal and/or replacement of existing facilities. Rather, revenue will be used to expand or provide additional facilities, as needed, to accommodate new development. An incremental expansion cost method is best suited for public facilities that will be expanded in regular increments, with LOS standards based on current conditions in the community.

Credits. Regardless of the methodology, a consideration of credits is integral to the development of a legally valid development impact fee methodology. There are two types of credits, each with specific and distinct characteristics, but both of which should be addressed in the calculation of development impact fees. The first is a credit due to possible double payment situations. This could occur when contributions are made by the property owner toward the capital costs of the public facility covered by the development impact fee. This type of credit is integrated into the impact fee calculation, thus reducing the fee amount. The second is a credit toward the payment of a fee for dedication of public sites or improvements provided by the developer and for which the facility fee is imposed. This type of credit is addressed in the administration and implementation of a development impact fee program. For ease of administration, TischlerBise normally recommends developer reimbursements for system improvements.

DEVELOPMENT IMPACT FEE COMPONENTS

Shown below, Figure ES1 summarizes service areas, methodologies, and cost allocation for each infrastructure component.

Figure ES1: Proposed Development Impact Fee Methodologies

Infrastructure Component	Service Area	Cost Recovery	Incremental Expansion	Plan-Based	Cost Allocation
Fire	Unincorporated Anne Arundel County	N/A	Fire Stations, Land, Fire Apparatus	Fire Facilities	Population, Vehicle Trips
Library	Anne Arundel County	N/A	Library Facilities	N/A	Population
Parks and Recreation	Anne Arundel County	N/A	Park Land, Park Amenities, Recreation Facilities	N/A	Population
Police	Unincorporated Anne Arundel County	N/A	Police Vehicles	Police Facilities	Population, Vehicle Trips
School	Anne Arundel County	N/A	School Facilities, School Facilities Land, Administrative Facilities, Administrative Facilities Land, Buses, Support Vehicles	N/A	Public School Students
Transportation	Anne Arundel County	N/A	Arterial Improvements	N/A	VMT

Calculations throughout this report are based on an analysis conducted using Excel software. Results are discussed using one- and two-decimal places (in most cases), which represent rounded figures. However, the analysis itself uses figures carried to their ultimate decimal places; therefore, the sums and products generated in the analysis may not equal the sum or product if the reader replicates the calculation with the factors shown in the report (due to the rounding of figures shown, not in the analysis).

CURRENT DEVELOPMENT IMPACT FEES

Residential

Shown below, Figure ES2 includes the current residential development impact fees assessed per unit, based on dwelling unit size. Current residential development impact fees include public safety, school, and transportation. The fire and police development impact fees shown below represent each component's share of the current public safety development impact fee – 75 percent fire and 25 percent police.

Figure ES2: Current Residential Development Impact Fees

Residential Fees per Development Unit								
Dwelling Unit Size	Development Unit	Fire ¹	Library	Parks & Recreation	Police ¹	School	Transportation	Current Fees
Under 500	Dwelling Unit	\$104	\$0	\$0	\$34	\$3,099	\$2,050	\$5,287
500 - 999	Dwelling Unit	\$169	\$0	\$0	\$56	\$5,703	\$3,363	\$9,291
1,000 - 1,499	Dwelling Unit	\$220	\$0	\$0	\$73	\$7,820	\$4,366	\$12,479
1,500 - 1,999	Dwelling Unit	\$254	\$0	\$0	\$85	\$9,213	\$5,066	\$14,618
2,000 - 2,499	Dwelling Unit	\$280	\$0	\$0	\$93	\$10,253	\$5,591	\$16,217
2,500 - 2,999	Dwelling Unit	\$301	\$0	\$0	\$100	\$11,086	\$5,996	\$17,483
3,000 - 3,499	Dwelling Unit	\$317	\$0	\$0	\$105	\$11,778	\$6,306	\$18,506
3,500 - 3,999	Dwelling Unit	\$331	\$0	\$0	\$110	\$12,370	\$6,596	\$19,407
4,000 - 4,499	Dwelling Unit	\$344	\$0	\$0	\$115	\$12,890	\$6,858	\$20,207
4,500 - 4,999	Dwelling Unit	\$356	\$0	\$0	\$118	\$13,349	\$7,092	\$20,915
5,000 - 5,499	Dwelling Unit	\$365	\$0	\$0	\$122	\$13,765	\$7,294	\$21,546
5,500 - 5,999	Dwelling Unit	\$375	\$0	\$0	\$125	\$14,141	\$7,464	\$22,105
6,000 and over	Dwelling Unit	\$379	\$0	\$0	\$126	\$14,317	\$7,552	\$22,374

1. Current fire (75 percent) and police (25 percent) development impact fees represent each department's share of existing public safety development impact fees

Nonresidential

Shown below, Figure ES3 includes the current nonresidential development impact fees assessed per 1,000 square feet of floor area unless otherwise noted. Current nonresidential development impact fees include public safety and transportation. The current fire and police development impact fees shown below represent each component's share of the current public safety development impact fee – 75 percent fire and 25 percent police.

Figure ES3: Current Nonresidential Development Impact Fees

Nonresidential Fees per Development Unit								
Development Type	Development Unit	Fire ¹	Library	Parks & Recreation	Police ¹	School	Transportation	Current Fees
Amusement, Rec., Assembly	Req Pkg Space	\$43	\$0	\$0	\$14	\$0	\$1,443	\$1,500
Hotel	Room	\$134	\$0	\$0	\$44	\$0	\$6,947	\$7,125
Industrial	1,000 sq ft	\$166	\$0	\$0	\$55	\$0	\$5,993	\$6,214
Self-Storage (Mini-Warehouse)	1,000 sq ft	\$37	\$0	\$0	\$12	\$0	\$987	\$1,036
For Profit Hospital	Bed	\$176	\$0	\$0	\$59	\$0	\$7,819	\$8,054
For Profit Nursing Home	Bed	\$143	\$0	\$0	\$48	\$0	\$1,739	\$1,930
Marinas	Berth	\$53	\$0	\$0	\$17	\$0	\$1,971	\$2,041
Office (Under 100,000 sq ft)	1,000 sq ft	\$397	\$0	\$0	\$132	\$0	\$9,692	\$10,221
Office (100,000-199,999 sq ft)	1,000 sq ft	\$354	\$0	\$0	\$118	\$0	\$8,394	\$8,866
Office (200,000 sq ft or more)	1,000 sq ft	\$325	\$0	\$0	\$108	\$0	\$7,473	\$7,906
Mercantile	1,000 sq ft	\$1,010	\$0	\$0	\$337	\$0	\$10,097	\$11,444

1. Current fire (75 percent) and police (25 percent) development impact fees represent each department's share of existing public safety development impact fees

MAXIMUM SUPPORTABLE DEVELOPMENT IMPACT FEES

Residential

Shown below, Figure ES4 includes the maximum supportable development impact fees by dwelling unit size. This includes the new library development impact fees and the new parks and recreation development impact fees, but it does not include the school development impact fees that will be assessed by housing type (see Figure ES5). These fees represent the highest amount supportable for each residential size threshold. Anne Arundel County may adopt fees that are less than the amounts shown. However, a reduction in development impact fee revenue will necessitate an increase in other revenues, a decrease in planned capital expenditures, and/or a decrease in levels of service. The fees for residential development are assessed per unit, based on dwelling unit size.

Figure ES4: Maximum Supportable Residential Development Impact Fees

Residential Fees per Development Unit							
Dwelling Unit Size	Development Unit	Fire	Library	Parks & Recreation	Police	Transportation	Maximum Supportable
Under 500	Dwelling Unit	\$327	\$217	\$527	\$141	\$1,434	\$2,646
500 - 999	Dwelling Unit	\$1,016	\$675	\$1,637	\$437	\$4,023	\$7,788
1,000 - 1,499	Dwelling Unit	\$1,428	\$949	\$2,301	\$614	\$5,542	\$10,834
1,500 - 1,999	Dwelling Unit	\$1,712	\$1,138	\$2,758	\$736	\$6,604	\$12,948
2,000 - 2,499	Dwelling Unit	\$1,939	\$1,289	\$3,125	\$834	\$7,439	\$14,626
2,500 - 2,999	Dwelling Unit	\$2,117	\$1,407	\$3,411	\$911	\$8,123	\$15,969
3,000 - 3,499	Dwelling Unit	\$2,273	\$1,511	\$3,663	\$978	\$8,696	\$17,121
3,500 - 3,999	Dwelling Unit	\$2,408	\$1,600	\$3,880	\$1,036	\$9,185	\$18,109
4,000 - 4,499	Dwelling Unit	\$2,522	\$1,676	\$4,063	\$1,085	\$9,632	\$18,978
4,500 - 4,999	Dwelling Unit	\$2,628	\$1,747	\$4,235	\$1,131	\$10,020	\$19,761
5,000 - 5,499	Dwelling Unit	\$2,728	\$1,813	\$4,395	\$1,173	\$10,383	\$20,492
5,500 - 5,999	Dwelling Unit	\$2,813	\$1,869	\$4,533	\$1,210	\$10,704	\$21,129
6,000 and over	Dwelling Unit	\$2,891	\$1,921	\$4,658	\$1,244	\$10,999	\$21,713

Shown below, Figure ES5 includes the maximum supportable school development impact fees. These fees represent the highest amount supportable and will be assessed per unit, based on housing type.

Figure ES5: Maximum Supportable School Development Impact Fees

Residential Fees per Development Unit		
Housing Type	Development Unit	Maximum Supportable
Single Family	Dwelling Unit	\$17,399
Townhouse	Dwelling Unit	\$17,997
Multifamily	Dwelling Unit	\$10,288

Nonresidential

Shown below, Figure ES6 includes the maximum supportable development impact fees for nonresidential development. These fees represent the highest amount supportable for each development type. Anne Arundel County may adopt fees that are less than the amounts shown. However, a reduction in development impact fee revenue will necessitate an increase in other revenues, a decrease in planned capital expenditures, and/or a decrease in levels of service. The fees for nonresidential development are assessed per 1,000 square feet of floor area unless otherwise noted.

Figure ES6: Maximum Supportable Nonresidential Development Impact Fees

Nonresidential Fees per Development Unit							
Development Type	Development Unit	Fire	Library	Parks & Recreation	Police	Transportation	Maximum Supportable
Amusement, Rec., Assembly	Req Pkg Space	\$366	\$0	\$0	\$105	\$1,518	\$1,989
Hotel	Room	\$946	\$0	\$0	\$270	\$3,914	\$5,130
Industrial	1,000 sq ft	\$577	\$0	\$0	\$165	\$2,387	\$3,129
Self-Storage (Mini-Warehouse)	1,000 sq ft	\$173	\$0	\$0	\$49	\$709	\$931
For Profit Hospital	Bed	\$1,246	\$0	\$0	\$355	\$5,162	\$6,763
For Profit Nursing Home	Bed	\$362	\$0	\$0	\$103	\$1,501	\$1,966
Marinas	Berth	\$286	\$0	\$0	\$82	\$1,181	\$1,549
Office	1,000 sq ft	\$1,281	\$0	\$0	\$365	\$5,305	\$6,951
Mercantile	1,000 sq ft	\$3,324	\$0	\$0	\$948	\$13,403	\$17,675

DIFFERENCE BETWEEN CURRENT AND MAXIMUM SUPPORTABLE DEVELOPMENT IMPACT FEES

Residential

Shown below, Figure ES7 includes the difference between current development impact fees and maximum supportable development impact fees by dwelling unit size. The difference between current and maximum supportable school development impact fees, assessed by housing type, is shown on the following page.

Figure ES7: Difference Between Current and Maximum Supportable Residential Development Impact Fees

Residential Fees per Development Unit							
Dwelling Unit Size	Development Unit	Fire	Library	Parks & Recreation	Police	Transportation	Difference
Under 500	Dwelling Unit	\$223	\$217	\$527	\$107	(\$616)	\$458
500 - 999	Dwelling Unit	\$847	\$675	\$1,637	\$381	\$660	\$4,200
1,000 - 1,499	Dwelling Unit	\$1,208	\$949	\$2,301	\$541	\$1,176	\$6,175
1,500 - 1,999	Dwelling Unit	\$1,458	\$1,138	\$2,758	\$651	\$1,538	\$7,543
2,000 - 2,499	Dwelling Unit	\$1,659	\$1,289	\$3,125	\$741	\$1,848	\$8,662
2,500 - 2,999	Dwelling Unit	\$1,816	\$1,407	\$3,411	\$811	\$2,127	\$9,572
3,000 - 3,499	Dwelling Unit	\$1,956	\$1,511	\$3,663	\$873	\$2,390	\$10,393
3,500 - 3,999	Dwelling Unit	\$2,077	\$1,600	\$3,880	\$926	\$2,589	\$11,072
4,000 - 4,499	Dwelling Unit	\$2,178	\$1,676	\$4,063	\$970	\$2,774	\$11,661
4,500 - 4,999	Dwelling Unit	\$2,272	\$1,747	\$4,235	\$1,013	\$2,928	\$12,195
5,000 - 5,499	Dwelling Unit	\$2,363	\$1,813	\$4,395	\$1,051	\$3,089	\$12,711
5,500 - 5,999	Dwelling Unit	\$2,438	\$1,869	\$4,533	\$1,085	\$3,240	\$13,165
6,000 and over	Dwelling Unit	\$2,512	\$1,921	\$4,658	\$1,118	\$3,447	\$13,656

Since Anne Arundel County currently assesses school development impact fees based on housing unit size, and Anne Arundel County will assess school development impact fees based on housing type, it is not possible to provide an exact comparison. The actual difference will depend on the unit type and size, however, the current fees shown in Figure ES8 represent averages based on TischlerBise analysis.

The 2008 Development Impact Fee Study included student generation rates by housing type and by dwelling unit size. TischlerBise matched student generation rates by housing type to the most similar student generation rates by dwelling unit size. Based on the student generation rates published in the 2008 Development Impact Fee Study, the student generation rate for single family was most similar to units with 3,000-3,499 square feet, the student generation rate for townhouse was most similar to units with 4,500-4,999 square feet, and the student generation rate for multifamily was most similar to units with 1,000-1,499 square feet. The comparison below uses the current fees for these size thresholds.

Figure ES8: Difference Between Current and Maximum Supportable School Development Impact Fees

Residential Fees per Development Unit				
Housing Type	Development Unit	Maximum Supportable	Current ¹	Difference
Single Family	Dwelling Unit	\$17,399	\$11,778	\$5,621
Townhouse	Dwelling Unit	\$17,997	\$13,349	\$4,648
Multifamily	Dwelling Unit	\$10,288	\$7,820	\$2,468

1. TischlerBise analysis of current student generation rates from the 2008 Development Impact Fee Study. Current single family based on 3,000-3,499 square feet, current townhouse based on 4,500-4,999 square feet, and current multifamily based on 1,000-1,499 square feet.

Nonresidential

Shown below, Figure ES9 includes the difference between current development impact fees and maximum supportable development impact fees for nonresidential development. Differences in transportation fees are related to changes in trip generation rates published by the Institute of Transportation Engineers, proportionate share, and trip length weighting factors compared to the previous study.

Figure ES9: Difference Between Current and Maximum Supportable Nonresidential Development Impact Fees

Nonresidential Fees per Development Unit							
Development Type	Development Unit	Fire	Library	Parks & Recreation	Police	Transportation	Difference
Amusement, Rec., Assembly	Req Pkg Space	\$323	\$0	\$0	\$91	\$75	\$489
Hotel	Room	\$812	\$0	\$0	\$226	(\$3,033)	(\$1,995)
Industrial	1,000 sq ft	\$411	\$0	\$0	\$110	(\$3,606)	(\$3,085)
Self-Storage (Mini-Warehouse)	1,000 sq ft	\$136	\$0	\$0	\$37	(\$278)	(\$105)
For Profit Hospital	Bed	\$1,070	\$0	\$0	\$296	(\$2,657)	(\$1,291)
For Profit Nursing Home	Bed	\$219	\$0	\$0	\$55	(\$238)	\$36
Marinas	Berth	\$233	\$0	\$0	\$65	(\$790)	(\$492)
Office	1,000 sq ft	\$927	\$0	\$0	\$247	(\$3,089)	(\$1,915)
Mercantile	1,000 sq ft	\$2,314	\$0	\$0	\$611	\$3,306	\$6,231

RECOMMENDATIONS

Fire and Police

TischlerBise recommends separating the existing public safety development impact fees into two categories: fire development impact fees and police development impact fees. Separating the fee categories provides a more accurate analysis due to differing levels of service and infrastructure costs between the departments. Creating the new fee categories also reduces the administrative burden related to tracking development impact fee revenues and expenditures within the existing public safety development impact fee fund. Since Anne Arundel County will create separate development impact fee funds for the new fee categories, it is easier to ensure revenues generated for each department are used to fund expenditures for the correct department.

Library

TischlerBise recommends adoption of a library development impact fee to fund growth-related capital improvements for library infrastructure.

Parks and Recreation

TischlerBise recommends adoption of a parks and recreation development impact fee to fund growth-related capital improvements for parks and recreation infrastructure.

School

Anne Arundel County currently collects and spends school development impact fees within seven districts. TischlerBise recommends a countywide school development impact fee district due to the use of countywide student generation rates in the calculation of the development impact fees and, due to recent changes to the County's adequate public facilities ordinance, the ability of Anne Arundel County Public Schools to make more frequent adjustments to school attendance zones to alleviate capacity issues.

Transportation

Anne Arundel County currently collects and spends transportation development impact fees within six districts. The County should review the existing district boundaries to ensure the districts are aligned with demand for future transportation improvements. The proposed transportation development impact fees use an incremental methodology that supports the use of a countywide transportation development impact fee district. Since transportation development impact fees will be used to construct system level transportation improvements that provide a countywide benefit, and areas experiencing growth will demand additional transportation improvements, a countywide district will allow Anne Arundel County the flexibility to fund growth-related transportation improvements in areas with transportation needs.

Update Cycle

Anne Arundel County last updated its development impact fees in 2008. Generally accepted practices include a review or update of development impact fees at least every five years due to potential changes in growth patterns, demographics, infrastructure costs, and infrastructure needs. TischlerBise recommends reviewing the development impact fee districts during development impact fee updates.

FIRE DEVELOPMENT IMPACT FEES

METHODOLOGY

The fire development impact fees include components for fire stations, fire facilities, land, and fire apparatus. The incremental expansion methodology is used for the fire stations, land, and fire apparatus components. The plan-based methodology is used for the fire facilities component.

SERVICE AREA

Anne Arundel County provides fire service in the unincorporated county; therefore, the service area for fire development impact fees is unincorporated Anne Arundel County.

PROPORTIONATE SHARE

The capital costs for fire development impact fees are allocated between residential and nonresidential development using calls for service. Based on 2022 call data provided by Anne Arundel County Fire Department, residential development accounts for approximately 63 percent of demand and nonresidential development accounts for the remaining 37 percent of demand.

Figure F1: Calls for Service

Description	Calls	Share
Residential	48,835	63%
Nonresidential	28,628	37%
Total	77,463	100%

Source: Anne Arundel County Fire Department, 2022

The proportionate share of costs attributable to residential development is allocated to population and then converted to an appropriate amount by dwelling unit size. Since nonresidential calls for service were unavailable by specific nonresidential use, TischlerBise recommends using vehicle trips as the demand indicator for nonresidential demand for fire services. Vehicle trip generation rates are highest for commercial/retail development and lowest for industrial development. Vehicle trip generation rates for office and institutional development fall between the other two categories. This ranking of vehicle trip generation rates is consistent with the relative demand for fire services from nonresidential development.

SERVICE UNITS

Figure F2 displays the service units for residential and nonresidential land uses. The fire development impact fees for residential development are calculated on a per capita basis and then converted to persons per housing unit by dwelling unit size. For nonresidential development, fire development impact fees are calculated per average weekday vehicle trip (AWVT) and then converted to vehicle trips per development unit.

Figure F2: Service Units

Residential Development		
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹
Under 500	Dwelling Unit	0.46
500 - 999	Dwelling Unit	1.43
1,000 - 1,499	Dwelling Unit	2.01
1,500 - 1,999	Dwelling Unit	2.41
2,000 - 2,499	Dwelling Unit	2.73
2,500 - 2,999	Dwelling Unit	2.98
3,000 - 3,499	Dwelling Unit	3.20
3,500 - 3,999	Dwelling Unit	3.39
4,000 - 4,499	Dwelling Unit	3.55
4,500 - 4,999	Dwelling Unit	3.70
5,000 - 5,499	Dwelling Unit	3.84
5,500 - 5,999	Dwelling Unit	3.96
6,000 and over	Dwelling Unit	4.07

Nonresidential Development				
Development Type	Development Unit	AWVTE per 1,000 Sq Ft ¹	Trip Adjustment ¹	AWVT per 1,000 Sq Ft
Amusement, Rec., Assembly	Req Pkg Space	3.10	50%	1.55
Hotel	Room	7.99	50%	4.00
Industrial	1,000 sq ft	4.87	50%	2.44
Self-Storage (Mini-Warehouse)	1,000 sq ft	1.45	50%	0.73
For Profit Hospital	Bed	10.54	50%	5.27
For Profit Nursing Home	Bed	3.06	50%	1.53
Marinas	Berth	2.41	50%	1.21
Office	1,000 sq ft	10.84	50%	5.42
Mercantile	1,000 sq ft	37.01	38%	14.06

1. See Land Use Assumptions

LEVEL OF SERVICE AND COST ANALYSIS

This section details the level of service and capital cost per demand unit for each infrastructure category.

Fire Stations – Incremental Expansion

Anne Arundel County currently provides 229,038 square feet of fire stations to existing development and plans to maintain the existing level of service by constructing additional fire stations to serve future development.

Figure F3: Existing Fire Stations

Description	Station Number	Square Feet
Galesville Fire Station	Fire Station 1	11,000
Severn Fire Station	Fire Station 4	11,000
Waugh Chapel Fire Station	Fire Station 5	10,436
Arundel Volunteer Fire Department	Fire Station 7	6,370
Annapolis Neck	Fire Station 8	11,000
Harwood Lothian Volunteer Fire Department	Fire Station 9	6,000
Jacobsville Fire Station	Fire Station 10	16,350
Orchard Beach Volunteer Fire Department	Fire Station 11	10,000
Marley Fire Station	Fire Station 18	11,000
Cape St. Claire Volunteer Fire Department	Fire Station 19	6,796
Lake Shore Fire Station	Fire Station 20	13,000
Harmons Dorsey Fire Department	Fire Station 21	8,138
Jones Station	Fire Station 23	8,412
South Glen Burnie Fire Station	Fire Station 26	8,281
Maryland City Volunteer Fire Department	Fire Station 27	15,200
Jessup Fire Station	Fire Station 29	6,000
Arminger Fire Department	Fire Station 30	10,500
Brooklyn Volunteer Fire Department	Fire Station 31	14,500
Community Volunteer Fire Company	Fire Station 32	11,625
Glen Burnie Volunteer Fire Department	Fire Station 33	13,830
West Annapolis Volunteer Fire Department	Fire Station 40	14,500
Avalon Shores Fire Station	Fire Station 41	5,100
Total		229,038

Source: Anne Arundel County Fire Department

The analysis uses construction costs from the FY2024 capital budget as a proxy for future construction costs. Although the figure below includes specific projects, the incremental expansion methodology allows Anne Arundel County to use development fees to fund a portion of these projects or to fund growth-related fire stations included in future capital budgets. Based on construction costs from the FY2024 capital budget, the weighted average construction cost for fire stations is \$1,247 per square foot.

Figure F4: Fire Station Cost Factors

Description	Square Feet	Construction Cost	Cost per Sq Ft
Crownsville FS Replacement	23,000	\$20,101,000	\$874
Cape St Claire FS Replacement	19,900	\$19,206,000	\$965
Jessup FS Replacement	20,000	\$28,039,000	\$1,402
Arundel FS Replacement	23,000	\$30,768,000	\$1,338
Waugh Chapel FS Replacement	20,000	\$33,904,470	\$1,695
Total	105,900	\$132,018,470	\$1,247

Source: Anne Arundel County Capital Budget FY2024

Anne Arundel County currently provides 229,038 square feet of fire stations to existing development. To allocate the proportionate share of demand to residential and nonresidential development, this analysis uses proportionate share factors shown in Figure F1. Anne Arundel County’s existing LOS for residential development is 0.2585 square feet per person (229,038 square feet X 63 percent residential share / 558,220 persons). The nonresidential level of service is 0.0889 square feet per vehicle trip (229,038 square feet X 37 percent nonresidential share / 953,445 vehicle trips). For fire stations, the cost is \$322.24 per person (0.2585 square feet per person X \$1,247 per square foot) and \$110.80 per vehicle trip (0.0889 square feet per vehicle trip X \$1,247 per square foot).

Figure F5: Existing Level of Service

Cost Factors	
Cost per Square Foot	\$1,247

Level-of-Service (LOS) Standards	
Existing Square Feet	229,038
Residential	
Residential Share	63%
2023 Population	558,220
Square Feet per Person	0.2585
Cost per Person	\$322.24
Nonresidential	
Nonresidential Share	37%
2023 Vehicle Trips	953,445
Square Feet per Vehicle Trip	0.0889
Cost per Vehicle Trip	\$110.80

Source: Anne Arundel County Fire Department

Fire Facilities – Plan-Based

Anne Arundel County currently provides 55,376 square feet of fire facilities to existing development and plans to increase the level of service by constructing additional fire facilities to serve existing and future development.

Figure F6: Existing Fire Facilities

Building Name	Description	Square Feet
Fire Headquarters	Fire Headquarters	28,520
Fire Training School	Administration & Classrooms	13,000
Fire Training School	Burn Building	2,000
Fire Training School	Existing Burn Building	3,000
Fire Training School	Fire Tower	1,200
Fire Training School	Pumper Test Building w/ Reservoir	1,000
911 Dispatch	Fire Share	6,656
Total		55,376

Source: Anne Arundel County Fire Department

Joint 911 Public Safety Center

Anne Arundel County plans to replace the existing 911 Dispatch Center with the Joint 911 Public Safety Center, and this analysis allocates costs to fire and police development impact fees based on each department’s share of the existing 911 Dispatch Center. Based on the analysis shown below, costs related to the Joint 911 Public Safety Center are allocated 40 percent to fire and 60 percent to police. The total cost of the planned facility is \$74,642,000; however, Anne Arundel County will fund a portion of the facility with state and federal grants. The calculation of development impact fees uses the eligible cost of \$62,170,500 that excludes a state grant of \$10,000,000 and a federal grant of \$2,471,500.

Figure F7: Joint 911 Public Safety Center Cost Allocation

Existing 911 Dispatch Center	Square Feet	Share
Fire Department	6,656	40%
Police Department	10,019	60%
Total	16,675	100%

Source: Anne Arundel County Office of Emergency Management

Description	Square Feet	Total Cost	Eligible Cost ¹	Cost per Sq Ft
Fire Department (40%)	16,800	\$29,856,800	\$24,868,200	\$1,480
Police Department (60%)	25,200	\$44,785,200	\$37,302,300	\$1,480
Joint 911 Public Safety Center	42,000	\$74,642,000	\$62,170,500	\$1,480

Source: Anne Arundel County Capital Budget FY2024

1. Excludes \$10.0 million state grant and \$2.5 million federal grant

Planned Fire Facilities

Anne Arundel County plans to construct 107,298 square feet of fire facilities at a cost of \$190,773,200 (excluding state and federal grants). These planned facilities will replace 26,856 square feet of existing facilities, but development impact fees are not available to fund replacement of existing fire facilities. The planned facilities represent a net increase of 80,442 square feet, and development impact fees are available to fund future development’s proportionate share of the planned fire facilities.

Figure F8: Planned Fire Facilities

Description	Square Feet	Total Cost	Eligible Cost ¹	Cost per Sq Ft
Joint 911 Public Safety Center	16,800	\$29,856,800	\$24,868,200	\$1,480
Fire Training Academy	90,498	\$165,905,000	\$165,905,000	\$1,833
Total	107,298	\$195,761,800	\$190,773,200	\$1,778

Source: Anne Arundel County Capital Budget FY2024

1. Excludes \$10.0 million state grant and \$2.5 million federal grant for Joint 911 Public Safety Center

Description	Square Feet		
	Planned	Existing	Net Increase
Joint 911 Public Safety Center	16,800	6,656	10,144
Fire Training Academy	90,498	20,200	70,298
Total	107,298	26,856	80,442

Source: Anne Arundel County Fire Department, Office of Emergency Management

Upon completion of the planned fire facilities, Anne Arundel County will provide 135,818 square feet of fire facilities to serve existing and future development during the next 30 years. To prevent future development from paying for a higher level of service than provided to existing development, the analysis allocates total square feet in 2053 to total development in 2053. To allocate the proportionate share of demand to residential and nonresidential development, this analysis uses proportionate share factors shown in Figure F1. Anne Arundel County’s planned LOS for residential development is 0.1329 square feet per person (135,818 square feet X 63 percent residential share / 643,918 persons in 2053). The planned nonresidential level of service is 0.0413 square feet per vehicle trip (135,818 square feet X 37 percent nonresidential share / 1,217,327 vehicle trips in 2053).

Based on the planned cost of \$190,773,200 to construct 107,298 square feet of fire facilities, the weighted average construction cost is \$1,778 per square foot. For fire facilities, the cost is \$236.26 per person (0.1329 square feet per person X \$1,778 per square foot) and \$73.40 per vehicle trip (0.0413 square feet per vehicle trip X \$1,778 per square foot).

Figure F9: Planned Level of Service

Cost Factors	
Cost per Square Foot	\$1,778

Level-of-Service (LOS) Standards	
Existing Square Feet	55,376
Replacement Square Feet	(26,856)
Planned Square Feet	107,298
Total Square Feet	135,818
Residential	
Residential Share	63%
2053 Population	643,918
Square Feet per Person	0.1329
Cost per Person	\$236.26
Nonresidential	
Nonresidential Share	37%
2053 Vehicle Trips	1,217,327
Square Feet per Vehicle Trip	0.0413
Cost per Vehicle Trip	\$73.40

Source: Anne Arundel County Fire Department

Land – Incremental Expansion

Anne Arundel County fire stations and fire facilities currently occupy 65.3 acres of land and the County plans to maintain the existing level of service by acquiring additional land for fire stations and fire facilities to serve future development. The analysis uses land acquisition costs from the FY2024 capital budget as a proxy for future land acquisition costs. Although the figure below includes specific projects, the incremental expansion methodology allows Anne Arundel County to use development fees to fund a portion of these projects or to fund growth-related land acquisitions included in future capital budgets. The weighted average for land acquisition costs in the FY2024 capital budget is \$513,900 per acre.

Figure F10: Land Cost Factors

Description	Acres	Land Cost	Cost per Acre
Crownsville FS Replacement	4.0	\$1,149,000	\$287,250
Cape St Claire FS Replacement	4.0	\$134,000	\$33,500
Jessup FS Replacement	4.0	\$5,045,000	\$1,261,250
Arundel FS Replacement	4.0	\$850,000	\$212,500
Waugh Chapel FS Replacement	4.0	\$3,100,000	\$775,000
Total	20.0	\$10,278,000	\$513,900

Source: Anne Arundel County Capital Budget FY2024

Anne Arundel County currently provides 65.3 acres of land for fire stations and fire facilities to existing development. To allocate the proportionate share of demand to residential and nonresidential development, this analysis uses proportionate share factors shown in Figure F1. Anne Arundel County’s existing LOS for residential development is 0.00007 acres per person (65.3 acres X 63 percent residential share / 558,220 persons). The nonresidential level of service is 0.00003 acres per vehicle trip (65.3 acres X 37 percent nonresidential share / 953,445 vehicle trips). For land, the cost is \$37.90 per person (0.00007 acres per person X \$513,900 per acre) and \$13.03 per vehicle trip (0.00003 acres per vehicle trip X \$513,900 per acre).

Figure F11: Existing Level of Service

Cost Factors	
Cost per Acre	\$513,900

Level-of-Service (LOS) Standards	
Existing Acres	65.3
Residential	
Residential Share	63%
2023 Population	558,220
Acres per Person	0.00007
Cost per Person	\$37.90
Nonresidential	
Nonresidential Share	37%
2023 Vehicle Trips	953,445
Acres per Vehicle Trip	0.00003
Cost per Vehicle Trip	\$13.03

Source: Anne Arundel County Fire Department

Fire Apparatus – Incremental Expansion

Anne Arundel County currently provides 132 fire apparatus to existing development and plans to maintain the existing level of service by acquiring additional apparatus to serve future development. Based on costs provided by staff, the weighted average cost of the existing fleet is \$764,765 per unit. The analysis uses this cost as a proxy for future apparatus costs. To allocate the proportionate share of demand to residential and nonresidential development, this analysis uses proportionate share factors shown in Figure F1. Anne Arundel County’s existing LOS for residential development is 0.0001 units per person (132 units X 63 percent residential share / 558,220 persons). The nonresidential level of service is 0.0001 units per vehicle trip (132 units X 37 percent nonresidential share / 953,445 vehicle trips). For fire apparatus, the cost is \$113.93 per person (0.0001 units per person X \$764,765 per unit) and \$39.17 per vehicle trip (0.0001 units per vehicle trip X \$764,765 per unit).

Figure F12: Existing Level of Service

Description	Units	Unit Cost	Total Cost
Ambulance	23	\$478,000	\$10,994,000
Engine	30	\$1,017,000	\$30,510,000
Engine - Medic	11	\$1,017,000	\$11,187,000
Medic Unit	28	\$539,000	\$15,092,000
Pumper Tanker	4	\$1,167,000	\$4,668,000
Squad	3	\$1,235,000	\$3,705,000
SUV	15	\$94,000	\$1,410,000
Tanker	7	\$587,000	\$4,109,000
Tower	3	\$1,734,000	\$5,202,000
Tower Ladder	2	\$2,434,000	\$4,868,000
Truck	6	\$1,534,000	\$9,204,000
Total	132	\$764,765	\$100,949,000

Cost Factors	
Weighted Average per Unit	\$764,765

Level-of-Service (LOS) Standards	
Existing Units	132
Residential	
Residential Share	63%
2023 Population	558,220
Units per Person	0.0001
Cost per Person	\$113.93
Nonresidential	
Nonresidential Share	37%
2023 Vehicle Trips	953,445
Units per Vehicle Trip	0.0001
Cost per Vehicle Trip	\$39.17

Source: Anne Arundel County Fire Department

PROJECTED DEMAND FOR CAPITAL IMPROVEMENTS

The analysis calculates growth-related demand for capital improvements using the levels of service and cost factors for the infrastructure components in the previous section. Growth-related demand is a projection of future capital improvements and estimated costs over the next 10 years to maintain existing levels of service to serve new development.

Fire Stations – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for fire stations over the next 10 years. Based on a projected population increase of 45,344 persons in the unincorporated county, future residential development demands approximately 11,721 square feet of fire stations (45,344 additional persons X 0.2585 square feet per person). With projected nonresidential growth of 97,502 vehicle trips in the unincorporated county, future nonresidential development demands approximately 8,666 square feet of fire stations (97,502 additional vehicle trips X 0.0889 square feet per vehicle trip). The growth-related cost of fire stations is \$25,415,152 (20,387.0 square feet X \$1,247 per square foot). Anne Arundel County may use development impact fees to construct additional growth-related fire stations.

Figure F13: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Sq Ft
Fire Stations	0.2585 Square Feet	per Person	\$1,247
	0.0889 Square Feet	per Vehicle Trip	

Demand for Fire Stations					
Year	Population	Vehicle Trips	Square Feet		
			Residential	Nonresidential	Total
2023	558,220	953,445	144,293.9	84,744.1	229,038.0
2024	563,858	971,872	145,751.3	86,381.9	232,133.1
2025	569,552	990,299	147,223.1	88,019.7	235,242.8
2026	574,196	997,863	148,423.5	88,692.0	237,115.5
2027	578,877	1,005,427	149,633.4	89,364.4	238,997.8
2028	583,595	1,012,992	150,853.1	90,036.7	240,889.9
2029	588,352	1,020,556	152,082.6	90,709.0	242,791.7
2030	593,147	1,028,121	153,322.0	91,381.4	244,703.4
2031	596,599	1,035,730	154,214.5	92,057.7	246,272.2
2032	600,072	1,043,338	155,112.1	92,734.0	247,846.1
2033	603,564	1,050,947	156,014.8	93,410.3	249,425.0
10-Yr Increase	45,344	97,502	11,720.8	8,666.2	20,387.0

Growth-Related Expenditures	\$14,611,580	\$10,803,572	\$25,415,152
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Fire Facilities – Incremental Expansion

Anne Arundel County will construct the Joint 911 Public Safety Center and the Fire Training Academy to serve existing and future development during the next 30 years. Based on a projected population increase of 85,698 persons in the unincorporated county, future residential development demands approximately 11,388 square feet of fire facilities (85,698 additional persons X 0.1329 square feet per person). With projected nonresidential growth of 263,882 vehicle trips in the unincorporated county, future nonresidential development demands approximately 10,893 square feet of fire facilities (263,882 additional vehicle trips X 0.0413 square feet per vehicle trip).

The cost of the Joint 911 Public Safety Center and the Fire Training Academy is \$190,773,256. The growth-related cost of these fire facilities is \$39,615,332 (22,281.1 square feet X \$1,778 per square foot), and existing development’s share is \$151,157,924. Anne Arundel County will use development impact fees collected over the next 30 years to fund future development’s share of the planned fire facilities. Existing development’s share may not be funded with development impact fees.

Figure F14: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Fire Facilities	0.1329 Square Feet	per Person	\$1,778
	0.0413 Square Feet	per Vehicle Trip	

Demand for Fire Facilities					
Year	Population	Vehicle Trips	Square Feet		
			Residential	Nonresidential	Total
2023	558,220	953,445	74,177.6	39,359.3	113,536.9
2024	563,858	971,872	74,926.8	40,120.0	115,046.7
2025	569,552	990,299	75,683.4	40,880.7	116,564.1
2026	574,196	997,863	76,300.5	41,192.9	117,493.4
2027	578,877	1,005,427	76,922.5	41,505.2	118,427.7
2028	583,595	1,012,992	77,549.5	41,817.5	119,367.0
2029	588,352	1,020,556	78,181.5	42,129.7	120,311.3
2030	593,147	1,028,121	78,818.7	42,442.0	121,260.7
2031	596,599	1,035,730	79,277.5	42,756.1	122,033.6
2032	600,072	1,043,338	79,738.9	43,070.2	122,809.1
2033	603,564	1,050,947	80,203.0	43,384.3	123,587.3
2038	618,285	1,089,514	82,159.1	44,976.4	127,135.5
2043	629,074	1,129,947	83,592.8	46,645.5	130,238.3
2048	636,977	1,173,076	84,642.9	48,425.9	133,068.9
2053	643,918	1,217,327	85,565.3	50,252.7	135,818.0
30-Yr Increase	85,698	263,882	11,387.7	10,893.4	22,281.1

Growth-Related Expenditures	\$20,247,191	\$19,368,141	\$39,615,332
Existing Development Expenditures	\$99,939,981	\$51,217,943	\$151,157,924
Total Expenditures	\$120,187,172	\$70,586,084	\$190,773,256

Land – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for land over the next 10 years. Based on a projected population increase of 45,344 persons in the unincorporated county, future residential development demands approximately 3.3 acres of land (45,344 additional persons X 0.00007 acres per person). With projected nonresidential growth of 97,502 vehicle trips in the unincorporated county, future nonresidential development demands approximately 2.5 acres of land (97,502 additional vehicle trips X 0.00003 acres per vehicle trip). The growth-related cost of land is \$2,989,181 (5.8 acres X \$513,900 per acre). Anne Arundel County may use development impact fees to acquire growth-related land for fire stations and fire facilities.

Figure F15: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Acre
Land	0.00007 Acres	per Person	\$513,900
	0.00003 Acres	per Vehicle Trip	

Demand for Land					
Year	Population	Vehicle Trips	Acres		
			Residential	Nonresidential	Total
2023	558,220	953,445	41.2	24.2	65.3
2024	563,858	971,872	41.6	24.6	66.2
2025	569,552	990,299	42.0	25.1	67.1
2026	574,196	997,863	42.3	25.3	67.7
2027	578,877	1,005,427	42.7	25.5	68.2
2028	583,595	1,012,992	43.0	25.7	68.7
2029	588,352	1,020,556	43.4	25.9	69.3
2030	593,147	1,028,121	43.7	26.1	69.8
2031	596,599	1,035,730	44.0	26.3	70.3
2032	600,072	1,043,338	44.3	26.5	70.7
2033	603,564	1,050,947	44.5	26.7	71.2
10-Yr Increase	45,344	97,502	3.3	2.5	5.8

Growth-Related Expenditures	\$1,718,529	\$1,270,653	\$2,989,181
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Fire Apparatus – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for fire apparatus over the next 10 years. Based on a projected population increase of 45,344 persons in the unincorporated county, future residential development demands approximately 6.8 units (45,344 additional persons X 0.0001 units per person). With projected nonresidential growth of 97,502 vehicle trips in the unincorporated county, future nonresidential development demands approximately 5.0 units (97,502 additional vehicle trips X 0.0001 units per vehicle trip). The growth-related cost of fire apparatus is \$8,985,628 (11.7 units X \$764,765 per unit). Anne Arundel County may use development impact fees to acquire growth-related fire apparatus.

Figure F16: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Fire Apparatus	0.0001 Units	per Person	\$764,765
	0.0001 Units	per Vehicle Trip	

Demand for Fire Apparatus					
Year	Population	Vehicle Trips	Units		
			Residential	Nonresidential	Total
2023	558,220	953,445	83.2	48.8	132.0
2024	563,858	971,872	84.0	49.8	133.8
2025	569,552	990,299	84.8	50.7	135.6
2026	574,196	997,863	85.5	51.1	136.7
2027	578,877	1,005,427	86.2	51.5	137.7
2028	583,595	1,012,992	86.9	51.9	138.8
2029	588,352	1,020,556	87.6	52.3	139.9
2030	593,147	1,028,121	88.4	52.7	141.0
2031	596,599	1,035,730	88.9	53.1	141.9
2032	600,072	1,043,338	89.4	53.4	142.8
2033	603,564	1,050,947	89.9	53.8	143.7
10-Yr Increase	45,344	97,502	6.8	5.0	11.7

Growth-Related Expenditures	\$5,165,983	\$3,819,646	\$8,985,628
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MAXIMUM SUPPORTABLE FIRE DEVELOPMENT IMPACT FEES

Figure F17 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable fire development impact fees. The total capital cost is \$710.33 per person and \$236.40 per vehicle trip. Fire development impact fees are assessed to residential development according to the number of persons per dwelling unit and to nonresidential development according to the number of vehicle trips per development unit. For a residential unit with 1,800 square feet, the fee of \$1,712 is calculated using a cost of \$710.33 per person multiplied by 2.41 persons per housing unit.

Figure F17: Maximum Supportable Fire Development Impact Fees

Fee Component	Cost per Person	Cost per Vehicle Trip
Fire Stations	\$322.24	\$110.80
Fire Facilities	\$236.26	\$73.40
Land	\$37.90	\$13.03
Fire Apparatus	\$113.93	\$39.17
Total	\$710.33	\$236.40

Residential Development Impact Fees					
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹	Maximum Supportable	Current Fees ²	Difference
Under 500	Dwelling Unit	0.46	\$327	\$104	\$223
500 - 999	Dwelling Unit	1.43	\$1,016	\$169	\$847
1,000 - 1,499	Dwelling Unit	2.01	\$1,428	\$220	\$1,208
1,500 - 1,999	Dwelling Unit	2.41	\$1,712	\$254	\$1,458
2,000 - 2,499	Dwelling Unit	2.73	\$1,939	\$280	\$1,659
2,500 - 2,999	Dwelling Unit	2.98	\$2,117	\$301	\$1,816
3,000 - 3,499	Dwelling Unit	3.20	\$2,273	\$317	\$1,956
3,500 - 3,999	Dwelling Unit	3.39	\$2,408	\$331	\$2,077
4,000 - 4,499	Dwelling Unit	3.55	\$2,522	\$344	\$2,178
4,500 - 4,999	Dwelling Unit	3.70	\$2,628	\$356	\$2,272
5,000 - 5,499	Dwelling Unit	3.84	\$2,728	\$365	\$2,363
5,500 - 5,999	Dwelling Unit	3.96	\$2,813	\$375	\$2,438
6,000 and over	Dwelling Unit	4.07	\$2,891	\$379	\$2,512

Nonresidential Development Impact Fees					
Development Type	Development Unit	Vehicle Trips per 1,000 Sq Ft ¹	Maximum Supportable	Current Fees ²	Difference
Amusement, Rec., Assembly	Req Pkg Space	1.55	\$366	\$43	\$323
Hotel	Room	4.00	\$946	\$134	\$812
Industrial	1,000 sq ft	2.44	\$577	\$166	\$411
Self-Storage (Mini-Warehouse)	1,000 sq ft	0.73	\$173	\$37	\$136
For Profit Hospital	Bed	5.27	\$1,246	\$176	\$1,070
For Profit Nursing Home	Bed	1.53	\$362	\$143	\$219
Marinas	Berth	1.21	\$286	\$53	\$233
Office	1,000 sq ft	5.42	\$1,281	\$354	\$927
Mercantile	1,000 sq ft	14.06	\$3,324	\$1,010	\$2,314

1. See Land Use Assumptions

2. Current fees represent 75 percent (fire share) of the current public safety development impact fees.

PROJECTED FIRE DEVELOPMENT IMPACT FEE REVENUE

This section summarizes the potential cash flow to Anne Arundel County based on adoption of the maximum supportable fire development impact fees. The cash flow projections are based on the assumptions detailed in this chapter and the development projections discussed in Appendix A. If development occurs at a more rapid rate than projected, the demand for infrastructure and the development impact fee revenue will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure and the development impact fee revenue will decrease at a corresponding rate.

Projected development impact fee revenue equals \$50,471,053 over the next 10 years, and total projected expenditures equal \$228,163,162. Projected revenue shown below for single-family units represents a residential unit with 1,500 to 1,999 square feet, and projected revenue for multi-family units represents a residential unit with 500 to 999 square feet. Actual development impact fee revenue will vary based on the mix of residential units in each dwelling unit size range.

Figure F18: Projected Fire Development Impact Fee Revenue

Fee Component	Growth Share		Existing Share	Total
	Years 1-10	Years 11-30		
Fire Stations	\$25,415,152	\$0	\$0	\$25,415,152
Fire Facilities	\$17,869,307	\$21,745,969	\$151,157,924	\$190,773,200
Land	\$2,989,181	\$0	\$0	\$2,989,181
Fire Apparatus	\$8,985,628	\$0	\$0	\$8,985,628
Total	\$55,259,269	\$21,745,969	\$151,157,924	\$228,163,162

Year	Single Family \$1,712 per unit	Multi-Family \$1,016 per unit	Mercantile \$3,324 per 1,000 sq ft	Office \$1,281 per 1,000 sq ft	Industrial \$577 per 1,000 sq ft	Institutional \$675 per 1,000 sq ft
	Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base 2023	188,073	36,778	37,394	26,159	55,396	28,018
Year 1 2024	189,850	37,347	38,116	26,665	56,467	28,559
Year 2 2025	191,645	37,921	38,839	27,170	57,537	29,101
Year 3 2026	193,110	38,390	39,136	27,378	57,977	29,323
Year 4 2027	194,585	38,862	39,432	27,585	58,416	29,545
Year 5 2028	196,073	39,339	39,729	27,793	58,856	29,768
Year 6 2029	197,573	39,819	40,026	28,001	59,295	29,990
Year 7 2030	199,085	40,303	40,322	28,208	59,735	30,212
Year 8 2031	200,174	40,652	40,621	28,417	60,177	30,436
Year 9 2032	201,270	41,002	40,919	28,626	60,619	30,659
Year 10 2033	202,372	41,355	41,218	28,834	61,061	30,883
10-Year Increase	14,299	4,578	3,824	2,675	5,665	2,865
Projected Revenue	\$24,479,784	\$4,650,761	\$12,710,928	\$3,426,818	\$3,268,783	\$1,933,979

Projected Fee Revenue (Years 1-10)	\$50,471,053
Projected Fee Revenue (Years 11-30)	\$19,936,666
Total Expenditures	\$228,163,162

LIBRARY DEVELOPMENT IMPACT FEES

METHODOLOGY

The library development impact fees include a component for library facilities. The incremental expansion methodology is used for library facilities.

SERVICE AREA

Anne Arundel County provides libraries throughout the county; therefore, there is a countywide service area for library development impact fees.

PROPORTIONATE SHARE

The capital costs for library development impact fees are allocated 100 percent to residential development.

SERVICE UNITS

Figure L1 displays the service units for residential land uses. The library development impact fees for residential development are calculated on a per capita basis and then converted to persons per housing unit by dwelling unit size.

Figure L1: Service Units

Residential Development		
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹
Under 500	Dwelling Unit	0.46
500 - 999	Dwelling Unit	1.43
1,000 - 1,499	Dwelling Unit	2.01
1,500 - 1,999	Dwelling Unit	2.41
2,000 - 2,499	Dwelling Unit	2.73
2,500 - 2,999	Dwelling Unit	2.98
3,000 - 3,499	Dwelling Unit	3.20
3,500 - 3,999	Dwelling Unit	3.39
4,000 - 4,499	Dwelling Unit	3.55
4,500 - 4,999	Dwelling Unit	3.70
5,000 - 5,499	Dwelling Unit	3.84
5,500 - 5,999	Dwelling Unit	3.96
6,000 and over	Dwelling Unit	4.07

1. See Land Use Assumptions

LEVEL OF SERVICE AND COST ANALYSIS

This section details the level of service and capital cost per person for each infrastructure category.

Library Facilities – Incremental Expansion

Anne Arundel County currently provides 252,500 square feet of library facilities and plans to construct additional library facilities to serve future development. This analysis allocates 100 percent of demand for library facilities to residential development. The existing level of service for residential development is 0.4215 square feet per person (252,500 square feet X 100 percent residential share / 599,090 persons).

This analysis uses a cost of \$1,120 per square foot based on projects in the FY2024 capital budget. For library facilities, the cost is \$472.05 per person (0.4215 square feet per person X \$1,120 per square foot).

Figure L2: Existing Level of Service

Description	Square Feet
Broadneck	12,000
Brooklyn Park	12,500
Busch Annapolis	32,500
Crofton	25,000
Deale	8,700
Eastport-Annapolis Neck	12,100
Edgewater	12,000
Glen Burnie	20,200
Linthicum	11,100
Maryland City at Russett	15,200
Odenton	39,200
Riviera Beach	20,000
Severn	11,500
Severna Park	20,500
Total	252,500

Cost Factors	
Cost per Square Foot	\$1,120

Level-of-Service (LOS) Standards	
Existing Square Feet	252,500
Residential	
Residential Share	100%
2023 Population	599,090
Square Feet per Person	0.4215
Cost per Person	\$472.05

Source: Anne Arundel County Public Library

Description	Square Feet	Total Cost	Cost per Sq Ft
New Glen Burnie Library	32,000	\$37,592,000	\$1,175
Millersville Library	40,000	\$43,023,000	\$1,076
Total	72,000	\$80,615,000	\$1,120

Source: Anne Arundel County Capital Budget FY2024

PROJECTED DEMAND FOR CAPITAL IMPROVEMENTS

The analysis calculates growth-related demand for capital improvements using the levels of service and cost factors for the infrastructure components in the previous section. Growth-related demand is a projection of future capital improvements and estimated costs over the next 10 years to maintain existing levels of service to serve new development.

Library Facilities – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for library facilities over the next 10 years. Based on a projected population increase of 46,941 persons, future residential development demands approximately 19,784 square feet of library facilities (46,941 additional persons X 0.4215 square feet per person). The growth-related cost of library facilities is \$22,158,258 (19,784.2 square feet X \$1,120 per square foot). Anne Arundel County may use development impact fees to construct additional library facilities.

Figure L3: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Library Facilities	0.4215 Square Feet	per Person	\$1,120
	0.0000 Square Feet	per Job	

Demand for Library Facilities					
Year	Population	Jobs	Square Feet		
			Residential	Nonresidential	Total
2023	599,090	-	252,500.0	-	252,500.0
2024	604,951	-	254,970.2	-	254,970.2
2025	610,869	-	257,464.6	-	257,464.6
2026	615,689	-	259,496.2	-	259,496.2
2027	620,548	-	261,543.7	-	261,543.7
2028	625,444	-	263,607.4	-	263,607.4
2029	630,379	-	265,687.4	-	265,687.4
2030	635,353	-	267,783.8	-	267,783.8
2031	638,893	-	269,275.6	-	269,275.6
2032	642,452	-	270,775.7	-	270,775.7
2033	646,031	-	272,284.2	-	272,284.2
10-Yr Increase	46,941	-	19,784.2	-	19,784.2

Growth-Related Expenditures	\$22,158,258	-	\$22,158,258
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MAXIMUM SUPPORTABLE LIBRARY DEVELOPMENT IMPACT FEES

Shown below, Figure L4 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable library development impact fees. The total capital cost is \$472.05 per person. Library development impact fees are assessed to residential development according to the number of persons per housing unit. For a residential unit with 1,800 square feet, the fee of \$1,138 is calculated using a cost of \$472.05 per person multiplied by 2.41 persons per housing unit.

Figure L4: Maximum Supportable Library Development Impact Fees

Fee Component	Cost per Person
Library Facilities	\$472.05
Total	\$472.05

Residential Development Impact Fees					
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹	Maximum Supportable	Current Fees	Difference
Under 500	Dwelling Unit	0.46	\$217	\$0	\$217
500 - 999	Dwelling Unit	1.43	\$675	\$0	\$675
1,000 - 1,499	Dwelling Unit	2.01	\$949	\$0	\$949
1,500 - 1,999	Dwelling Unit	2.41	\$1,138	\$0	\$1,138
2,000 - 2,499	Dwelling Unit	2.73	\$1,289	\$0	\$1,289
2,500 - 2,999	Dwelling Unit	2.98	\$1,407	\$0	\$1,407
3,000 - 3,499	Dwelling Unit	3.20	\$1,511	\$0	\$1,511
3,500 - 3,999	Dwelling Unit	3.39	\$1,600	\$0	\$1,600
4,000 - 4,499	Dwelling Unit	3.55	\$1,676	\$0	\$1,676
4,500 - 4,999	Dwelling Unit	3.70	\$1,747	\$0	\$1,747
5,000 - 5,499	Dwelling Unit	3.84	\$1,813	\$0	\$1,813
5,500 - 5,999	Dwelling Unit	3.96	\$1,869	\$0	\$1,869
6,000 and over	Dwelling Unit	4.07	\$1,921	\$0	\$1,921

1. See Land Use Assumptions

PROJECTED LIBRARY DEVELOPMENT IMPACT FEE REVENUE

This section summarizes the potential cash flow to Anne Arundel County based on adoption of the maximum supportable library development impact fees. The cash flow projections are based on the assumptions detailed in this chapter and the development projections discussed in Appendix A. If development occurs at a more rapid rate than projected, the demand for infrastructure and the development impact fee revenue will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure and the development impact fee revenue will decrease at a corresponding rate.

Projected development impact fee revenue equals \$20,087,616 and total projected expenditures equal \$22,158,258. Projected development impact fee revenue shown below for single-family units represents a residential unit with 1,500 to 1,999 square feet, and projected development impact fee revenue for multi-family units represents a residential unit with 500 to 999 square feet. Actual development impact fee revenue will vary based on the mix of residential units in each dwelling unit size range.

Figure L5: Projected Library Development Impact Fee Revenue

Fee Component	Growth Share	Existing Share	Total
Library Facilities	\$22,158,258	\$0	\$22,158,258
Total	\$22,158,258	\$0	\$22,158,258

		Single Family \$1,138 per unit	Multi-Family \$675 per unit	Mercantile \$0 per 1,000 sq ft	Office \$0 per 1,000 sq ft	Industrial \$0 per 1,000 sq ft	Institutional \$0 per 1,000 sq ft
Year		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2023	200,173	43,422	41,155	29,000	57,216	31,449
Year 1	2024	202,025	44,015	41,950	29,560	58,322	32,057
Year 2	2025	203,896	44,613	42,745	30,121	59,428	32,665
Year 3	2026	205,419	45,101	43,072	30,351	59,882	32,914
Year 4	2027	206,954	45,593	43,399	30,581	60,336	33,164
Year 5	2028	208,502	46,088	43,725	30,811	60,790	33,414
Year 6	2029	210,061	46,587	44,052	31,041	61,244	33,663
Year 7	2030	211,633	47,090	44,378	31,271	61,698	33,913
Year 8	2031	212,752	47,449	44,707	31,503	62,154	34,164
Year 9	2032	213,877	47,809	45,035	31,734	62,611	34,415
Year 10	2033	215,008	48,171	45,363	31,966	63,067	34,665
10-Year Increase		14,835	4,749	4,209	2,966	5,851	3,216
Projected Revenue		\$16,881,997	\$3,205,619	\$0	\$0	\$0	\$0

Projected Fee Revenue	\$20,087,616
Total Expenditures	\$22,158,258

PARKS AND RECREATION DEVELOPMENT IMPACT FEES

METHODOLOGY

The parks and recreation development impact fees include components for park land, park amenities, and recreation facilities. The incremental expansion methodology is used for all components.

SERVICE AREA

Anne Arundel County provides access to parks and recreation facilities throughout the county; therefore, there is a countywide service area for parks and recreation development impact fees.

PROPORTIONATE SHARE

The capital costs for parks and recreation development impact fees are allocated 100 percent to residential development.

SERVICE UNITS

Figure PR1 displays the service units for residential land uses. The parks and recreation development impact fees for residential development are calculated on a per capita basis and then converted to persons per housing unit by dwelling unit size.

Figure PR1: Service Units

Residential Development		
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹
Under 500	Dwelling Unit	0.46
500 - 999	Dwelling Unit	1.43
1,000 - 1,499	Dwelling Unit	2.01
1,500 - 1,999	Dwelling Unit	2.41
2,000 - 2,499	Dwelling Unit	2.73
2,500 - 2,999	Dwelling Unit	2.98
3,000 - 3,499	Dwelling Unit	3.20
3,500 - 3,999	Dwelling Unit	3.39
4,000 - 4,499	Dwelling Unit	3.55
4,500 - 4,999	Dwelling Unit	3.70
5,000 - 5,499	Dwelling Unit	3.84
5,500 - 5,999	Dwelling Unit	3.96
6,000 and over	Dwelling Unit	4.07

1. See Land Use Assumptions

LEVEL OF SERVICE AND COST ANALYSIS

This section details the level of service and capital cost per person for each infrastructure category.

Park Land – Incremental Expansion

Anne Arundel County currently provides approximately 38,400 acres of recreation and resource land under federal, state, and local ownership. In combination, the County, the City of Annapolis, the Board of Education, and the Town of Highland Beach provide 10,100.5 acres of local recreation land. This acreage comprises 7,882.3 acres of County parks and recreation areas, 2,047.6 acres of recreation land at schools (school recreation parks), 169.6 acres in the City of Annapolis, and 1.0 acre in the Town of Highland Beach.

Figure PR2: Existing Park Land

Owner	Recreation	Resource	Total
Anne Arundel County	7,882.3	10,802.9	18,685.3
Board of Education	2,047.6	0.0	2,047.6
City of Annapolis	169.6	470.5	640.1
Town of Highland Beach	1.0	0.2	1.2
Subtotal, Local	10,100.5	11,273.6	21,374.2
State	1,866.5	2,871.0	4,737.5
Federal	0.0	12,288.5	12,288.5
Subtotal, State and Federal	1,866.5	15,159.5	17,026.0
Total	11,967.1	26,433.1	38,400.2

Source: Anne Arundel County 2022 Land Preservation, Parks & Recreation Plan

Based on recent and planned park land acquisitions provided by Anne Arundel County Recreation & Parks, the weighted average cost to acquire an acre of park land is \$79,283 per acre. The analysis uses this cost to project future park land acquisition costs.

Figure PR3: Park Land Cost per Acre

Description	Purchase Year	Acres	Cost	Cost per Acre
2672 Solomons Island Rd. Edgewater	FY22	5.64	\$362,642	\$64,253
1557 Severn Chapel Rd. Crownsville (Betty Forney)	FY22	2.88	\$392,997	\$136,457
5992 Pindell Road, Lothian (Wilt)	FY22	2.17	\$192,207	\$88,575
Elktonia/Carrs Beach, Annapolis - Owned by City of Annapolis	FY23	5.17	\$6,498,250	\$1,256,915
1588 Millersville Rd. Millersville (Hanahoe)	FY23	2.11	\$486,283	\$230,575
241-249 Delaware Ave. Glen Burnie	FY23	1.12	\$36,000	\$32,143
818 Cornish Lane, Parcel 818, Pasadena	FY23	5.50	\$169,788	\$30,871
1151 Deep Cove Road Churchton (Hardisty)	FY23	5.54	\$140,075	\$25,298
440 Ritchie Hwy, Severna Park (Cattail Creek)	FY24	11.38	\$1,357,350	\$119,261
Race Road Properties, Hanover	FY24	13.76	\$5,891,000	\$428,281
499 Elizabeth Road, Glen Burnie (GBHOA)	FY24	3.50	\$300,000	\$85,714
6095 Solomons Island Road Tracys Landing (Wilkerson)	FY24	107.28	\$2,000,000	\$18,643
Bestgate Rd/Moran Drive, Annapolis (Saltworks Creek)	FY24	47.17	\$1,000,000	\$21,200
4162 Sands Road, Harwood (Parker)	FY24	29.17	\$390,800	\$13,396
Total		242.39	\$19,217,392	\$79,283

Source: Anne Arundel County Recreation & Parks

Although Anne Arundel County provides approximately 38,400 acres of park land to existing development, the analysis includes only recreation land owned by Anne Arundel County. The County currently provides 7,882.3 acres of recreation land and plans to acquire additional park land to serve future development. This analysis allocates 100 percent of demand for park land to residential development. Anne Arundel County’s existing LOS for residential development is 0.013 acres per person (7,882.3 acres X 100 percent residential share / 599,090 persons).

Based on recent and planned park land acquisition costs provided by Anne Arundel County Recreation & Parks, the weighted average cost to acquire park land is \$79,283 per acre. For park land, the cost is \$1,043.14 per person (0.013 acres per person X \$79,283 per acre).

Figure PR4: Existing Level of Service

Cost Factors	
Cost per Acre	\$79,283

Level-of-Service (LOS) Standards	
Existing Acres - Recreation	7,882.3
Residential	
Residential Share	100%
2023 Population	599,090
Acres per Person	0.013
Cost per Person	\$1,043.14

Source: Anne Arundel County Recreation & Parks

Park Amenities – Incremental Expansion

Anne Arundel County currently provides 991 park amenities. This includes 861 park amenities in county parks and 496 park amenities in Board of Education (BOE) school recreation parks. Since school recreation parks do not have the same availability as county parks, the analysis includes an adjustment to reflect the availability of school recreation parks. Based on estimates provided by Anne Arundel County Parks & Recreation, school recreation parks are available for public use 26 percent of the time. Applying the adjustment factor of 26 percent to the BOE units results in a total of 130 adjusted BOE park amenities. Based on recent and planned construction costs provided by Anne Arundel County Parks & Recreation, the total cost of existing park amenities is \$266,595,330. The weighted average cost of existing park amenities is \$269,016 per unit.

Figure PR5: Existing Park Amenities

Description	County Units	BOE Units	BOE Adjustment ¹	Adjusted BOE Units	Total Units	Unit Cost	Total Cost
Lighted Baseball	56	4	26%	1	57	\$766,768	\$43,705,791
Unlighted Baseball	130	151	26%	40	170	\$366,768	\$62,350,606
Lighted Multipurpose Fields	52	26	26%	7	59	\$634,838	\$37,455,438
Unlighted Multipurpose Fields	43	119	26%	31	74	\$438,175	\$32,424,963
Outdoor Basketball Courts	77	74	26%	19	96	\$174,826	\$16,783,260
Lighted Outdoor Basketball	8	0	26%	0	8	\$215,426	\$1,723,408
Playgrounds	73	107	26%	28	101	\$336,000	\$33,936,000
Pavilions	58	1	26%	0	58	\$91,230	\$5,291,364
Picnic Areas	208	6	26%	2	210	\$68,000	\$14,280,000
Dog Areas	9	0	26%	0	9	\$275,000	\$2,475,000
Car-top Launches	21	0	26%	0	21	\$33,500	\$703,500
Boat Ramps	2	0	26%	0	2	\$100,000	\$200,000
Skate Courts	5	0	26%	0	5	\$800,000	\$4,000,000
Volleyball Courts	9	0	26%	0	9	\$10,000	\$90,000
Outdoor Pickleball Courts	42	8	26%	2	44	\$64,600	\$2,842,400
Lighted Outdoor Tennis Courts	16	0	26%	0	16	\$153,600	\$2,457,600
Outdoor Tennis Courts	52	0	26%	0	52	\$113,000	\$5,876,000
Total	861	496		130	991	\$269,016	\$266,595,330

Source: Anne Arundel County Recreation & Parks

1. BOE unit availability for public use is 26 percent according to Anne Arundel County Recreation & Parks

Anne Arundel County currently provides 991 park amenities. This analysis allocates 100 percent of demand for park amenities to residential development. The existing LOS for residential development is 0.0017 units per person (991 units X 100 percent residential share / 599,090 persons).

Based on recent and planned construction costs provided by Anne Arundel County Parks & Recreation, the weighted average cost of existing park amenities is \$269,016 per unit. Anne Arundel County may use development impact fees to construct additional park amenities in existing or future parks. For park amenities, the cost is \$445.00 per person (0.0017 units per person X \$269,016 per unit).

Figure PR6: Existing Level of Service

Cost Factors	
Weighted Average per Unit	\$269,016

Level-of-Service (LOS) Standards	
Existing Units	991
Residential	
Residential Share	100%
2023 Population	599,090
Units per Person	0.0017
Cost per Person	\$445.00

Source: Anne Arundel County Recreation & Parks

Recreation Facilities – Incremental Expansion

Anne Arundel County currently provides 87,755 square feet of recreation facilities and plans to construct additional recreation facilities to serve future development.

Figure PR7: Existing Recreation Facilities

Site Description	Building Description	Square Feet
Arundel Olympic Swim Center	Arundel Olympic Swim Center	40,000
North Arundel Aquatic Swim Center	North Arundel Aquatic Center	25,981
Davidsonville Family Recreation Center	Community Center Building	6,792
South County Recreation Center	Recreation Center	8,100
South County Recreation Center	Recreation Center Annex	2,082
North County Recreation Center	Recreation Center	4,800
Total		87,755

Source: Anne Arundel County Recreation & Parks

This analysis allocates 100 percent of demand for recreation facilities to residential development. The existing LOS for residential development is 0.1465 square feet per person (87,755 square feet X 100 percent residential share / 599,090 persons).

Based on construction costs provided by Anne Arundel County Parks & Recreation, the construction cost for recreation facilities is \$400 per square foot. For recreation facilities, the cost is \$58.59 per person (0.1465 square feet per person X \$400 per square foot).

Figure PR8: Existing Level of Service

Cost Factors	
Cost per Square Foot	\$400

Level-of-Service (LOS) Standards	
Existing Square Feet	87,755
Residential	
Residential Share	100%
2023 Population	599,090
Square Feet per Person	0.1465
Cost per Person	\$58.59

Source: Anne Arundel County Recreation & Parks

PROJECTED DEMAND FOR CAPITAL IMPROVEMENTS

The analysis calculates growth-related demand for capital improvements using the levels of service and cost factors for the infrastructure components in the previous section. Growth-related demand is a projection of future capital improvements and estimated costs over the next 10 years to maintain existing levels of service to serve new development.

Park Land – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for park land over the next 10 years. Based on a projected population increase of 46,941 persons, future residential development demands approximately 618 acres of park land (46,941 additional persons X 0.013 acres per person). The growth-related cost of park land is \$48,965,181 (617.6 acres X \$79,283 per acre). Anne Arundel County may use development impact fees to acquire additional park land.

Figure PR9: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Acre
Park Land	0.013 Acres	per Person	\$79,283
	0.000 Acres	per Job	

Demand for Park Land					
Year	Population	Jobs	Acres		
			Residential	Nonresidential	Total
2023	599,090	-	7,882.3	-	7,882.3
2024	604,951	-	7,959.4	-	7,959.4
2025	610,869	-	8,037.3	-	8,037.3
2026	615,689	-	8,100.7	-	8,100.7
2027	620,548	-	8,164.6	-	8,164.6
2028	625,444	-	8,229.0	-	8,229.0
2029	630,379	-	8,294.0	-	8,294.0
2030	635,353	-	8,359.4	-	8,359.4
2031	638,893	-	8,406.0	-	8,406.0
2032	642,452	-	8,452.8	-	8,452.8
2033	646,031	-	8,499.9	-	8,499.9
10-Yr Increase	46,941	-	617.6	-	617.6

Growth-Related Expenditures	\$48,965,181	-	\$48,965,181
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Park Amenities – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for park amenities over the next 10 years. Based on a projected population increase of 46,941 persons, future residential development demands approximately 78 park amenities (46,941 additional persons X 0.0017 units per person). The growth-related cost of park amenities is \$20,875,642 (77.6 units X \$269,016 per unit). Anne Arundel County may use development impact fees to construct additional park amenities in existing or future parks.

Figure PR10: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Park Amenities	0.0017 Units	per Person	\$269,016
	0.0000 Units	per Job	

Demand for Park Amenities					
Year	Population	Jobs	Units		
			Residential	Nonresidential	Total
2023	599,090	-	991.0	-	991.0
2024	604,951	-	1,000.7	-	1,000.7
2025	610,869	-	1,010.5	-	1,010.5
2026	615,689	-	1,018.5	-	1,018.5
2027	620,548	-	1,026.5	-	1,026.5
2028	625,444	-	1,034.6	-	1,034.6
2029	630,379	-	1,042.8	-	1,042.8
2030	635,353	-	1,051.0	-	1,051.0
2031	638,893	-	1,056.8	-	1,056.8
2032	642,452	-	1,062.7	-	1,062.7
2033	646,031	-	1,068.6	-	1,068.6
10-Yr Increase	46,941	-	77.6	-	77.6

Growth-Related Expenditures	\$20,875,642	-	\$20,875,642
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Recreation Facilities – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for recreation facilities over the next 10 years. Based on a projected population increase of 46,941 persons, future residential development demands approximately 6,876 square feet of recreation facilities (46,941 additional persons X 0.1465 square feet per person). The growth-related cost of recreation facilities is \$2,750,360 (6,875.9 square feet X \$400 per square foot). Anne Arundel County may use development impact fees to construct additional recreation facilities.

Figure PR11: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Recreation Facilities	0.1465 Square Feet	per Person	\$400
	0.0000 Square Feet	per Job	

Demand for Recreation Facilities					
Year	Population	Jobs	Square Feet		
			Residential	Nonresidential	Total
2023	599,090	-	87,755.0	-	87,755.0
2024	604,951	-	88,613.5	-	88,613.5
2025	610,869	-	89,480.4	-	89,480.4
2026	615,689	-	90,186.5	-	90,186.5
2027	620,548	-	90,898.1	-	90,898.1
2028	625,444	-	91,615.3	-	91,615.3
2029	630,379	-	92,338.2	-	92,338.2
2030	635,353	-	93,066.8	-	93,066.8
2031	638,893	-	93,585.3	-	93,585.3
2032	642,452	-	94,106.6	-	94,106.6
2033	646,031	-	94,630.9	-	94,630.9
10-Yr Increase	46,941	-	6,875.9	-	6,875.9

Growth-Related Expenditures	\$2,750,360	-	\$2,750,360
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CREDIT EVALUATION

Anne Arundel County consistently funds Recreation & Parks capital costs with “grants & aid” funding sources. Shown below, grants & aid funding from FY2020 through FY2024 accounts for 26 percent of Recreation & Parks capital costs. To ensure future development does not pay more than its proportionate share for future park infrastructure, the cost per person used to calculate the parks and recreation development impact fees includes a credit of 26 percent.

Figure PR12: Grants & Aid Credit

Year	Grants & Aid Funding	Capital Cost	Share of Capital Cost
2020	\$12,168,918	\$47,561,018	26%
2021	\$3,998,900	\$35,074,200	11%
2022	\$15,122,400	\$46,682,050	32%
2023 ¹	\$22,797,000	\$69,544,450	33%
2024	\$22,061,600	\$94,370,500	23%
Total	\$76,148,818	\$293,232,218	26%

Source: Anne Arundel County Capital Budget FY2020 - FY2024

1. Excludes \$30.6 million State funding and capital cost for Crownsville Hospital

MAXIMUM SUPPORTABLE PARKS AND RECREATION DEVELOPMENT IMPACT FEES

Shown below, Figure PR13 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable parks and recreation development impact fees. The gross capital cost is \$1,546.73 per person. After applying the credit, the net capital cost used to calculate parks and recreation development impact fees is \$1,144.58 per person. Parks and recreation development impact fees are assessed to residential development according to the number of persons per housing unit. For a residential unit with 1,800 square feet, the fee of \$2,758 is calculated using a cost of \$1,144.58 per person multiplied by 2.41 persons per housing unit.

Figure PR13: Maximum Supportable Parks and Recreation Development Impact Fees

Fee Component	Cost per Person
Park Land	\$1,043.14
Park Amenities	\$445.00
Recreation Facilities	\$58.59
Subtotal	\$1,546.73
Credit: Grants & Aid (26%)	(\$402.15)
Total	\$1,144.58

Residential Development Impact Fees					
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹	Maximum Supportable	Current Fees	Difference
Under 500	Dwelling Unit	0.46	\$527	\$0	\$527
500 - 999	Dwelling Unit	1.43	\$1,637	\$0	\$1,637
1,000 - 1,499	Dwelling Unit	2.01	\$2,301	\$0	\$2,301
1,500 - 1,999	Dwelling Unit	2.41	\$2,758	\$0	\$2,758
2,000 - 2,499	Dwelling Unit	2.73	\$3,125	\$0	\$3,125
2,500 - 2,999	Dwelling Unit	2.98	\$3,411	\$0	\$3,411
3,000 - 3,499	Dwelling Unit	3.20	\$3,663	\$0	\$3,663
3,500 - 3,999	Dwelling Unit	3.39	\$3,880	\$0	\$3,880
4,000 - 4,499	Dwelling Unit	3.55	\$4,063	\$0	\$4,063
4,500 - 4,999	Dwelling Unit	3.70	\$4,235	\$0	\$4,235
5,000 - 5,499	Dwelling Unit	3.84	\$4,395	\$0	\$4,395
5,500 - 5,999	Dwelling Unit	3.96	\$4,533	\$0	\$4,533
6,000 and over	Dwelling Unit	4.07	\$4,658	\$0	\$4,658

1. See Land Use Assumptions

PROJECTED PARKS AND RECREATION DEVELOPMENT IMPACT FEE REVENUE

This section summarizes the potential cash flow to Anne Arundel County based on adoption of the maximum supportable parks and recreation development impact fees. The cash flow projections are based on the assumptions detailed in this chapter and the development projections discussed in Appendix A. If development occurs at a more rapid rate than projected, the demand for infrastructure and the development impact fee revenue will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure and the development impact fee revenue will decrease at a corresponding rate.

Projected development impact fee revenue equals \$48,688,586 and total projected expenditures equal \$53,717,475. Projected development impact fee revenue shown below for single-family units represents a residential unit with 1,500 to 1,999 square feet, and projected development impact fee revenue for multi-family units represents a residential unit with 500 to 999 square feet. Actual development impact fee revenue will vary based on the mix of residential units in each dwelling unit size range.

Figure PR14: Projected Parks and Recreation Development Impact Fee Revenue

Fee Component	Growth Share	Existing Share	Total
Park Land	\$48,965,181	\$0	\$48,965,181
Park Amenities	\$20,875,642	\$0	\$20,875,642
Recreation Facilities	\$2,750,360	\$0	\$2,750,360
Credit: Grants & Aid (26%)	(\$18,873,707)	\$0	(\$18,873,707)
Total	\$53,717,475	\$0	\$53,717,475

		Single Family \$2,758 per unit	Multi-Family \$1,637 per unit	Mercantile \$0 per 1,000 sq ft	Office \$0 per 1,000 sq ft	Industrial \$0 per 1,000 sq ft	Institutional \$0 per 1,000 sq ft
Year		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2023	200,173	43,422	41,155	29,000	57,216	31,449
Year 1	2024	202,025	44,015	41,950	29,560	58,322	32,057
Year 2	2025	203,896	44,613	42,745	30,121	59,428	32,665
Year 3	2026	205,419	45,101	43,072	30,351	59,882	32,914
Year 4	2027	206,954	45,593	43,399	30,581	60,336	33,164
Year 5	2028	208,502	46,088	43,725	30,811	60,790	33,414
Year 6	2029	210,061	46,587	44,052	31,041	61,244	33,663
Year 7	2030	211,633	47,090	44,378	31,271	61,698	33,913
Year 8	2031	212,752	47,449	44,707	31,503	62,154	34,164
Year 9	2032	213,877	47,809	45,035	31,734	62,611	34,415
Year 10	2033	215,008	48,171	45,363	31,966	63,067	34,665
10-Year Increase		14,835	4,749	4,209	2,966	5,851	3,216
Projected Revenue		\$40,914,366	\$7,774,219	\$0	\$0	\$0	\$0

Projected Fee Revenue	\$48,688,586
Total Expenditures	\$53,717,475

POLICE DEVELOPMENT IMPACT FEES

METHODOLOGY

The police development impact fees include components for police facilities and police vehicles. The plan-based methodology is used for the police facilities component, and the incremental expansion methodology is used for the police vehicles component.

SERVICE AREA

Anne Arundel County provides police service in the unincorporated county; therefore, the service area for police development impact fees is unincorporated Anne Arundel County.

PROPORTIONATE SHARE

The capital costs for police development impact fees are allocated between residential and nonresidential development using functional population. Based on 2020 estimates from the U.S. Census Bureau's OnTheMap web application, residential development accounts for approximately 71 percent of functional population and nonresidential development accounts for the remaining 29 percent.

Figure P1: Functional Population

Demand Units in 2020				
Residential			Demand Hours/Day	Person Hours
Population	568,439	↘		
Residents Not Working	300,084		20	6,001,680
Employed Residents	268,355	↘		
Employed in Anne Arundel	110,417		14	1,545,838
Employed outside Anne Arundel	157,938		14	2,211,132
			Residential Subtotal	9,758,650
			Residential Share	71%
Nonresidential				
Non-working Residents	300,084		4	1,200,336
Jobs Located in Anne Arundel	270,513	↘		
Residents Employed in Anne Arundel	110,417		10	1,104,170
Non-Resident Workers (inflow commuters)	160,096		10	1,600,960
			Nonresidential Subtotal	3,905,466
			Nonresidential Share	29%
			Total	13,664,116

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates (population), U.S. Census Bureau, OnTheMap 6.1.1 Application and LEHD Origin-Destination Employment Statistics (employment).

The proportionate share of costs attributable to residential development is allocated to population and then converted to an appropriate amount by dwelling unit size. Since nonresidential calls for service were unavailable, TischlerBise recommends using vehicle trips as the demand indicator for nonresidential demand for police services. Vehicle trip generation rates are highest for commercial/retail development and lowest for industrial development. Vehicle trip generation rates for office and institutional development fall between the other two categories. This ranking of vehicle trip generation rates is consistent with the relative demand for police services from nonresidential development.

SERVICE UNITS

Figure P2 displays the service units for residential and nonresidential land uses. The police development impact fees for residential development are calculated on a per capita basis and then converted to persons per housing unit by dwelling unit size. For nonresidential development, police development impact fees are calculated per average weekday vehicle trip (AWVT) and then converted to vehicle trips per development unit.

Figure P2: Service Units

Residential Development		
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹
Under 500	Dwelling Unit	0.46
500 - 999	Dwelling Unit	1.43
1,000 - 1,499	Dwelling Unit	2.01
1,500 - 1,999	Dwelling Unit	2.41
2,000 - 2,499	Dwelling Unit	2.73
2,500 - 2,999	Dwelling Unit	2.98
3,000 - 3,499	Dwelling Unit	3.20
3,500 - 3,999	Dwelling Unit	3.39
4,000 - 4,499	Dwelling Unit	3.55
4,500 - 4,999	Dwelling Unit	3.70
5,000 - 5,499	Dwelling Unit	3.84
5,500 - 5,999	Dwelling Unit	3.96
6,000 and over	Dwelling Unit	4.07

Nonresidential Development				
Development Type	Development Unit	AWVTE per 1,000 Sq Ft ¹	Trip Adjustment ¹	AWVT per 1,000 Sq Ft
Amusement, Rec., Assembly	Req Pkg Space	3.10	50%	1.55
Hotel	Room	7.99	50%	4.00
Industrial	1,000 sq ft	4.87	50%	2.44
Self-Storage (Mini-Warehouse)	1,000 sq ft	1.45	50%	0.73
For Profit Hospital	Bed	10.54	50%	5.27
For Profit Nursing Home	Bed	3.06	50%	1.53
Marinas	Berth	2.41	50%	1.21
Office	1,000 sq ft	10.84	50%	5.42
Mercantile	1,000 sq ft	37.01	38%	14.06

1. See Land Use Assumptions

LEVEL OF SERVICE AND COST ANALYSIS

This section details the level of service and capital cost per demand unit for each infrastructure category.

Police Facilities – Plan-Based

Anne Arundel County currently provides 212,979 square feet of police facilities to existing development and plans to construct additional police facilities to serve future development.

Figure P3: Existing Police Facilities

Building Name	Description	Square Feet
Eastern Police Station	Eastern District Police Station	17,500
Northern District Police Station	Northern District Police Station	12,200
Southern District Police Station	Sothern District Police Station	15,000
Western District Police Station	Western District Police Station	11,400
K-9 Building	Offices and K9 Dog Kennels	2,300
911 Dispatch Center	911 Dispatch Center	10,019
Police Administration	Police Headquarters	45,376
Police Criminal Evidence Storage Building	Evidence Storage	12,600
Police Laboratory	Crime Laboratory	6,860
Police Training Academy	Administration Building - Classrooms	7,947
Police Training Academy	Classrooms	1,600
Police Training Academy	Underground Storage	4,500
Police Training Academy	Underground Gym	4,500
Police Training Academy	Video Building	1,980
Police Training Academy	Garage	800
Police Training Academy	Generator Building	1,200
Police Training Academy	Firing Range	25,000
Police Academy	Administration Building	17,288
Police Academy	Water Treatment Bldg and Equipment	200
Police Academy	Fitness Center	13,109
Police Academy	MAT Building	300
Combined Support Services Complex	Quick Response Team (share)	1,300
Total		212,979

Source: Anne Arundel County Police Department

Joint 911 Public Safety Center

Anne Arundel County plans to replace the existing 911 Dispatch Center with the Joint 911 Public Safety Center, and this analysis allocates costs to fire and police development impact fees based on each department’s share of the existing 911 Dispatch Center. Based on the analysis shown below, costs related to the Joint 911 Public Safety Center are allocated 40 percent to fire and 60 percent to police. The total cost of the planned facility is \$74,642,000; however, Anne Arundel County will fund a portion of the facility with state and federal grants. The calculation of development impact fees uses the eligible cost of \$62,170,500 that excludes a state grant of \$10,000,000 and a federal grant of \$2,471,500.

Figure P4: Joint 911 Public Safety Center Cost Allocation

Existing 911 Dispatch Center	Square Feet	Share
Fire Department	6,656	40%
Police Department	10,019	60%
Total	16,675	100%

Description	Square Feet	Total Cost	Eligible Cost ¹	Cost per Sq Ft
Fire Department (40%)	16,800	\$29,856,800	\$24,868,200	\$1,480
Police Department (60%)	25,200	\$44,785,200	\$37,302,300	\$1,480
Joint 911 Public Safety Center	42,000	\$74,642,000	\$62,170,500	\$1,480

Source: Anne Arundel County Office of Emergency Management

1. Excludes \$10.0 million state grant and \$2.5 million federal grant

Planned Police Facilities

Anne Arundel County plans to construct 211,211 square feet of police facilities at a cost of \$149,975,300. These planned facilities will replace 111,503 square feet of existing facilities, but development impact fees are not available to fund replacement of existing police facilities. The planned facilities represent a net increase of 99,708 square feet, and development impact fees are available to fund future development’s proportionate share of the new facilities.

Figure P5: Planned Police Facilities

Description	Square Feet	Eligible Cost ¹	Cost per Sq Ft
Joint 911 Public Safety Center (share)	25,200	\$37,302,300	\$1,480
Police Firing Range	25,800	\$26,705,000	\$1,035
Police Training Academy	55,224	\$21,046,000	\$381
Police C.I.D. Facility	15,000	\$10,708,000	\$714
Evidence & Forensic Sci Unit	62,563	\$40,013,000	\$640
Police Special Ops Facility	27,424	\$14,201,000	\$518
Total	211,211	\$149,975,300	\$710

Description	Square Feet		
	Planned	Existing	Net Increase
Joint 911 Public Safety Center	25,200	10,019	15,181
Police Firing Range	25,800	25,000	800
Police Training Academy	55,224	53,424	1,800
Police C.I.D. Facility	15,000	0	15,000
Evidence & Forensic Sci Unit	62,563	19,460	43,103
Police Special Ops Facility	27,424	3,600	23,824
Total	211,211	111,503	99,708

Source: Anne Arundel County Capital Budget FY2024, Anne Arundel County Police Department

1. Does not include state or federal grants

Upon completion of the planned police facilities, Anne Arundel County will provide 312,687 square feet of police facilities to serve existing and future development during the next 30 years. To allocate the proportionate share of demand to residential and nonresidential development, this analysis uses proportionate share factors shown in Figure P1. Anne Arundel County’s planned LOS for residential development is 0.3448 square feet per person (312,687 square feet X 71 percent residential share / 643,918 persons in 2053). The planned nonresidential level of service is 0.0745 square feet per vehicle trip (312,687 square feet X 29 percent nonresidential share / 1,217,327 vehicle trips in 2053).

Based on the planned cost of \$149,975,300 to construct 211,211 square feet of police facilities, the weighted average construction cost is \$710 per square foot. For police facilities, the cost is \$244.82 per person (0.3448 square feet per person X \$710 per square foot) and \$52.89 per vehicle trip (0.0745 square feet per vehicle trip X \$710 per square foot).

Figure P6: Planned Level of Service

Cost Factors	
Cost per Square Foot	\$710

Level-of-Service (LOS) Standards	
Existing Square Feet	212,979
Replacement Square Feet	(111,503)
Planned Square Feet	211,211
Total Square Feet	312,687
Residential	
Residential Share	71%
2053 Population	643,918
Square Feet per Person	0.3448
Cost per Person	\$244.82
Nonresidential	
Nonresidential Share	29%
2053 Vehicle Trips	1,217,327
Square Feet per Vehicle Trip	0.0745
Cost per Vehicle Trip	\$52.89

Source: Anne Arundel County Police Department

Police Vehicles – Incremental Expansion

Anne Arundel County currently provides 825 police vehicles to existing development and plans to acquire additional vehicles to serve future development. Based on costs provided by staff, the weighted average cost of the existing fleet is \$57,896 per unit. The analysis uses this cost to project future vehicle costs.

Figure P7: Existing Police Vehicles

Description	Units	Unit Cost	Total Cost
Animal Control Van W/Insert	6	\$81,750	\$490,500
Compact Automobile	6	\$16,800	\$100,800
Mid Size Automobile (Police)	57	\$36,000	\$2,052,000
1/2 Ton Pick Up Truck (F-150)	3	\$36,000	\$108,000
1/2 Ton Pick Up Truck 4X4 (F-150)	23	\$54,000	\$1,242,000
Police/Sheriff 1/2 Ton Pick Up Upfit	5	\$54,000	\$270,000
1/2 Ton Pick Up- K9 Upfit	2	\$70,500	\$141,000
Midsize SUV Sheriff Unmarked	4	\$46,800	\$187,200
Midsize & Fullsize SUV 4X4 Utility	16	\$33,000	\$528,000
Police SUV Patrol	619	\$61,200	\$37,882,800
Police PKG Hybrid Midsize SUV	18	\$64,200	\$1,155,600
Fullsize Sport Utility Police	15	\$74,500	\$1,117,500
3/4 Ton 4X4 Pick Up Truck/K9/SSV	7	\$58,000	\$406,000
3/4 Ton Pick Up Truck	8	\$45,000	\$360,000
1/2 Ton Minivan, Cargo	9	\$30,000	\$270,000
3/4 Ton Cargo Van	6	\$35,100	\$210,600
3/4 Ton 4X4 or AWD Cargo Van	7	\$81,750	\$572,250
3/4 Ton Passenger Van	1	\$40,000	\$40,000
1 Ton Cargo Van	2	\$40,000	\$80,000
1 Ton 15 Passenger Van	11	\$50,000	\$550,000
Total	825	\$57,896	\$47,764,250

Source: Anne Arundel County Police Department

Anne Arundel County currently provides 825 police vehicles to existing development. To allocate the proportionate share of demand to residential and nonresidential development, this analysis uses proportionate share factors shown in Figure P1. Anne Arundel County’s existing LOS for residential development is 0.0010 units per person (825 units X 71 percent residential share / 558,220 persons). The nonresidential level of service is 0.0003 units per vehicle trip (825 units X 29 percent nonresidential share / 953,445 vehicle trips). For police vehicles, the cost is \$60.75 per person (0.0010 units per person X \$57,896 per unit) and \$14.53 per vehicle trip (0.0003 units per vehicle trip X \$57,896 per unit).

Figure P8: Existing Level of Service

Cost Factors	
Weighted Average per Unit	\$57,896

Level-of-Service (LOS) Standards	
Existing Units	825
Residential	
Residential Share	71%
2023 Population	558,220
Units per Person	0.0010
Cost per Person	\$60.75
Nonresidential	
Nonresidential Share	29%
2023 Vehicle Trips	953,445
Units per Vehicle Trip	0.0003
Cost per Vehicle Trip	\$14.53

Source: Anne Arundel County Police Department

PROJECTED DEMAND FOR CAPITAL IMPROVEMENTS

The analysis calculates growth-related demand for capital improvements using the levels of service and cost factors for the infrastructure components in the previous section. Growth-related demand is a projection of future capital improvements and estimated costs over a specified amount of time and a specified level of service to serve new development.

Police Facilities – Incremental Expansion

Anne Arundel County will construct police facilities to serve existing and future development during the next 30 years. Based on a projected population increase of 85,698 persons in the unincorporated county, future residential development demands approximately 29,547 square feet of police facilities (85,698 additional persons X 0.3448 square feet per person). With projected nonresidential growth of 263,882 vehicle trips in the unincorporated county, future nonresidential development demands approximately 19,657 square feet of police facilities (263,882 additional vehicle trips X 0.0745 square feet per vehicle trip). The growth-related cost of police facilities is \$34,938,049 (49,203.4 square feet X \$710 per square foot). Anne Arundel County may use development impact fees to fund future development’s share of the planned police facilities listed in Figure P5. Existing development’s share of \$115,037,307 may not be funded with development impact fees.

Figure P9: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Police Facilities	0.3448 Square Feet	per Person	\$710
	0.0745 Square Feet	per Vehicle Trip	

Demand for Police Facilities					
Year	Population	Vehicle Trips	Square Feet		
			Residential	Nonresidential	Total
2023	558,220	953,445	192,461.1	71,022.5	263,483.6
2024	563,858	971,872	194,404.9	72,395.1	266,800.1
2025	569,552	990,299	196,368.1	73,767.8	270,135.9
2026	574,196	997,863	197,969.1	74,331.2	272,300.4
2027	578,877	1,005,427	199,583.0	74,894.7	274,477.7
2028	583,595	1,012,992	201,209.9	75,458.2	276,668.1
2029	588,352	1,020,556	202,849.8	76,021.7	278,871.5
2030	593,147	1,028,121	204,502.9	76,585.1	281,088.0
2031	596,599	1,035,730	205,693.3	77,151.9	282,845.3
2032	600,072	1,043,338	206,890.5	77,718.7	284,609.3
2033	603,564	1,050,947	208,094.5	78,285.5	286,380.0
2038	618,285	1,089,514	213,170.0	81,158.3	294,328.4
2043	629,074	1,129,947	216,889.7	84,170.2	301,059.9
2048	636,977	1,173,076	219,614.5	87,382.9	306,997.4
2053	643,918	1,217,327	222,007.8	90,679.2	312,687.0
30-Yr Increase	85,698	263,882	29,546.6	19,656.7	49,203.4

Growth-Related Expenditures	\$20,980,339	\$13,957,710	\$34,938,049
Existing Development Expenditures	\$85,502,180	\$29,535,127	\$115,037,307
Total Expenditures	\$106,482,519	\$43,492,837	\$149,975,356

Police Vehicles – Incremental Expansion

Anne Arundel County plans to maintain the existing level of service for police vehicles over the next 10 years. Based on a projected population increase of 45,344 persons in the unincorporated county, future residential development demands approximately 48 units (45,344 additional persons X 0.0010 units per person). With projected nonresidential growth of 97,502 vehicle trips in the unincorporated county, future nonresidential development demands approximately 25 units (97,502 additional vehicle trips X 0.0003 units per vehicle trip). The growth-related cost of police vehicles is \$4,171,195 (72.0 units X \$57,896 per unit). Anne Arundel County may use development impact fees to acquire additional police vehicles.

Figure P10: Projected Demand

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Police Vehicles	0.0010 Units	per Person	\$57,896
	0.0003 Units	per Vehicle Trip	

Demand for Police Vehicles					
Year	Population	Vehicle Trips	Units		
			Residential	Nonresidential	Total
2023	558,220	953,445	585.8	239.3	825.0
2024	563,858	971,872	591.7	243.9	835.5
2025	569,552	990,299	597.6	248.5	846.1
2026	574,196	997,863	602.5	250.4	852.9
2027	578,877	1,005,427	607.4	252.3	859.7
2028	583,595	1,012,992	612.4	254.2	866.6
2029	588,352	1,020,556	617.4	256.1	873.5
2030	593,147	1,028,121	622.4	258.0	880.4
2031	596,599	1,035,730	626.0	259.9	885.9
2032	600,072	1,043,338	629.7	261.8	891.5
2033	603,564	1,050,947	633.3	263.7	897.0
10-Yr Increase	45,344	97,502	47.6	24.5	72.0

Growth-Related Expenditures	\$2,754,683	\$1,416,512	\$4,171,195
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MAXIMUM SUPPORTABLE POLICE DEVELOPMENT IMPACT FEES

Figure P11 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable police development impact fees. The total capital cost is \$305.57 per person and \$67.42 per vehicle trip. Police development impact fees are assessed to residential development according to the number of persons per dwelling unit and to nonresidential development according to the number of vehicle trips per development unit. For a residential unit with 1,800 square feet, the fee of \$736 is calculated using a cost of \$305.57 per person multiplied by 2.41 persons per housing unit.

Figure P11: Maximum Supportable Police Development Impact Fees

Fee Component	Cost per Person	Cost per Vehicle Trip
Police Facilities	\$244.82	\$52.89
Police Vehicles	\$60.75	\$14.53
Total	\$305.57	\$67.42

Residential Development Impact Fees					
Dwelling Unit Size	Development Unit	Persons per Housing Unit ¹	Maximum Supportable	Current Fees ²	Difference
Under 500	Dwelling Unit	0.46	\$141	\$34	\$107
500 - 999	Dwelling Unit	1.43	\$437	\$56	\$381
1,000 - 1,499	Dwelling Unit	2.01	\$614	\$73	\$541
1,500 - 1,999	Dwelling Unit	2.41	\$736	\$85	\$651
2,000 - 2,499	Dwelling Unit	2.73	\$834	\$93	\$741
2,500 - 2,999	Dwelling Unit	2.98	\$911	\$100	\$811
3,000 - 3,499	Dwelling Unit	3.20	\$978	\$105	\$873
3,500 - 3,999	Dwelling Unit	3.39	\$1,036	\$110	\$926
4,000 - 4,499	Dwelling Unit	3.55	\$1,085	\$115	\$970
4,500 - 4,999	Dwelling Unit	3.70	\$1,131	\$118	\$1,013
5,000 - 5,499	Dwelling Unit	3.84	\$1,173	\$122	\$1,051
5,500 - 5,999	Dwelling Unit	3.96	\$1,210	\$125	\$1,085
6,000 and over	Dwelling Unit	4.07	\$1,244	\$126	\$1,118

Nonresidential Development Impact Fees					
Development Type	Development Unit	Vehicle Trips per 1,000 Sq Ft ¹	Maximum Supportable	Current Fees ²	Difference
Amusement, Rec., Assembly	Req Pkg Space	1.55	\$105	\$14	\$91
Hotel	Room	4.00	\$270	\$44	\$226
Industrial	1,000 sq ft	2.44	\$165	\$55	\$110
Self-Storage (Mini-Warehouse)	1,000 sq ft	0.73	\$49	\$12	\$37
For Profit Hospital	Bed	5.27	\$355	\$59	\$296
For Profit Nursing Home	Bed	1.53	\$103	\$48	\$55
Marinas	Berth	1.21	\$82	\$17	\$65
Office	1,000 sq ft	5.42	\$365	\$118	\$247
Mercantile	1,000 sq ft	14.06	\$948	\$337	\$611

1. See Land Use Assumptions

2. Current fees represent 25 percent (police share) of the current public safety development impact fees.

PROJECTED POLICE DEVELOPMENT IMPACT FEE REVENUE

This section summarizes the potential cash flow to Anne Arundel County based on adoption of the maximum supportable police development impact fees. The cash flow projections are based on the assumptions detailed in this chapter and the development projections discussed in Appendix A. If development occurs at a more rapid rate than projected, the demand for infrastructure and the development impact fee revenue will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure and the development impact fee revenue will decrease at a corresponding rate.

Projected development impact fee revenue equals \$18,613,672 and total projected expenditures equal \$154,146,495. Projected development impact fee revenue shown below for single-family units represents a residential unit with 1,500 to 1,999 square feet, and projected development impact fee revenue for multi-family units represents a residential unit with 500 to 999 square feet. Actual development impact fee revenue will vary based on the mix of residential units in each dwelling unit size range.

Figure P12: Projected Police Development Impact Fee Revenue

Fee Component	Growth Share		Existing Share	Total
	Years 1-10	Years 11-30		
Police Facilities	\$16,258,114	\$18,679,879	\$115,037,307	\$149,975,300
Police Vehicles	\$4,171,195	\$0	\$0	\$4,171,195
Total	\$20,429,310	\$18,679,879	\$115,037,307	\$154,146,495

Year	Hsg Unit	Single Family	Multi-Family	Mercantile	Office	Industrial	Institutional
		\$736 per unit	\$437 per unit	\$948 per 1,000 sq ft	\$365 per 1,000 sq ft	\$165 per 1,000 sq ft	\$193 per 1,000 sq ft
Base 2023	188,073	36,778	37,394	26,159	55,396	28,018	
Year 1 2024	189,850	37,347	38,116	26,665	56,467	28,559	
Year 2 2025	191,645	37,921	38,839	27,170	57,537	29,101	
Year 3 2026	193,110	38,390	39,136	27,378	57,977	29,323	
Year 4 2027	194,585	38,862	39,432	27,585	58,416	29,545	
Year 5 2028	196,073	39,339	39,729	27,793	58,856	29,768	
Year 6 2029	197,573	39,819	40,026	28,001	59,295	29,990	
Year 7 2030	199,085	40,303	40,322	28,208	59,735	30,212	
Year 8 2031	200,174	40,652	40,621	28,417	60,177	30,436	
Year 9 2032	201,270	41,002	40,919	28,626	60,619	30,659	
Year 10 2033	202,372	41,355	41,218	28,834	61,061	30,883	
10-Year Increase	14,299	4,578	3,824	2,675	5,665	2,865	
Projected Revenue	\$10,524,019	\$2,000,377	\$3,625,138	\$976,416	\$934,747	\$552,975	

Projected Fee Revenue (Years 1-10)	\$18,613,672
Projected Fee Revenue (Years 11-30)	\$17,089,926
Total Expenditures	\$154,146,495

SCHOOL DEVELOPMENT IMPACT FEES

METHODOLOGY

The school development impact fees include components for school facilities, school facilities land, administrative facilities, administrative facilities land, buses, and support vehicles. The incremental expansion methodology is used for all components.

SERVICE AREA

Anne Arundel County Public Schools provide access to public schools throughout the county; therefore, the service area for school development impact fees is Anne Arundel County.

PROPORTIONATE SHARE

The capital costs for school development impact fees are allocated 100 percent to residential development.

SERVICE UNITS

The number of public school students by housing unit type is the best indicator of demand for school facilities. Housing types have varying numbers of public school students and, consequently, a varying demand on school infrastructure and services. Thus, it is important to differentiate between housing types. Anne Arundel County Public Schools provided student generation rates calculated by MGT Consulting Group for the following housing types: single family, townhouse, and multi-family. Figure S1 displays the service units for residential land uses. The school development impact fees are calculated on a per public school student basis and then converted to public school students per housing unit by type of unit.

Student generation rates are shown with three decimal places, but it is often easier to understand the rates based on the expected number of students from 100 housing units. For example, Anne Arundel County Public Schools should expect 100 new single-family housing units to generate approximately 36 public school students (100 units X 0.361 public school students per unit). Continuing the example, those 100 single-family housing units are expected to generate approximately 17 elementary school students (100 units X 0.169 elementary school students per unit), approximately eight middle school students (100 units X 0.083 middle school students per unit), and approximately 11 high school students (100 units X 0.109 high school students per unit).

Figure S1: Service Units

Anne Arundel County Public School Students per Housing Unit				
Housing Type	Elementary (K-5)	Middle (6-8)	High (9-12)	Total
Single Family	0.169	0.083	0.109	0.361
Townhouse	0.189	0.085	0.100	0.374
Multifamily	0.113	0.047	0.054	0.214

Source: MGT Consulting Group - Anne Arundel Economic Development Commission, November, 2019

LEVEL OF SERVICE AND COST ANALYSIS

This section details the level of service and capital cost per demand unit for each infrastructure category.

Elementary School Facilities – Incremental Expansion

The inventory and current levels of service for elementary schools are shown in Figure S2. Anne Arundel County Public Schools currently provide 5,871,036 square feet of elementary school facilities on 1,341.55 acres of land. Total enrollment in all elementary schools for the 2022-2023 school year is 37,299 students and state rated capacity includes 44,151 student stations. Overall, elementary schools are operating at 84 percent of state rated capacity for the 2022-2023 school year.

Since elementary schools overall are currently operating below capacity, *the level of service standard on which the development impact fees are based is calculated using student capacity*. This ensures future development is not charged for a higher level of service than what is currently provided or what is planned to be provided. Using a level of service that is based on student capacity represents the level of service the School District currently provides.

Levels of service are shown for elementary school facilities and land at the bottom of Figure S2. Levels of service are calculated by dividing the amount of infrastructure by total capacity. For elementary schools, the existing level of service is 132.98 square feet per student (5,871,036 square feet divided by 44,151 student stations) and 0.030 acres per student (1,341.55 acres divided by 44,151 student stations).

Figure S2: Existing Level of Service

Elementary School	Building Square Feet	Acres	SY 22/23 Enrollment	State Rated Capacity	Capacity Utilization
Annapolis	70,180	2.69	200	304	66%
Arnold	89,253	15.08	503	580	87%
Belle Grove	59,928	7.45	311	359	87%
Belvedere	68,476	14.50	529	516	103%
Benfield	82,775	17.76	449	520	86%
Bodkin	78,469	20.20	520	580	90%
Broadneck	84,111	29.17	687	707	97%
Brock Bridge	78,748	55.00	472	753	63%
Brooklyn Park	74,540	12.22	484	487	99%
Cape St. Claire	84,647	29.29	631	776	81%
Central	83,381	24.05	570	610	93%
Crofton	86,640	16.30	649	659	98%
Crofton Meadows	78,618	15.00	574	579	99%
Crofton Woods	86,758	14.47	734	753	97%
Davidsonville	78,725	18.67	659	671	98%
Deale	53,444	17.07	175	329	53%
Eastport	42,430	3.00	269	323	83%
Edgewater	89,634	14.36	578	661	87%
Folger McKinsey	83,175	15.33	636	649	98%
Fort Smallwood	64,907	58.53	420	555	76%
Four Seasons	83,703	19.91	664	654	102%
Frank Hebron-Harman	84,835	18.81	677	750	90%

Elementary School	Building Square Feet	Acres	SY 22/23 Enrollment	State Rated Capacity	Capacity Utilization
Freetown	82,460	15.09	513	631	81%
George Cromwell	74,468	16.54	360	477	75%
Georgetown East	80,399	15.07	290	561	52%
Germantown	89,998	36.00	482	650	74%
Glen Burnie Park	70,633	22.19	489	624	78%
Glendale	75,065	14.44	400	514	78%
High Point	98,681	10.13	704	734	96%
Hillsmere	67,988	16.12	390	506	77%
Hilltop	82,903	20.00	535	639	84%
Jacobsville	73,193	26.92	510	610	84%
Jessup	98,879	31.13	582	781	75%
Jones	48,772	8.69	312	353	88%
Lake Shore	63,422	16.35	333	389	86%
Linthicum	81,718	8.04	459	646	71%
Lothian	84,558	17.06	478	552	87%
Manor View	71,576	17.58	240	516	47%
Marley	81,934	21.14	756	841	90%
Maryland City	61,434	13.86	436	506	86%
Mayo	60,648	7.28	345	398	87%
Meade Heights	82,855	16.33	371	616	60%
Millersville	59,346	15.15	372	430	87%
Mills-Parole	89,767	8.89	578	706	82%
Nantucket	86,273	20.00	709	763	93%
North Glen	57,087	15.00	298	350	85%
Oak Hill	80,482	17.23	614	683	90%
Oakwood	55,674	13.14	368	399	92%
Odenton	89,287	12.95	575	585	98%
Overlook	62,129	11.60	351	382	92%
Park	77,436	6.00	507	621	82%
Pasadena	68,023	13.70	356	473	75%
Pershing Hill	87,160	8.32	556	710	78%
Piney Orchard	76,448	21.11	966	649	149%
Point Pleasant	95,925	21.50	509	677	75%
Quarterfield	83,840	22.25	436	585	75%
Richard Henry Lee	80,979	4.66	510	522	98%
Ridgeway	77,659	15.69	598	635	94%
Rippling Woods	102,834	20.00	546	773	71%
Riviera Beach	57,867	9.44	281	359	78%
Rolling Knolls	84,588	14.74	377	529	71%
Seven Oaks	81,209	20.00	495	692	72%
Severn	62,964	12.49	570	532	107%
Severna Park	56,345	8.74	379	433	88%
Shady Side	79,968	17.05	401	647	62%
Shipley's Choice	68,119	19.89	342	443	77%
Solley	90,507	10.27	705	783	90%
South Shore	52,503	14.34	287	374	77%

Elementary School	Building Square Feet	Acres	SY 22/23 Enrollment	State Rated Capacity	Capacity Utilization
Southgate	87,165	15.97	697	704	99%
Sunset	78,144	18.07	434	598	73%
Tracey's	56,640	14.20	437	443	99%
Tyler Heights	84,813	15.26	424	565	75%
Van Bokkelen	76,833	49.54	402	539	75%
Waugh Chapel	62,101	20.20	573	541	106%
West Annapolis	53,885	2.23	233	307	76%
West Meade	45,680	9.16	210	336	63%
Windsor Farm	77,432	20.00	491	603	81%
Woodside	64,963	13.95	336	461	73%
Total	5,871,036	1,341.55	37,299	44,151	84%

Elementary School Level of Service	Building Square Feet	Acres
per Student (enrollment)	157.40	0.036
per Student (capacity)	132.98	0.030

Middle School Facilities – Incremental Expansion

The inventory and current levels of service for middle schools are shown in Figure S3. Anne Arundel County Public Schools currently provide 3,502,858 square feet of middle school facilities on 668.68 acres of land. Total enrollment in all middle schools for the 2022-2023 school year is 18,166 students and state rated capacity includes 24,599 student stations. Overall, middle schools are operating at 74 percent of state rated capacity for the 2022-2023 school year.

Since middle schools overall are currently operating below capacity, *the level of service standard on which the development impact fees are based is calculated using student capacity.* This ensures future development is not charged for a higher level of service than what is currently provided or what is planned to be provided. Using a level of service that is based on student capacity represents the level of service the School District currently provides.

Levels of service are shown for middle school facilities and land at the bottom of Figure S3. Levels of service are calculated by dividing the amount of infrastructure by total capacity. For middle schools, the existing level of service is 142.40 square feet per student (3,502,858 square feet divided by 24,599 student stations) and 0.027 acres per student (668.68 acres divided by 24,599 student stations).

Figure S3: Existing Level of Service

Middle School	Building Square Feet	Acres	SY 22/23 Enrollment	State Rated Capacity	Capacity Utilization
Annapolis	216,000	39.83	879	1,549	57%
Arundel	162,322	62.21	1,286	1,389	93%
Bates	145,520	16.21	682	1,077	63%
Brooklyn Park	248,809	44.15	775	1,166	66%
Central	158,125	40.00	1,299	1,385	94%
Chesapeake Bay	343,446	40.40	1,067	1,962	54%
Corkran	151,790	31.11	644	1,030	63%
Crofton	140,611	31.11	1,374	1,254	110%
Lindale	191,583	38.47	1,178	1,481	80%
MacArthur	211,620	40.30	878	1,674	52%
Magothy River	170,000	24.07	683	1,118	61%
Marley	154,293	33.56	924	1,215	76%
Meade	150,000	35.00	788	1,108	71%
Northeast	164,393	29.38	882	1,080	82%
Old Mill Middle North	159,635	34.00	960	1,060	91%
Old Mill Middle South	158,704	34.00	979	1,072	91%
Severn River	170,000	24.07	734	1,118	66%
Severna Park	205,905	38.60	1,399	1,476	95%
Southern	200,102	32.21	755	1,385	55%
Total	3,502,858	668.68	18,166	24,599	74%

Middle School Level of Service	Building Square Feet	Acres
per Student (enrollment)	192.82	0.037
per Student (capacity)	142.40	0.027

Source: Anne Arundel County Public Schools

High School Facilities – Incremental Expansion

The inventory and current levels of service for high schools are shown in Figure S4. Anne Arundel County Public Schools currently provide 4,067,523 square feet of high school facilities on 819.24 acres of land. Total enrollment in all high schools for the 2022-2023 school year is 24,670 students and state rated capacity includes 27,535 student stations. Overall, high schools are operating at 90 percent of state rated capacity for the 2022-2023 school year.

Since high schools overall are currently operating below capacity, *the level of service standard on which the development impact fees are based is calculated using student capacity.* This ensures future development is not charged for a higher level of service than what is currently provided or what is planned to be provided. Using a level of service that is based on student capacity represents the level of service the School District currently provides.

Levels of service are shown for high school facilities and land at the bottom of Figure S4. Levels of service are calculated by dividing the amount of infrastructure by total capacity. For high schools, the existing level of service is 147.72 square feet per student (4,067,523 square feet divided by 27,535 student stations) and 0.030 acres per student (819.24 acres divided by 27,535 student stations).

Figure S4: Existing Level of Service

High School	Building Square Feet	Acres	SY 22/23 Enrollment	State Rated Capacity	Capacity Utilization
Annapolis	281,500	56.71	2,127	2,083	102%
Arundel	292,177	62.21	1,617	2,143	75%
Broadneck	297,740	84.60	2,174	2,239	97%
Chesapeake	322,400	80.81	1,419	2,068	69%
Crofton	275,768	123.89	1,805	1,743	104%
Glen Burnie	401,580	39.12	2,324	2,395	97%
Meade	384,824	56.25	2,330	2,538	92%
North County	331,764	48.35	2,451	2,402	102%
Northeast	320,308	35.00	1,390	1,797	77%
Old Mill	283,194	70.79	2,445	2,369	103%
Severna Park	354,162	41.40	1,873	2,205	85%
South River	295,900	60.19	1,649	2,232	74%
Southern	226,206	59.92	1,066	1,321	81%
Total	4,067,523	819.24	24,670	27,535	90%

High School Level of Service	Building Square Feet	Acres
per Student (enrollment)	164.88	0.033
per Student (capacity)	147.72	0.030

Source: Anne Arundel County Public Schools

Administrative Facilities – Incremental Expansion

The inventory and current levels of service for administrative facilities are shown in Figure S5. Anne Arundel County Public Schools currently provide 233,810 square feet of administrative facilities on 61.60 acres of land. Total enrollment for the 2022-2023 school year is 80,135 students.

Levels of service are shown for administrative facilities and land at the bottom of Figure S5. Levels of service are calculated by dividing the amount of infrastructure by total enrollment. For administrative facilities, the existing level of service is 2.92 square feet per student (233,810 square feet divided by 80,135 students) and 0.0008 acres per student (61.60 acres divided by 80,135 students).

Figure S5: Existing Level of Service

Administrative Facility	Building Square Feet	Acres	Building Value
Carol S. Parham Administrative Bldg	113,750	14.91	\$25,287,590
Carver Staff Development Center	20,711	5.28	\$3,609,520
Fort Smallwood Facilities	30,292	35.91	\$6,624,600
Millersville Administrative Facility	17,500	5.50	\$1,779,050
Resource Center at Glendale ¹	5,184	-	\$903,140
Resource Center at Pt. Pleasant ¹	46,373	-	\$8,081,810
Total	233,810	61.60	\$46,285,710

Administrative Facility Level of Service	Building Square Feet	Acres
Total Square Feet and Acres	233,810	61.60
Current Enrollment	80,135	80,135
Units per Student	2.92	0.0008

Source: Anne Arundel County Public Schools

1. Land shared with a school

Buses – Incremental Expansion

The inventory and current levels of service for buses are shown in Figure S6. Anne Arundel County Public Schools currently provide 55 special education buses to serve total enrollment for the 2022-2023 school year of 80,135 students. Levels of service are calculated by dividing the amount of infrastructure by total enrollment. For buses, the existing level of service is 0.00069 units per student (55 units divided by 80,135 students).

Figure S6: Existing Level of Service

Description	Units	Unit Cost	Total Cost
Special Education Bus	55	\$125,979	\$6,928,845
Total	55	\$125,979	\$6,928,845

Level-of-Service Analysis	
Existing Units	55
Current Enrollment	80,135
Units per Student	0.00069

Source: Anne Arundel County Public Schools

Support Vehicles – Incremental Expansion

The inventory and current levels of service for support vehicles are shown in Figure S7. Anne Arundel County Public Schools currently provide 299 support vehicles to serve total enrollment for the 2022-2023 school year of 80,135 students. Levels of service are calculated by dividing the amount of infrastructure by total enrollment. For support vehicles, the existing level of service is 0.00373 units per student (299 units divided by 80,135 students).

Figure S7: Existing Level of Service

Description	Units	Unit Cost	Total Cost
Large Truck	53	\$157,345	\$8,339,285
Pickup Truck	61	\$50,414	\$3,075,254
SUV	82	\$25,983	\$2,130,606
Van	103	\$37,456	\$3,857,968
Total	299	\$58,204	\$17,403,113

Level-of-Service Analysis	
Existing Units	299
Current Enrollment	80,135
Units per Student	0.00373

Source: Anne Arundel County Public Schools

CAPITAL COST FACTORS

School Facilities

Shown below, Figure S8 contains the estimated construction costs used in this analysis. Based on costs included in the FY2024 capital budget, the construction cost is \$551 per square foot for elementary schools, \$540 per square foot for middle schools, and \$518 per square foot for high schools.

Figure S8: School Facilities Cost

School	Description	Total Cost	Year	Square Feet	State Rated Capacity	Cost per Sq Ft
Hillsmere ES	Replacement	\$38,965,000	2023	67,988	506	\$573
Quarterfield ES	Replacement	\$45,080,000	2023	83,840	585	\$538
Rippling Woods ES	Replacement	\$53,954,000	2023	102,834	775	\$525
West County ES	New School	\$50,266,000	2024	87,090	598	\$577
Subtotal, Elementary School		\$188,265,000		341,752	2,464	\$551
Old Mill South MS	Replacement	\$85,766,000	2024	158,877	1,199	\$540
Subtotal, Middle School		\$85,766,000		158,877	1,199	\$540
Old Mill West HS	New School	\$161,797,000	2024	312,510	2,137	\$518
Subtotal, High School		\$161,797,000		312,510	2,137	\$518
Total		\$435,828,000		813,139	5,800	\$536

Source: Anne Arundel County, FY2024 Capital Budget

Land

Anne Arundel County Public Schools anticipate the need to purchase land for future school facilities and for future administrative facilities to accommodate school capital needs brought about by future development in the county. Based on recent land acquisitions, Anne Arundel County Public Schools expect to acquire land for \$182,000 per acre.

Figure S9: Land Cost

School	Year	Cost	Acres	Cost per Acre
Tanyard Springs ES	2021	\$5,100,000	14.69	\$347,000
West County ES	2019	\$1,092,500	37.50	\$29,000
Old Mill West HS	2018	\$13,250,000	48.30	\$274,000
Elvaton ES	2017	\$1,562,500	15.00	\$104,000
Total		\$21,005,000	115.49	\$182,000

Source: Anne Arundel County Public Schools

Administrative Facilities

Anne Arundel County Public Schools provided a building value of \$46,285,710 for existing administrative facilities. Dividing the building value by 233,810 square feet of existing administrative facilities provides a value of \$198 per square foot. The analysis uses this to estimate capital costs per student.

Buses

Anne Arundel County Public Schools anticipate the need to purchase additional buses to accommodate school capital needs brought about by future development in the county. As shown below, the total value of the existing fleet is estimated at \$6,928,845, which equates to an average cost of \$125,979 per unit. The analysis uses this to estimate capital costs per student.

Figure S10: Bus Cost

Description	Units	Unit Cost	Total Cost
Special Education Bus	55	\$125,979	\$6,928,845
Total	55	\$125,979	\$6,928,845

Source: Anne Arundel County Public Schools

Support Vehicles

Anne Arundel County Public Schools anticipate the need to purchase additional support vehicles to accommodate school capital needs brought about by future development in the county. As shown below, the total value of the existing fleet is estimated at \$17,403,113, which equates to an average cost of \$58,204 per unit. The analysis uses this to estimate capital costs per student.

Figure S11: Support Vehicle Cost

Description	Units	Unit Cost	Total Cost
Large Truck	53	\$157,345	\$8,339,285
Pickup Truck	61	\$50,414	\$3,075,254
SUV	82	\$25,983	\$2,130,606
Van	103	\$37,456	\$3,857,968
Total	299	\$58,204	\$17,403,113

Source: Anne Arundel County Public Schools

PROJECTED DEMAND FOR CAPITAL IMPROVEMENTS

The analysis calculates growth-related demand for capital improvements using the levels of service and cost factors for the infrastructure components in the previous section. Growth-related demand is a projection of future capital improvements and estimated costs over a specified amount of time and a specified level of service to serve new development.

Projected Enrollment

As shown below, projected enrollment in the 2023 Educational Facilities Master Plan increases from 80,135 students in the 2022-2023 school year to 86,442 students in the 2032-2033 school year. This increase of 6,307 students includes 3,807 elementary school students, 1,252 middle school students, and 1,248 high school students.

Figure S12: Projected Enrollment

Anne Arundel County Public Schools Enrollment				
School Year	Elementary (K-5)	Middle (6-8)	High (9-12)	Total
2022-2023	37,299	18,166	24,670	80,135
2023-2024	37,680	18,291	24,795	80,766
2024-2025	38,060	18,416	24,920	81,396
2025-2026	38,441	18,542	25,044	82,027
2026-2027	38,822	18,667	25,169	82,658
2027-2028	39,203	18,792	25,294	83,289
2028-2029	39,583	18,917	25,419	83,919
2029-2030	39,964	19,042	25,544	84,550
2030-2031	40,345	19,168	25,668	85,181
2031-2032	40,725	19,293	25,793	85,811
2032-2033	41,106	19,418	25,918	86,442
10-Yr Change	3,807	1,252	1,248	6,307

Source: Anne Arundel County Public Schools Educational Facilities Master Plan, July 2023 (cells shaded yellow)

Existing Permanent Capacity Utilization

Anne Arundel County Public Schools currently provide 96,285 permanent student stations. By school type, permanent capacity is as follows: 44,151 permanent elementary school student stations; 24,599 permanent middle school student stations; and 27,535 permanent high school student stations. Based on 2022-2023 school year enrollment, current permanent capacity utilization is 84 percent for elementary schools, 74 percent for middle schools, and 90 percent for high schools.

Figure S13: Existing Enrollment and Permanent Capacity Utilization

School Level	SY 22/23 Enrollment	State Rated Capacity	Capacity Utilization
Elementary (K-5)	37,299	44,151	84%
Middle (6-8)	18,166	24,599	74%
High (9-12)	24,670	27,535	90%
Total	80,135	96,285	83%

Source: Anne Arundel County Public Schools

Planned Permanent Student Stations

As student enrollment increases, future development will demand additional school infrastructure. Figure S14 below shows permanent capacity projects included in the 2023 Educational Facilities Master Plan. Anne Arundel County Public Schools identified the need for capacity expansion of 5,986 permanent student stations during the next six years. Since some of the permanent capacity projects are replacements of existing facilities, the permanent capacity utilization projections in the next section represent only the net new permanent capacity. This includes 690 permanent student stations at the elementary school level, 212 permanent student stations at the middle school level, and 2,137 permanent student stations at the high school level.

Figure S14: Planned Permanent Student Stations

School	School Level	Description	Year	Planned Capacity	Net New Capacity
Park	Elementary	Addition	2024	713	92
West County	Elementary	New School	2024	598	598
Crofton	Middle	Replacement	2023	1,339	85
Old Mill South	Middle	Replacement	2024	1,199	127
Old Mill West	High	New School	2024	2,137	2,137
Total				5,986	3,039

Source: Anne Arundel County Public Schools Educational Facilities Master Plan, July 2023

Planned Permanent Capacity Utilization

Elementary Schools

As shown in Figure S15, without any additional elementary school capacity, permanent capacity utilization will equal 93 percent by the end of the study period. To prevent overcrowding, planned permanent capacity identified in Figure S14 is added to existing permanent capacity to project permanent capacity utilization. Based on enrollment growth of 3,807 elementary school students and additional permanent capacity of 690 student stations identified in the 2023 Educational Facilities Master Plan, projected elementary school permanent capacity utilization is 92 percent at the end of the study period.

Figure S15: Planned Elementary School Permanent Capacity Utilization

Elementary Schools				
School Year	Projected Enrollment	Planned Capacity ¹	Total Capacity ¹	Capacity Utilization
2022-2023	37,299	0	44,151	84%
2023-2024	37,680	0	44,151	85%
2024-2025	38,060	690	44,841	85%
2025-2026	38,441	0	44,841	86%
2026-2027	38,822	0	44,841	87%
2027-2028	39,203	0	44,841	87%
2028-2029	39,583	0	44,841	88%
2029-2030	39,964	0	44,841	89%
2030-2031	40,345	0	44,841	90%
2031-2032	40,725	0	44,841	91%
2032-2033	41,106	0	44,841	92%
10-Yr Change	3,807	690	690	7%
Utilization Without Additional Permanent Capacity				93%

1. Based on current and planned state rated capacity.

Middle Schools

As shown in Figure S16, without any additional middle school capacity, permanent capacity utilization will equal 79 percent by the end of the study period. To prevent overcrowding, planned permanent capacity identified in Figure S14 is added to existing permanent capacity to project permanent capacity utilization. Based on enrollment growth of 1,252 middle school students and additional permanent capacity of 212 student stations identified in the 2023 Educational Facilities Master Plan, projected middle school permanent capacity utilization is 78 percent at the end of the study period.

Figure S16: Planned Middle School Permanent Capacity Utilization

Middle Schools				
School Year	Projected Enrollment	Planned Capacity ¹	Total Capacity ¹	Capacity Utilization
2022-2023	18,166	0	24,599	74%
2023-2024	18,291	85	24,684	74%
2024-2025	18,416	127	24,811	74%
2025-2026	18,542	0	24,811	75%
2026-2027	18,667	0	24,811	75%
2027-2028	18,792	0	24,811	76%
2028-2029	18,917	0	24,811	76%
2029-2030	19,042	0	24,811	77%
2030-2031	19,168	0	24,811	77%
2031-2032	19,293	0	24,811	78%
2032-2033	19,418	0	24,811	78%
10-Yr Change	1,252	212	212	4%
Utilization Without Additional Permanent Capacity				79%

1. Based on current and planned state rated capacity.

High Schools

As shown in Figure S17, without any additional high school capacity, permanent capacity utilization will equal 94 percent by the end of the study period. To prevent overcrowding, planned permanent capacity identified in Figure S14 is added to existing permanent capacity to project permanent capacity utilization. Based on enrollment growth of 1,248 high school students and additional permanent capacity of 2,137 student stations identified in the 2023 Educational Facilities Master Plan, projected high school permanent capacity utilization is 87 percent at the end of the study period.

Figure S17: Planned High School Permanent Capacity Utilization

High Schools				
School Year	Projected Enrollment	Planned Capacity ¹	Total Capacity ¹	Capacity Utilization
2022-2023	24,670	0	27,535	90%
2023-2024	24,795	2,137	29,672	84%
2024-2025	24,920	0	29,672	84%
2025-2026	25,044	0	29,672	84%
2026-2027	25,169	0	29,672	85%
2027-2028	25,294	0	29,672	85%
2028-2029	25,419	0	29,672	86%
2029-2030	25,544	0	29,672	86%
2030-2031	25,668	0	29,672	87%
2031-2032	25,793	0	29,672	87%
2032-2033	25,918	0	29,672	87%
10-Yr Change	1,248	2,137	2,137	-2%
Utilization Without Additional Permanent Capacity				94%

1. Based on current and planned state rated capacity.

School Facilities Land

Anne Arundel County plans to maintain the existing level of service for school facilities land over the next 10 years. Based on a projected enrollment increase of 3,807 elementary school students, future residential development demands approximately 116 acres of land for elementary school facilities (3,807 elementary school students X 0.030 acres per elementary school student). For middle schools, the projected enrollment increase of 1,252 middle school students results in demand from future residential development of approximately 34 acres of land for middle school facilities (1,252 middle school students X 0.027 acres per middle school student). Based on a projected enrollment increase of 1,248 high school students, future residential development demands approximately 37 acres of land for high school facilities (1,248 high school students X 0.030 acres per high school student). The growth-related cost of school facilities land is \$34,005,301 (186.84 acres X \$182,000 per acre). Anne Arundel County may use development impact fees to acquire additional land for school facilities.

Figure S18: Projected Demand

School Facilities Land							
School Year	Projected Enrollment			Acres			
	Elementary	Middle	High	Elementary	Middle	High	
2022-2023	37,299	18,166	24,670	1,341.55	668.68	819.24	
2023-2024	37,680	18,291	24,795	1,353.12	672.08	822.95	
2024-2025	38,060	18,416	24,920	1,364.69	675.49	826.67	
2025-2026	38,441	18,542	25,044	1,376.25	678.89	830.38	
2026-2027	38,822	18,667	25,169	1,387.82	682.29	834.09	
2027-2028	39,203	18,792	25,294	1,399.39	685.70	837.81	
2028-2029	39,583	18,917	25,419	1,410.96	689.10	841.52	
2029-2030	39,964	19,042	25,544	1,422.52	692.50	845.23	
2030-2031	40,345	19,168	25,668	1,434.09	695.91	848.95	
2031-2032	40,725	19,293	25,793	1,445.66	699.31	852.66	
2032-2033	41,106	19,418	25,918	1,457.23	702.71	856.37	
10-Yr Change	3,807	1,252	1,248	115.68	34.03	37.13	
				Cost per Acre	\$182,000	\$182,000	\$182,000
				Growth-Related Cost	\$21,053,320	\$6,194,077	\$6,757,904

Administrative Facilities

Anne Arundel County plans to maintain the existing level of service for administrative facilities over the next 10 years. Based on a projected enrollment increase of 6,307 students, future residential development demands approximately 18,402 square feet of administrative facilities (6,307 students X 2.92 square feet per student) and approximately five acres of land for administrative facilities (6,307 students X 0.0008 acres per student). The growth-related cost of administrative facilities is \$3,643,585 (18,402 square feet X \$198 per square foot), and the growth-related cost of administrative facilities land is \$882,417 (4.85 acres X \$182,000 per acre). Anne Arundel County may use development impact fees to construct or expand administrative facilities.

Figure S19: Projected Demand

Administrative Facilities			
School Year	Projected Enrollment	Square Feet	Acres
2022-2023	80,135	233,810	61.60
2023-2024	80,766	235,650	62.09
2024-2025	81,396	237,490	62.57
2025-2026	82,027	239,331	63.06
2026-2027	82,658	241,171	63.54
2027-2028	83,289	243,011	64.03
2028-2029	83,919	244,851	64.51
2029-2030	84,550	246,691	65.00
2030-2031	85,181	248,532	65.48
2031-2032	85,811	250,372	65.97
2032-2033	86,442	252,212	66.45
10-Yr Change	6,307	18,402	4.85
Cost per Sq Ft or Acre		\$198	\$182,000
Growth-Related Cost		\$3,643,585	\$882,417

Buses

Anne Arundel County plans to maintain the existing level of service for buses over the next 10 years. Based on a projected enrollment increase of 6,307 students, future residential development demands approximately four additional buses (6,307 students X 0.00069 units per student). The growth-related cost of buses is \$545,333 (4.33 units X \$125,979 per unit). Anne Arundel County may use development impact fees to expand its fleet of buses.

Figure S20: Projected Demand

Buses		
School Year	Projected Enrollment	Units
2022-2023	80,135	55.00
2023-2024	80,766	55.43
2024-2025	81,396	55.87
2025-2026	82,027	56.30
2026-2027	82,658	56.73
2027-2028	83,289	57.16
2028-2029	83,919	57.60
2029-2030	84,550	58.03
2030-2031	85,181	58.46
2031-2032	85,811	58.90
2032-2033	86,442	59.33
10-Yr Change	6,307	4.33
Cost per Unit		\$125,979
Growth-Related Cost		\$545,333

Support Vehicles

Anne Arundel County plans to maintain the existing level of service for support vehicles over the next 10 years. Based on a projected enrollment increase of 6,307 students, future residential development demands approximately 24 additional support vehicles (6,307 students X 0.00373 units per student). The growth-related cost of support vehicles is \$1,369,697 (23.53 units X \$58,204 per unit). Anne Arundel County may use development impact fees to expand its fleet of support vehicles.

Figure S21: Projected Demand

Support Vehicles		
School Year	Projected Enrollment	Units
2022-2023	80,135	299.00
2023-2024	80,766	301.35
2024-2025	81,396	303.71
2025-2026	82,027	306.06
2026-2027	82,658	308.41
2027-2028	83,289	310.77
2028-2029	83,919	313.12
2029-2030	84,550	315.47
2030-2031	85,181	317.83
2031-2032	85,811	320.18
2032-2033	86,442	322.53
10-Yr Change	6,307	23.53
Cost per Unit		\$58,204
Growth-Related Cost		\$1,369,697

CREDIT EVALUATION

State Capital Funding

The school development impact fees include a credit for state capital funding. Shown below, the total cost of recent and future school capacity projects included in the FY2024 capital budget equals \$1,484,833,214. State capital funding for these projects equals \$539,244,000 and represents 36.30 percent of the total cost of school capacity projects. The maximum supportable school development impact fees include a credit of 36.30 percent of gross capital costs per student.

Figure S22: State Capital Funding Credit

Project	Year	Total Cost	Impact Fee Funding	Bond Funding	State Funding
Severna Park HS Additions	2017	\$117,600,000	\$2,584,000	\$72,902,000	\$42,114,000
Manor View ES	Multiple	\$87,656,214	\$2,800,000	\$50,976,214	\$33,880,000
High Point ES	2019	\$34,016,000	\$0	\$27,198,000	\$6,818,000
George Cromwell ES	2019	\$39,246,000	\$9,777,000	\$18,080,000	\$11,389,000
Jessup ES	2017	\$33,460,000	\$6,200,000	\$21,668,000	\$5,592,000
Old Mill MS North	2019	\$47,023,000	\$8,394,000	\$24,827,000	\$13,802,000
Old Mill MS South	2028	\$91,448,000	\$3,950,000	\$58,286,000	\$29,212,000
Edgewater ES	2024	\$85,766,000	\$1,800,000	\$52,599,000	\$31,367,000
Tyler Heights ES	2021	\$46,472,000	\$2,030,000	\$35,230,000	\$9,212,000
Richard Henry Lee ES	2021	\$38,847,000	\$5,500,000	\$29,212,000	\$4,135,000
CAT North	2021	\$36,889,000	\$1,800,000	\$25,072,000	\$10,017,000
Old Mill HS	2026	\$115,833,000	\$0	\$61,847,000	\$53,986,000
West County ES	2028	\$193,876,000	\$0	\$110,758,000	\$83,118,000
Arnold ES	2024	\$50,266,000	\$750,000	\$28,328,000	\$21,188,000
Crofton Area HS	2019	\$39,804,000	\$2,876,000	\$27,657,000	\$9,271,000
Old Mill West HS	2020	\$126,835,000	\$45,865,000	\$31,224,000	\$49,746,000
Quarterfield ES	2024	\$161,797,000	\$250,000	\$90,758,000	\$70,789,000
Hillsmere ES	2023	\$45,080,000	\$7,800,000	\$23,138,000	\$14,142,000
Rippling Woods ES	2023	\$38,965,000	\$0	\$23,259,000	\$15,706,000
	2023	\$53,954,000	\$7,700,000	\$22,494,000	\$23,760,000
Total		\$1,484,833,214	\$110,076,000	\$835,513,214	\$539,244,000
Funding Share		100.0%	7.4%	56.3%	36.3%

Source: Anne Arundel County, FY2024 Capital Budget

Development Impact Fee Fund Balance

The school development impact fees include a credit for the existing school development impact fee fund balance. Shown below, the total cost of recent and future school capacity projects included in the FY2024 capital budget equals \$1,484,833,214. The existing fund balance equals \$16,150,026 and represents 1.10 percent of the total cost of school capacity projects. The maximum supportable school development impact fees include a credit of 1.10 percent of gross capital costs per student.

Figure S23: Development Impact Fee Fund Balance Credit

Development Impact Fee Fund Balance Credit	
Existing Fund Balance (11/30/21)	\$16,150,026
Total Capacity Cost ¹	\$1,484,833,214
Development Impact Fee Fund Balance Credit	1.10%

Source: Anne Arundel County Public Schools

1. Anne Arundel County, FY2024 Capital Budget

Existing Debt Service

The school development impact fees include a credit for existing debt service. A credit is necessary since new residential development will pay the school development impact fee and will also generate property tax revenue used to repay existing debt service. As shown in Figure S24, the principal portion of existing debt service equals \$6,008,814 over the next 10 years. Annual principal payments are divided by projected student enrollment in each year to estimate the principal payment per student. To account for the time value of money, annual principal payments per student are discounted using a net present value formula based on the interest rate of 2.0 percent. The total net present value of future principal payments is \$66 per student. This amount is subtracted from the gross capital cost per student to derive a net capital cost per student.

Figure S24: Existing Debt Service Credit

Year	Principal Payment	Total Student Enrollment	Payment per Student
2023-2024	\$816,303	80,766	\$10.11
2024-2025	\$749,417	81,396	\$9.21
2025-2026	\$711,726	82,027	\$8.68
2026-2027	\$715,339	82,658	\$8.65
2027-2028	\$718,296	83,289	\$8.62
2028-2029	\$719,642	83,919	\$8.58
2029-2030	\$712,214	84,550	\$8.42
2030-2031	\$667,681	85,181	\$7.84
2031-2032	\$138,271	85,811	\$1.61
2032-2033	\$59,925	86,442	\$0.69
Total	\$6,008,814		\$72.41
Discount Rate			2.0%
Credit per Student			\$66

Source: Anne Arundel County Public Schools

Future Debt Service

The school development impact fees include a credit for future debt service. A credit is necessary since new residential development will pay the school development impact fee and will also generate property tax revenue used to pay future debt service. As shown below, the FY2024 capital budget includes bond funding of \$409,620,000 for school capacity projects.

Figure S25: Future Bond Funding

Project	Project Description	Year	Future Bond Funding
Old Mill MS North	Replacement	2028	\$58,286,000
Old Mill MS South	Replacement	2024	\$52,599,000
Old Mill HS	Replacement	2028	\$110,758,000
West County ES	New School	2024	\$28,328,000
Old Mill West HS	New School	2024	\$90,758,000
Quarterfield ES	Replacement	2023	\$23,138,000
Hillsmere ES	Replacement	2023	\$23,259,000
Rippling Woods ES	Replacement	2023	\$22,494,000
Total			\$409,620,000

Source: Anne Arundel County, FY2024 Capital Budget

As shown in Figure S26, the principal portion of future debt service equals \$409,620,000 over the next 20 years. Annual principal payments are divided by projected student enrollment in each year to estimate the principal payment per student. To account for the time value of money, annual principal payments per student are discounted using a net present value formula based on an expected interest rate of 5.0 percent. The total net present value of future principal payments is \$2,725 per student. This amount is subtracted from the gross capital cost per student to derive a net capital cost per student.

Figure S26: Future Debt Service Credit

Year	Principal Payment	Total Student Enrollment	Payment per Student
2023-2024	\$12,387,969	80,766	\$153.38
2024-2025	\$13,007,367	81,396	\$159.80
2025-2026	\$13,657,735	82,027	\$166.50
2026-2027	\$14,340,622	82,658	\$173.49
2027-2028	\$15,057,653	83,289	\$180.79
2028-2029	\$15,810,536	83,919	\$188.40
2029-2030	\$16,601,063	84,550	\$196.35
2030-2031	\$17,431,116	85,181	\$204.64
2031-2032	\$18,302,672	85,811	\$213.29
2032-2033	\$19,217,805	86,442	\$222.32
2033-2034	\$20,178,695	87,073	\$231.75
2034-2035	\$21,187,630	87,703	\$241.58
2035-2036	\$22,247,012	88,334	\$251.85
2036-2037	\$23,359,362	88,965	\$262.57
2037-2038	\$24,527,330	89,596	\$273.76
2038-2039	\$25,753,697	90,226	\$285.43
2039-2040	\$27,041,382	90,857	\$297.63
2040-2041	\$28,393,451	91,488	\$310.35
2041-2042	\$29,813,123	92,118	\$323.64
2042-2043	\$31,303,780	92,749	\$337.51
Total	\$409,620,000		\$4,675.03
Discount Rate			5.0%
Credit per Student			\$2,725

MAXIMUM SUPPORTABLE SCHOOL DEVELOPMENT IMPACT FEES

Input Variables Summary

Figure S27 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable school development impact fees.

Figure S27: School Development Impact Fee Input Variables Summary

Level-of-Service Standards			
Fee Component	Elementary	Middle	High
School Facilities			
Square Feet per Student	132.98	142.40	147.72
Cost per Square Foot	\$551	\$540	\$518
Cost per Student	\$73,272	\$76,896	\$76,519
School Facilities Land			
Acres per Student	0.030	0.027	0.030
Cost per Acre	\$182,000	\$182,000	\$182,000
Cost per Student	\$5,460	\$4,914	\$5,460
Administrative Facilities			
Square Feet per Student	2.92	2.92	2.92
Cost per Square Foot	\$198	\$198	\$198
Cost per Student	\$578	\$578	\$578
Administrative Facilities Land			
Acres per Student	0.0008	0.0008	0.0008
Cost per Acre	\$182,000	\$182,000	\$182,000
Cost per Student	\$146	\$146	\$146
Buses			
Units per Student	0.0007	0.0007	0.0007
Cost per Bus	\$125,979	\$125,979	\$125,979
Cost per Student	\$87	\$87	\$87
Support Vehicles			
Units per Student	0.0037	0.0037	0.0037
Cost per Unit	\$58,204	\$58,204	\$58,204
Cost per Student	\$217	\$217	\$217

Gross Capital Cost

The gross capital cost per student is the sum of the cost per student for each fee component. For example, for elementary school students, the calculation is as follows: \$73,272 (school facilities) + \$5,460 (school facilities land) + \$578 (administrative facilities) + \$146 (administrative facilities land) + \$87 (buses) + \$217 (support vehicles) = \$79,760 gross capital cost per elementary school student.

Net Capital Cost

The net capital cost per student is the sum of the gross capital cost per student and the proposed credits. Continuing with elementary schools, the calculation is as follows: \$79,760 (gross capital cost per student) – 36.30 percent (state capital funding) – 1.10 percent (DIF fund balance) - \$66 (existing debt service) - \$2,725 (future debt service) = \$47,139 net capital cost per elementary school student. The same approach is followed for middle school and high school students.

Figure S28: Net Capital Cost per Student

Capital Cost per Student			
Fee Component	Elementary	Middle	High
School Facilities	\$73,272	\$76,896	\$76,519
School Facilities Land	\$5,460	\$4,914	\$5,460
Administrative Facilities	\$578	\$578	\$578
Administrative Facilities Land	\$146	\$146	\$146
Buses	\$87	\$87	\$87
Support Vehicles	\$217	\$217	\$217
Gross Capital Cost per Student	\$79,760	\$82,838	\$83,007
Credit: State Capital Funding	(36.30%)	(36.30%)	(36.30%)
Credit: DIF Fund Balance	(1.10%)	(1.10%)	(1.10%)
Credit: Existing Debt Service	(\$66)	(\$66)	(\$66)
Credit: Future Debt Service	(\$2,725)	(\$2,725)	(\$2,725)
Net Capital Cost per Student	\$47,139	\$49,066	\$49,171

Maximum Supportable School Development Impact Fees

Shown below, Figure S29 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable school development impact fees. The net capital cost is \$47,139 per elementary school student, \$49,066 per middle school student, and \$49,171 per high school student. School development impact fees are assessed to residential development according to the number of public school students per dwelling unit.

For a single-family unit, the elementary school portion of the fee is \$7,966 (0.169 elementary school students per single-family unit X \$47,139 net capital cost per elementary school student), the middle school portion of the fee is \$4,072 (0.083 middle school students per single-family unit X \$49,066 net capital cost per middle school student), and the high school portion of the fee is \$5,360 (0.109 high school students per single-family unit X \$49,171 net capital cost per high school student). The maximum supportable school development impact fee for a single-family unit is \$17,399.

Figure S29: Maximum Supportable School Development Impact Fees

Net Capital Cost	Elementary (K-5)	Middle (6-8)	High (9-12)
Per Student	\$47,139	\$49,066	\$49,171

Anne Arundel County Public School Students per Housing Unit				
Housing Type	Elementary (K-5)	Middle (6-8)	High (9-12)	Total
Single Family	0.169	0.083	0.109	0.361
Townhouse	0.189	0.085	0.100	0.374
Multifamily	0.113	0.047	0.054	0.214

Residential Development Impact Fees						
Housing Type	Elementary (K-5)	Middle (6-8)	High (9-12)	Maximum Supportable	Current Fees ¹	Difference
Single Family	\$7,966	\$4,072	\$5,360	\$17,399	\$11,778	\$5,621
Townhouse	\$8,909	\$4,171	\$4,917	\$17,997	\$13,349	\$4,648
Multifamily	\$5,327	\$2,306	\$2,655	\$10,288	\$7,820	\$2,468

1. TischlerBise analysis of current student generation rates from the 2008 Development Impact Fee Study. Current single family based on 3,000-3,499 square feet, current townhouse based on 4,500-4,999 square feet, and current multifamily based on 1,000-1,499 square feet.

TRANSPORTATION DEVELOPMENT IMPACT FEES

METHODOLOGY

The transportation development impact fees include a component for arterial improvements. The incremental expansion methodology is used for the arterial improvements component.

SERVICE AREA

Anne Arundel County provides arterial improvements throughout the county; therefore, the service area for transportation development impact fees is Anne Arundel County.

PROPORTIONATE SHARE

The capital costs for transportation development impact fees are allocated between residential and nonresidential development based on trip generation rates, trip adjustment factors, and trip lengths.

SERVICE UNITS

Anne Arundel County will use vehicle miles traveled (VMT) as the demand units for transportation development impact fees. Components used to determine VMT include average weekday vehicle trip generation rates, adjustments for pass-by trips, and trip length weighting factors.

Residential Trip Generation Rates

For residential development, TischlerBise uses trip generation rates published in *Trip Generation*, Institute of Transportation Engineers (ITE), 11th Edition (2021). The prototype for single-family development is Single-Family Detached Housing (ITE 210) which generates 9.43 average weekday vehicle trip ends per dwelling unit. The prototype for multi-family development is Multifamily Housing Low-Rise (ITE 220) which generates 6.74 average weekday vehicle trip ends per dwelling unit.

As an alternative to simply using national average trip generation rates for residential development published by the Institute of Transportation Engineers (ITE), TischlerBise derives custom trip rates using local demographic data. Key inputs needed for the analysis (i.e., average number of persons and vehicles available per housing unit) are available from American Community Survey (ACS) data.

Demand Indicators by Dwelling Size

Development impact fees must be proportionate to the demand for infrastructure. Because averages per housing unit for vehicle trip ends have a positive correlation to the number of bedrooms, TischlerBise recommends residential fee schedules that increase by dwelling unit size. Custom tabulations of demographic data by bedroom range can be created from individual survey responses provided by the U.S. Census Bureau in files known as Public Use Microdata Samples (PUMS). PUMS files are only available for areas of at least 100,000 persons with Anne Arundel County included in Public Use Microdata Areas (PUMA) 1201 - 1204.

Cells shaded yellow are survey results for the PUMA. Rather than rely on one methodology, the recommended trip generation rates shown at the bottom of Figure T1, shaded gray, are an average of trip rates based on persons and vehicles available for all types of housing units. In Anne Arundel, each housing unit is expected to yield an average of 8.86 Average Weekday Vehicle Trip Ends (AWVTE), compared to the national average of 8.95 trip ends.

Figure T1: Average Weekday Vehicle Trip Ends by Bedroom Range

Bedroom Range	Persons ¹	Vehicles Available ¹	Housing Units ¹	Anne Arundel Housing Mix	Unadjusted PPHU	Adjusted PPHU ²	Unadjusted VPHU	Adjusted VPHU ²
0-2	3,609	2,956	2,157	23%	1.67	1.68	1.37	1.31
3	8,618	7,162	3,650	40%	2.36	2.37	1.96	1.87
4	7,775	6,371	2,664	29%	2.92	2.93	2.39	2.28
5+	2,610	2,063	757	8%	3.45	3.46	2.73	2.60
Total	22,612	18,552	9,228	100%	2.45	2.46	2.01	1.92

National Averages According to ITE

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HU	Anne Arundel Housing Mix	Persons per Housing Unit	Vehicles per Housing Unit
210 SFD	2.65	6.36	9.43	82%	3.56	1.48
220 Apt	1.86	4.40	6.74	18%	3.62	1.53
Wtd Avg	2.51	6.01	8.95	100%	3.57	1.49

Recommended AWVTE per Housing Unit by Bedroom

Bedroom Range	AWVTE per HU Based on Persons ³	AWVTE per HU Based on Vehicles ⁴	AWVTE per Housing Unit ⁵
0-2	4.22	7.87	6.05
3	5.95	11.24	8.60
4	7.35	13.70	10.53
5+	8.68	15.63	12.16
Average	6.17	11.54	8.86

1. American Community Survey, Public Use Microdata Sample for Maryland PUMA's 1201-1204 (2017-2021 5-Year unweighted data).
2. Adjusted multipliers are scaled to make the average PUMS values match control totals for Anne Arundel County based on 2017-2021 American Community Survey 5-Year Estimates.
3. Adjusted persons per housing unit multiplied by national weighted average trip rate per person.
4. Adjusted vehicles available per housing unit multiplied by national weighted average trip rate per vehicle.
5. Average trip rates based on persons and vehicles per housing unit.

Recommended AWVTE per Housing Unit by Type

Dwelling Type	AWVTE per HU Based on Persons ³	AWVTE per HU Based on Vehicles ⁴	AWVTE per Housing Unit ⁵
Single Family	6.58	12.08	9.33
Multi-Family	4.27	9.08	6.68
Average	6.17	11.54	8.86

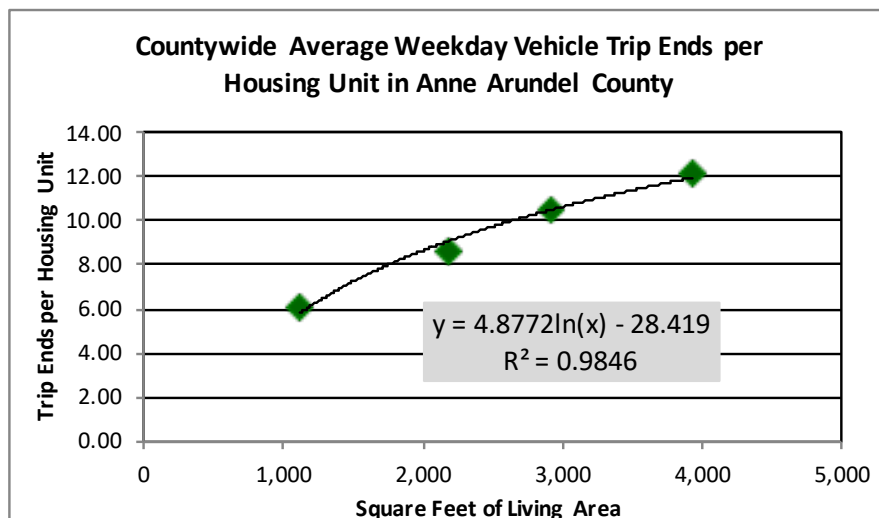
Adjusted PPHU	Adjusted VPHU
2.62	2.01
1.70	1.51
2.46	1.92

Vehicle Trip Ends by Dwelling Size

To derive AWWTE by dwelling size, TischlerBise matches trip generation rates and average floor area by bedroom range, as shown in Figure T2, with a logarithmic trend line derived from 2021 square footage estimates published by the U.S. Census Bureau (South Atlantic region). Dwellings with two bedrooms or less average 1,123 square feet of floor area—based on multi-family dwellings constructed in South Atlantic census region. Three-bedroom dwellings average 2,180 square feet, four-bedroom dwellings average 2,916 square feet, and dwellings with five or more bedrooms average 3,924 square feet—based on single-family dwellings constructed in South Atlantic census division. Using the trend line formula shown in the chart, TischlerBise derives the estimated average weekday vehicle trip ends, by dwelling size, to match Anne Arundel County’s existing development impact fee size thresholds. As shown in the upper-right corner of the table below, the smallest floor area range (under 500 square feet) generates an estimated average of 1.88 vehicle trip ends per dwelling. The largest floor area range (6,000 square feet or more) generates an estimated average of 14.40 vehicle trip ends per dwelling.

Figure T2: Vehicle Trip Ends by Dwelling Size

Actual Averages per Housing Unit			Fitted-Curve Values	
Bedrooms	Square Feet	Trip Ends	Sq Ft Range	Trip Ends
0-2	1,123	6.05	Under 500	1.88
3	2,180	8.60	500 to 999	5.27
4	2,916	10.53	1,000 to 1,499	7.25
5+	3,924	12.16	1,500 to 1,999	8.65
Average weekday trip ends per housing unit derived from 2017-2021 ACS 5-Year data. Unit size for 0-2 bedroom is from the 2021 U.S. Census Bureau average for all multi-family units constructed in the Census South region. Unit size for all other bedrooms is from the 2021 U.S. Census Bureau average for single-family units constructed in the Census South Atlantic division.			2,000 to 2,499	9.74
			2,500 to 2,999	10.63
			3,000 to 3,499	11.38
			3,500 to 3,999	12.03
			4,000 to 4,499	12.61
			4,500 to 4,999	13.12
			5,000 to 5,499	13.59
5,500 to 5,999	14.01			
6,000 or More	14.40			



Nonresidential Trip Generation Rates

For nonresidential development, TischlerBise uses trip generation rates published in Trip Generation, Institute of Transportation Engineers (ITE), 11th Edition (2021). The prototype for industrial development is Light Industrial (ITE 110) which generates 4.87 average weekday vehicle trip ends per 1,000 square feet of floor area. Institutional development uses Hospital (ITE 610) and generates 10.77 average weekday vehicle trip ends per 1,000 square feet of floor area. For office development, the proxy is General Office (ITE 710), and it generates 10.84 average weekday vehicle trip ends per 1,000 square feet of floor area. The prototype for retail development is Shopping Center (ITE 820) which generates 37.01 average weekday vehicle trips per 1,000 square feet of floor area.

Figure T3: Average Weekday Vehicle Trip Ends by Land Use

ITE Code	Land Use / Size	Demand Unit	Wkdy Trip Ends Per Dmd Unit ¹	Wkdy Trip Ends Per Employee ¹	Emp Per Dmd Unit	Sq Ft Per Emp
110	Light Industrial	1,000 Sq Ft	4.87	3.10	1.57	637
610	Hospital	1,000 Sq Ft	10.77	3.77	2.86	350
710	General Office (avg size)	1,000 Sq Ft	10.84	3.33	3.26	307
820	Shopping Center (avg size)	1,000 Sq Ft	37.01	17.42	2.12	471

1. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Trip Rate Adjustments

To calculate transportation development impact fees, trip generation rates require an adjustment factor to avoid double counting each trip at both the origin and destination points. Therefore, the basic trip adjustment factor is 50 percent.

Adjustment for Pass-By Trips

For commercial / retail development, the trip adjustment factor is less than 50 percent because this type of development attracts vehicles as they pass by on arterial roads. For example, when someone stops at a convenience store on the way home from work, the convenience store is not the primary destination. For the average shopping center, ITE data indicate 24 percent of the vehicles that enter are passing by on their way to some other primary destination. The remaining 76 percent of attraction trips have the commercial / retail site as their primary destination. Because attraction trips are half of all trips, the trip adjustment factor is 76 percent multiplied by 50 percent, or approximately 38 percent of the trip ends.

Trip Length Weighting Factor by Type of Land Use

The transportation development impact fee methodology includes a percentage adjustment, or weighting factor, to account for trip length variation by type of land use. As documented in Table 6a, 6b, and 6c of the 2017 National Household Travel Survey, vehicle trips from residential development are approximately 117 percent of the average trip length. The residential trip length adjustment factor includes data on home-base work trips, social, and recreational purposes. Conversely, shopping trips associated with commercial / retail development are roughly 75 percent of the average trip length while other nonresidential development typically accounts for trips that are 73 percent of the average for all trips.

Lane Capacity

Transportation development impact fees are based on established daily per-lane capacities for each classification of roadways. Based on TischlerBise analysis of the existing arterial network, the daily capacity is approximately 7,100 vehicles per lane. Arterial lane capacity is used to calculate VMT on the County arterial network. This reflects the ability of arterials to absorb additional VMT before reaching capacity.

Service Units

Figure T4 displays the service units for residential and nonresidential land uses. The transportation development impact fees for residential development are calculated on a per VMT basis and then converted to VMT per housing unit by dwelling unit size. For nonresidential development, transportation development impact fees are calculated per VMT and then converted to VMT per development unit.

Figure T4: Service Units

Residential Development						
Dwelling Unit Size	Development Unit	AWVTE per unit ¹	Trip Rate Adjustment ¹	Average Trip Length (miles)	Trip Length Weight Factor ²	Avg Wkdy VMT per Unit
Under 500	Dwelling Unit	1.88	50%	1.548	117%	1.70
500 - 999	Dwelling Unit	5.27	50%	1.548	117%	4.77
1,000 - 1,499	Dwelling Unit	7.25	50%	1.548	117%	6.57
1,500 - 1,999	Dwelling Unit	8.65	50%	1.548	117%	7.83
2,000 - 2,499	Dwelling Unit	9.74	50%	1.548	117%	8.82
2,500 - 2,999	Dwelling Unit	10.63	50%	1.548	117%	9.63
3,000 - 3,499	Dwelling Unit	11.38	50%	1.548	117%	10.31
3,500 - 3,999	Dwelling Unit	12.03	50%	1.548	117%	10.89
4,000 - 4,499	Dwelling Unit	12.61	50%	1.548	117%	11.42
4,500 - 4,999	Dwelling Unit	13.12	50%	1.548	117%	11.88
5,000 - 5,499	Dwelling Unit	13.59	50%	1.548	117%	12.31
5,500 - 5,999	Dwelling Unit	14.01	50%	1.548	117%	12.69
6,000 and over	Dwelling Unit	14.40	50%	1.548	117%	13.04

Nonresidential Development						
Development Type	Development Unit	AWVTE per 1,000 Sq Ft ¹	Trip Adjustment ¹	Average Trip Length (miles)	Trip Length Weight Factor ²	Avg Wkdy VMT per 1,000 Sq Ft
Amusement, Rec., Assembly	Req Pkg Space	3.10	50%	1.548	75%	1.80
Hotel	Room	7.99	50%	1.548	75%	4.64
Industrial	1,000 sq ft	4.87	50%	1.548	75%	2.83
Self-Storage (Mini-Warehouse)	1,000 sq ft	1.45	50%	1.548	75%	0.84
For Profit Hospital	Bed	10.54	50%	1.548	75%	6.12
For Profit Nursing Home	Bed	3.06	50%	1.548	75%	1.78
Marinas	Berth	2.41	50%	1.548	75%	1.40
Office	1,000 sq ft	10.84	50%	1.548	75%	6.29
Mercantile	1,000 sq ft	37.01	38%	1.548	73%	15.89

1. See Land Use Assumptions

2. U.S. Department of Transportation, Federal Highway Administration, 2017 National Household Transportation Survey

LEVEL OF SERVICE AND COST ANALYSIS

This section details the level of service and capital cost per demand unit for each infrastructure category.

Arterial Improvements – Incremental Expansion

Anne Arundel County currently provides 443.14 lane miles of arterials to existing development and plans to expand its network to serve future development. Anne Arundel County’s existing LOS is 1.4058 lane miles per 10,000 VMT (443.14 lane miles / 3,152,233 VMT / 10,000).

The Maryland Department of Transportation’s Highway Cost Estimating Manual (January 2022) includes a median cost of \$5,900,000 per lane mile for minor arterials and \$6,200,000 per lane mile for other principal arterials. These cost estimates include intersections and multimodal improvements developed in conjunction with arterial improvements. Based on recommendations from staff, this analysis uses \$6,000,000 per lane mile. For arterial improvements, the cost is \$843.47 per VMT (443.14 lane miles / 3,152,233 VMT X \$6,000,000 per lane mile).

Figure T5: Existing Level of Service

Cost Factors	
Cost per Lane Mile ¹	\$6,000,000

Level-of-Service (LOS) Standards	
Existing Lane Miles	443.14
2023 VMT	3,152,233
Lane Miles per 10,000 VMT	1.4058
Cost per VMT	\$843.47

1. Maryland Department of Transportation, Highway Cost Estimating Manual, January 2022

PROJECTED DEMAND FOR CAPITAL IMPROVEMENTS

The analysis calculates growth-related demand for capital improvements using the levels of service and cost factors for the infrastructure components in the previous section. Growth-related demand is a projection of future capital improvements and estimated costs over a specified amount of time and a specified level of service to serve new development.

Projected Travel Demand

The projected need for system lane miles is a function of the development forecast (see Appendix A) and the existing infrastructure standards. A typical vehicle trip, such as a person leaving their home and traveling to work, generally begins on a local street that connects to a collector street, which connects to an arterial road and eventually to a state or interstate highway. For development impact fees, this progression of travel up and down the functional classification chain narrows the average trip length determination to the following question, “what is the average vehicle trip length on transportation development impact fee system improvements (i.e., the same type of streets used to document current infrastructure standards)?”

A Vehicle Mile of Travel (VMT) is a measurement unit equal to one vehicle traveling one mile. In the aggregate, VMT is the product of daily traffic on a roadway segment (vehicle trips) multiplied by the length of that segment. A lane mile is a rectangular area of pavement, one lane wide and one mile long. The segment length in this study reflects the “consumption” or utilization of the roadway system and is calibrated to the current and planned arterial network of lane miles and a lane capacity standard of approximately 7,100 vehicles per lane.

Figure T6 shows the calibration of existing development to Anne Arundel County’s existing arterial network. Based on 443.14 lane miles of arterials at full lane capacity, Anne Arundel County’s weighted-average miles per trip on the existing arterial network is 1.547955 miles. The methodology is as follows:

- With an existing inventory of 443.14 lane miles of arterials and an average daily lane capacity standard of 7,113 vehicles per lane, the arterial network can accommodate 3,152,263 VMT (i.e., 7,113 vehicles per day traveling the entire 443.14 lane miles).
- To derive the average utilization (expressed in miles per trip) of the existing system improvements, we divide VMT by the aggregate number of vehicle trips associated with existing development in Anne Arundel County. Existing development currently generates an estimated 2,123,481 vehicle trips on an average day. Based on 3,152,263 VMT that can be accommodated on the existing arterial network, and 2,123,481 average day vehicle trips, the average utilization of the arterial network is approximately 1.48 miles per trip.
- However, to be consistent with the methodology used in the development impact fee calculations, TischlerBise further refined the average utilization. This refinement is necessary because the calibration of average utilization includes the same adjustment factors used in the development impact fee calculations (i.e., commercial pass-by adjustment and average trip length adjustment by type of land use). With these additional refinements, TischlerBise determined the average utilization on the arterial network to be 1.547955 miles per trip.

Anne Arundel County plans to maintain the existing level of service for arterial improvements over the next 10 years. Based on a projected increase of 276,619 VMT, future development demands approximately 38.9 lane miles of arterial improvements (276,619 additional VMT X 1.4058 lane miles per 10,000 VMT / 10,000). The growth-related cost of arterial improvements is \$233,320,151 (38.9 lane miles X \$6,000,000 per lane mile). Anne Arundel County may use development impact fees to construct additional arterial improvements.

Figure T6: Travel Demand Model

Anne Arundel County, Maryland	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
	Base	1	2	3	4	5	6	7	8	9	10	
Single Family Units	200,173	202,025	203,896	205,419	206,954	208,502	210,061	211,633	212,752	213,877	215,008	14,835
Multi-Family Units	43,422	44,015	44,613	45,101	45,593	46,088	46,587	47,090	47,449	47,809	48,171	4,749
Retail KSF	41,155	41,950	42,745	43,072	43,399	43,725	44,052	44,378	44,707	45,035	45,363	4,209
Office KSF	29,000	29,560	30,121	30,351	30,581	30,811	31,041	31,271	31,503	31,734	31,966	2,966
Industrial KSF	57,216	58,322	59,428	59,882	60,336	60,790	61,244	61,698	62,154	62,611	63,067	5,851
Institutional KSF	31,449	32,057	32,665	32,914	33,164	33,414	33,663	33,913	34,164	34,415	34,665	3,216
Single Family Trips	933,807	942,448	951,174	958,280	965,442	972,661	979,936	987,270	992,488	997,735	1,003,012	69,204
Multi-Family Trips	145,028	147,009	149,009	150,637	152,279	153,934	155,601	157,282	158,478	159,681	160,890	15,862
Residential Trips	1,078,836	1,089,457	1,100,182	1,108,917	1,117,721	1,126,594	1,135,538	1,144,552	1,150,966	1,157,416	1,163,902	85,066
Retail Trips	578,791	589,977	601,163	605,756	610,349	614,942	619,535	624,128	628,746	633,365	637,983	59,192
Office Trips	157,179	160,217	163,255	164,502	165,749	166,997	168,244	169,491	170,746	172,000	173,254	16,074
Industrial Trips	139,321	142,014	144,706	145,812	146,917	148,023	149,128	150,234	151,346	152,457	153,569	14,248
Institutional Trips	169,354	172,627	175,900	177,244	178,588	179,932	181,276	182,620	183,971	185,322	186,673	17,319
Nonresidential Trips	1,044,646	1,064,835	1,085,024	1,093,314	1,101,604	1,109,894	1,118,183	1,126,473	1,134,809	1,143,144	1,151,479	106,834
Total Vehicle Trips	2,123,481	2,154,292	2,185,206	2,202,231	2,219,325	2,236,488	2,253,721	2,271,025	2,285,774	2,300,560	2,315,381	191,900
Vehicle Miles Traveled (VMT)	3,152,263	3,194,660	3,237,245	3,262,574	3,288,029	3,313,609	3,339,316	3,365,151	3,386,330	3,407,574	3,428,882	276,619
Arterial Lane Miles - Total	443.14	449.10	455.09	458.65	462.23	465.82	469.44	473.07	476.04	479.03	482.03	38.9
Arterial Lane Miles - New		6.0	6.0	3.6	3.6	3.6	3.6	3.6	3.0	3.0	3.0	38.9
Arterial Cost (x\$1,000)		\$35,760	\$35,919	\$21,365	\$21,470	\$21,576	\$21,683	\$21,791	\$17,864	\$17,919	\$17,973	\$233,320

MAXIMUM SUPPORTABLE TRANSPORTATION DEVELOPMENT IMPACT FEES

Figure T7 provides a summary of the input variables (described in the previous sections) used to calculate the maximum supportable transportation development impact fees. The total capital cost is \$843.47 per VMT. Transportation development impact fees are assessed to all development according to the number of VMT per development unit. For a residential unit with 1,800 square feet, the fee of \$6,604 is calculated using a cost of \$843.47 per person multiplied by 7.83 VMT per housing unit.

Figure T7: Maximum Supportable Transportation Development Impact Fees

Fee Component	Cost per VMT
Arterial Improvements	\$843.47
Total	\$843.47

Residential Development Impact Fees					
Dwelling Unit Size	Development Unit	Avg Wkdy VMT per Unit ¹	Maximum Supportable	Current Fees	Difference
Under 500	Dwelling Unit	1.70	\$1,434	\$2,050	(\$616)
500 - 999	Dwelling Unit	4.77	\$4,023	\$3,363	\$660
1,000 - 1,499	Dwelling Unit	6.57	\$5,542	\$4,366	\$1,176
1,500 - 1,999	Dwelling Unit	7.83	\$6,604	\$5,066	\$1,538
2,000 - 2,499	Dwelling Unit	8.82	\$7,439	\$5,591	\$1,848
2,500 - 2,999	Dwelling Unit	9.63	\$8,123	\$5,996	\$2,127
3,000 - 3,499	Dwelling Unit	10.31	\$8,696	\$6,306	\$2,390
3,500 - 3,999	Dwelling Unit	10.89	\$9,185	\$6,596	\$2,589
4,000 - 4,499	Dwelling Unit	11.42	\$9,632	\$6,858	\$2,774
4,500 - 4,999	Dwelling Unit	11.88	\$10,020	\$7,092	\$2,928
5,000 - 5,499	Dwelling Unit	12.31	\$10,383	\$7,294	\$3,089
5,500 - 5,999	Dwelling Unit	12.69	\$10,704	\$7,464	\$3,240
6,000 and over	Dwelling Unit	13.04	\$10,999	\$7,552	\$3,447

Nonresidential Development Impact Fees					
Development Type	Development Unit	Avg Wkdy VMT per 1,000 Sq Ft ¹	Maximum Supportable	Current Fees	Difference
Amusement, Rec., Assembly	Req Pkg Space	1.80	\$1,518	\$1,443	\$75
Hotel	Room	4.64	\$3,914	\$6,947	(\$3,033)
Industrial	1,000 sq ft	2.83	\$2,387	\$5,993	(\$3,606)
Self-Storage (Mini-Warehouse)	1,000 sq ft	0.84	\$709	\$987	(\$278)
For Profit Hospital	Bed	6.12	\$5,162	\$7,819	(\$2,657)
For Profit Nursing Home	Bed	1.78	\$1,501	\$1,739	(\$238)
Marinas	Berth	1.40	\$1,181	\$1,971	(\$790)
Office	1,000 sq ft	6.29	\$5,305	\$8,394	(\$3,089)
Mercantile	1,000 sq ft	15.89	\$13,403	\$10,097	\$3,306

1. See Land Use Assumptions

PROJECTED TRANSPORTATION DEVELOPMENT IMPACT FEE REVENUE

This section summarizes the potential cash flow to Anne Arundel County based on adoption of the maximum supportable transportation development impact fees. The cash flow projections are based on the assumptions detailed in this chapter and the development projections discussed in Appendix A. If development occurs at a more rapid rate than projected, the demand for infrastructure and the development impact fee revenue will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure and the development impact fee revenue will decrease at a corresponding rate.

Projected development impact fee revenue equals \$219,710,353 and total projected expenditures equal \$233,320,151. Projected development impact fee revenue shown below for single-family units represents a residential unit with 1,500 to 1,999 square feet, and projected development impact fee revenue for multi-family units represents a residential unit with 500 to 999 square feet. Actual development impact fee revenue will vary based on the mix of residential units in each dwelling unit size range.

Figure T8: Projected Transportation Development Impact Fee Revenue

Fee Component	Growth Share	Existing Share	Total
Arterial Improvements	\$233,320,151	\$0	\$233,320,151
Total	\$233,320,151	\$0	\$233,320,151

		Single Family \$6,604 per unit	Multi-Family \$4,023 per unit	Mercantile \$13,403 per 1,000 sq ft	Office \$5,305 per 1,000 sq ft	Industrial \$2,387 per 1,000 sq ft	Institutional \$5,137 per 1,000 sq ft
Year		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2023	200,173	43,422	41,155	29,000	57,216	31,449
Year 1	2024	202,025	44,015	41,950	29,560	58,322	32,057
Year 2	2025	203,896	44,613	42,745	30,121	59,428	32,665
Year 3	2026	205,419	45,101	43,072	30,351	59,882	32,914
Year 4	2027	206,954	45,593	43,399	30,581	60,336	33,164
Year 5	2028	208,502	46,088	43,725	30,811	60,790	33,414
Year 6	2029	210,061	46,587	44,052	31,041	61,244	33,663
Year 7	2030	211,633	47,090	44,378	31,271	61,698	33,913
Year 8	2031	212,752	47,449	44,707	31,503	62,154	34,164
Year 9	2032	213,877	47,809	45,035	31,734	62,611	34,415
Year 10	2033	215,008	48,171	45,363	31,966	63,067	34,665
10-Year Increase		14,835	4,749	4,209	2,966	5,851	3,216
Projected Revenue		\$97,970,340	\$19,105,227	\$56,413,227	\$15,734,630	\$13,966,337	\$16,520,592

Projected Fee Revenue	\$219,710,353
Total Expenditures	\$233,320,151

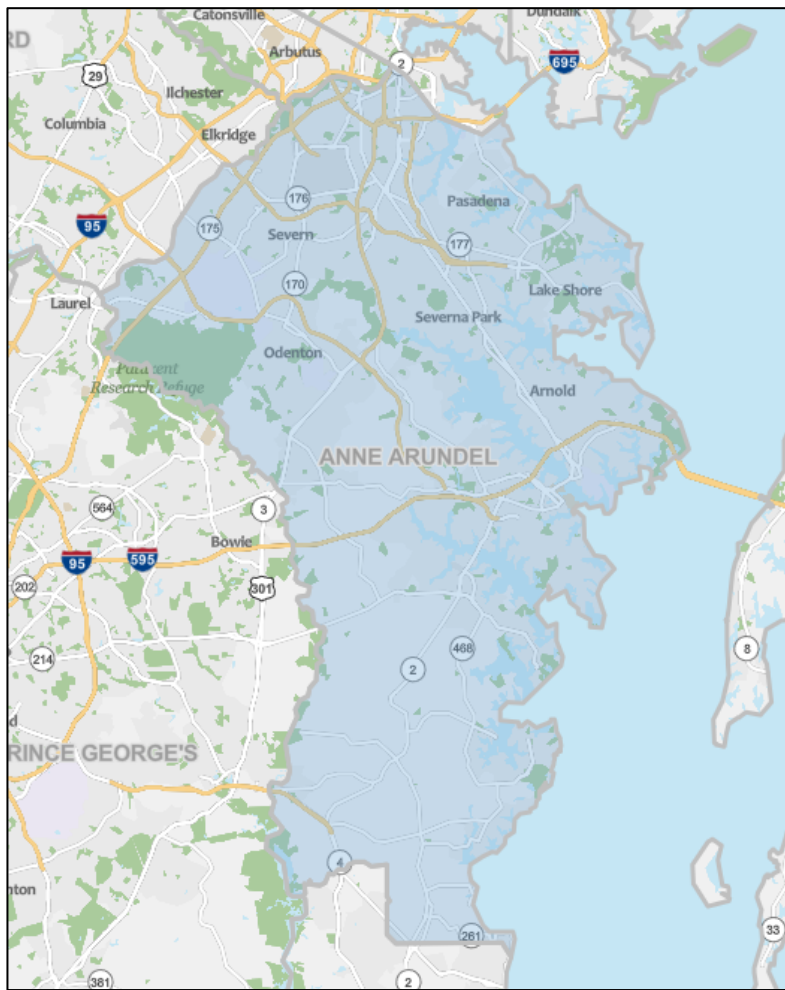
APPENDIX A: LAND USE ASSUMPTIONS

As part of our Work Scope, TischlerBise has prepared documentation on demographic data and development projections that will be used in the Anne Arundel County Development Impact Fee Study. The data estimates and projections are used in the study's calculations and to illustrate the possible future pace of service demands on the County's infrastructure. Furthermore, this section demonstrates the history of development and base year development levels in Anne Arundel County. The base year assumptions are used in the development impact fee calculations to determine current levels of service.

STUDY AREA

It is essential for a development impact fee study to have an appropriate study area. The study area defines the level of service calculations, capacity needs, and benefit zones. The following estimates are countywide, however, as the development impact fee study progresses, service areas may be constructed necessitating demographic assumptions to be estimated appropriately. Additional service area estimates will be included in an updated demographic memo.

Figure 1: Anne Arundel County Study Area



RESIDENTIAL DEVELOPMENT

Occupancy Factors

Development impact fees often use per capita standards and persons per housing unit or persons per household to derive proportionate share fee amounts. Housing types have varying household sizes and, consequently, a varying demand on County infrastructure and services. Thus, it is important to differentiate between housing types and size.

When persons per housing unit (PPHU) is used in the development impact fee calculations, infrastructure standards are derived using year-round population. In contrast, when persons per household (PPHH) is used in the development impact fee calculations, the fee methodology assumes all housing units will be occupied, thus requiring seasonal or peak population to be used when deriving infrastructure standards. TischlerBise recommends Anne Arundel impose fees for residential development according to persons per housing unit.

Figure 2 shows the U.S. Census Bureau American Community Survey 2017-2021 5-Year Estimates for Anne Arundel County. Single-family units average 2.62 persons per unit, and multi-family units average 1.70 persons per unit. Figure 3 shows the U.S. Census Bureau American Community Survey 2017-2021 5-Year Estimates for Annapolis. Single-family units average 2.42 persons per unit, and multi-family units average 1.75 persons per unit.

The figures below illustrate the PPHU factors used to project population. These figures are used solely to calculate the PPHU factors. Base year housing stock and population estimates are detailed in the following section.

Figure 2: Anne Arundel County Persons per Housing Unit

Housing Type	Persons	Households	Persons per Household	Housing Units	Persons per Housing Unit	Housing Mix	Vacancy Rate
Single-Family ¹	498,519	180,419	2.76	190,155	2.62	82.2%	5.10%
Multi-Family ²	69,920	38,175	1.83	41,067	1.70	17.8%	7.00%
Total	568,439	218,594	2.60	231,222	2.46	100.0%	5.50%

Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

1. Includes detached, attached (i.e., townhouses), and mobile home units.
2. Includes dwellings in structures with two or more units.

Figure 3: Annapolis Persons per Housing Unit

Housing Type	Persons	Households	Persons per Household	Housing Units	Persons per Housing Unit	Housing Mix	Vacancy Rate
Single-Family ¹	28,586	10,769	2.65	11,811	2.42	64.5%	8.80%
Multi-Family ²	11,371	6,032	1.89	6,502	1.75	35.5%	7.20%
Total	39,957	16,801	2.38	18,313	2.18	100.0%	8.30%

Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

1. Includes detached, attached (i.e., townhouses), and mobile home units.
2. Includes dwellings in structures with two or more units.

Population and Housing Unit Estimates

The Baltimore Metropolitan Council (BMC) published a detailed Traffic Analysis Zone (TAZ) model which includes population data in 5-year increments beginning in 2020. The base year, 2023, population estimate is calculated by applying the 2020 to 2025 population growth rate to the 2022 population estimate from the Maryland Department of Planning. As a result, the 2023 population estimate is 599,090 residents for Anne Arundel County and 40,870 residents for Annapolis.

The number of single-family and multi-family housing units are calculated based on the base year population, PPHU, housing mix, and the vacancy rate factors listed in Figure 2 and Figure 3. The 2023 housing unit estimate includes 243,595 housing units for Anne Arundel County and 18,744 housing units for Annapolis.

Figure 4: Anne Arundel County Base Year Population and Housing Units

Anne Arundel County, Maryland	2022	2023 Base Year
Population		
Single-Family	520,310	525,116
Multi-Family	72,976	73,975
Population¹	593,286	599,090
Percent Increase		1.0%
Housing Units		
Single-Family	198,339	200,173
Multi-Family	42,834	43,422
Total Housing Units²	241,173	243,595

Figure 5: Annapolis Base Year Population and Housing Units

Annapolis, Maryland	2022	2023 Base Year
Population		
Single-Family	29,080	29,261
Multi-Family	11,568	11,609
Population¹	40,648	40,870
Percent Increase		0.5%
Housing Units		
Single-Family	12,026	12,100
Multi-Family	6,620	6,644
Total Housing Units²	18,646	18,744

1. 2022 estimate from Maryland Department of Planning, Projections and State Data Center Unit, March 2023; Projected growth rates from Baltimore Metropolitan Council Region Traffic Analysis Zone Model, Round 10 Cooperative Forecasts 2020-2050
2. Projected housing units based on Anne Arundel County FY 2017 - FY 2022 permits completed for new residential development (76% single family and 24% multi-family)

Residential Development Projections

Anne Arundel County

The analysis uses these projections for library, parks and recreation, school, and transportation development impact fees. As stated previously, the BMC published population estimates in 5-year increments. By 2033, there is a projected increase of 46,941 residents, an increase of 7.8 percent from the base year. Importantly, the estimates were constructed with a consideration of land availability and capacity for future development in accordance with the County’s latest Comprehensive Plan and other regional plans. There has also been a focus on the transition of homes from empty nesters to younger, larger households.

Housing development is assumed to be consistent with population growth. As a result, single-family growth includes 1,861 units per year for the first two years; 1,548 units per year for the next 5-year increment; and 1,125 units per year in the final three years of the projection. This results in an additional 14,835 single-family units over the next ten years. Multi-family growth includes 596 units per year for the first two years; 495 units per year for the next 5-year increment; and 360 units per year in the final three years of the projection. This results in an additional 4,749 multi-family units over the next ten years. Projected growth in Anne Arundel County over the next 10 years includes an additional 46,941 residents in 19,584 new housing units.

Figure 6: Anne Arundel County Residential Development Projections

Anne Arundel County, Maryland	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
		Base Year	1	2	3	4	5	6	7	8	9	10	
Population													
Single-Family	520,310	525,116	529,969	534,869	538,860	542,883	546,937	551,023	555,142	558,072	561,019	563,983	38,867
Multi-Family	72,976	73,975	74,983	76,000	76,829	77,665	78,507	79,356	80,211	80,820	81,432	82,048	8,073
Population¹	593,286	599,090	604,951	610,869	615,689	620,548	625,444	630,379	635,353	638,893	642,452	646,031	46,941
Percent Increase		1.0%	1.0%	1.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.6%	0.6%	0.6%	7.8%
Housing Units													
Single-Family	198,339	200,173	202,025	203,896	205,419	206,954	208,502	210,061	211,633	212,752	213,877	215,008	14,835
Multi-Family	42,834	43,422	44,015	44,613	45,101	45,593	46,088	46,587	47,090	47,449	47,809	48,171	4,749
Total Housing Units²	241,173	243,595	246,040	248,509	250,520	252,547	254,590	256,649	258,724	260,200	261,685	263,179	19,584
Net New Housing Units			2,445	2,469	2,011	2,027	2,043	2,059	2,075	1,477	1,485	1,493	19,584

1. 2022 estimate from Maryland Department of Planning, Projections and State Data Center Unit, March 2023; Projected growth rates from Baltimore Metropolitan Council Region Traffic Analysis Zone Model, Round 10 Cooperative Forecasts 2020-2050

2. Projected housing units based on Anne Arundel County FY 2017 - FY 2022 permits completed for new residential development (76% single family and 24% multi-family)

Annapolis

Shown below, projections for Annapolis use the same methodology used for Anne Arundel County shown on the previous page. As stated previously, the BMC published population estimates in 5-year increments. By 2033, there is a projected increase of 1,597 residents, an increase of 3.9 percent from the base year.

Housing development is assumed to be consistent with population growth. As a result, single-family growth includes 75 units per year for the first two years; 60 units per year for the next 5-year increment; and 29 units per year in the final three years of the projection. This results in an additional 536 single-family units over the next ten years. Multi-family growth includes 24 units per year for the first two years; 19 units per year for the next 5-year increment; and nine units per year in the final three years of the projection. This results in an additional 172 multi-family units over the next ten years. Projected growth in Annapolis over the next 10 years includes an additional 1,597 residents in 707 new housing units.

Figure 7: Annapolis Residential Development Projections

Annapolis, Maryland	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
		Base Year	1	2	3	4	5	6	7	8	9	10	
Population													
Single-Family	29,080	29,261	29,442	29,624	29,767	29,911	30,055	30,200	30,346	30,416	30,487	30,557	1,297
Multi-Family	11,568	11,609	11,651	11,693	11,727	11,760	11,793	11,827	11,861	11,877	11,893	11,910	300
Population¹	40,648	40,870	41,093	41,317	41,494	41,671	41,849	42,027	42,206	42,293	42,380	42,467	1,597
Percent Increase		0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.2%	0.2%	0.2%	3.9%
Housing Units													
Single-Family	12,026	12,100	12,175	12,250	12,309	12,369	12,429	12,488	12,549	12,578	12,607	12,636	536
Multi-Family	6,620	6,644	6,668	6,692	6,711	6,730	6,749	6,768	6,788	6,797	6,806	6,816	172
Total Housing Units²	18,646	18,744	18,843	18,942	19,020	19,099	19,178	19,257	19,336	19,375	19,413	19,452	707
Net New Housing Units			99	99	78	78	79	79	79	38	38	39	707

1. 2022 estimate from Maryland Department of Planning, Projections and State Data Center Unit, March 2023; Projected growth rates from Baltimore Metropolitan Council Region Traffic Analysis Zone Model, Round 10 Cooperative Forecasts 2020-2050

2. Projected housing units based on Anne Arundel County FY 2017 - FY 2022 permits completed for new residential development (76% single family and 24% multi-family)

Unincorporated Anne Arundel County

The analysis uses these projections for fire and police development impact fees. Shown below, projections for unincorporated Anne Arundel County use the same methodology used for Anne Arundel County. Projected growth in unincorporated Anne Arundel County over the next 10 years includes an additional 45,344 residents in 18,876 new housing units.

Figure 8: Unincorporated Anne Arundel County Residential Development Projections

Unincorporated Anne Arundel County,	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
		Base Year	1	2	3	4	5	6	7	8	9	10	
Population													
Single-Family	491,229	495,855	500,527	505,245	509,093	512,972	516,882	520,823	524,796	527,656	530,533	533,426	37,570
Multi-Family	61,409	62,365	63,331	64,307	65,103	65,905	66,714	67,529	68,351	68,943	69,539	70,138	7,773
Population¹	552,638	558,220	563,858	569,552	574,196	578,877	583,595	588,352	593,147	596,599	600,072	603,564	45,344
Percent Increase		1.0%	1.0%	1.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.6%	0.6%	0.6%	8.1%
Housing Units													
Single-Family	186,313	188,073	189,850	191,645	193,110	194,585	196,073	197,573	199,085	200,174	201,270	202,372	14,299
Multi-Family	36,214	36,778	37,347	37,921	38,390	38,862	39,339	39,819	40,303	40,652	41,002	41,355	4,578
Total Housing Units	222,527	224,851	227,197	229,567	231,500	233,448	235,412	237,392	239,388	240,826	242,272	243,727	18,876
Net New Housing Units			2,346	2,370	1,933	1,948	1,964	1,980	1,996	1,438	1,446	1,455	18,876

1. 2022 estimate from Maryland Department of Planning, Projections and State Data Center Unit, March 2023; Projected growth rates from Baltimore Metropolitan Council Region Traffic Analysis Zone Model, Round 10 Cooperative Forecasts 2020-2050
2. Projected housing units based on Anne Arundel County FY 2017 - FY 2022 permits completed for new residential development (76% single family and 24% multi-family)

NONRESIDENTIAL DEVELOPMENT

Employment Estimate

The Baltimore Metropolitan Council (BMC) published a detailed Traffic Analysis Zone (TAZ) model which includes employment data in 5-year increments beginning in 2020. The base year, 2023, employment estimate is calculated by applying the 2020 to 2025 employment growth rate to the 2022 employment estimate. For Anne Arundel County, the 2022 estimate uses Quarterly Census of Employment and Wages (QCEW) data published by the U.S. Bureau of Labor Statistics. For Annapolis, the 2022 estimate uses Esri Business Analyst Online data. As a result, the 2023 employment estimate is 361,515 jobs for Anne Arundel County and 29,899 jobs for Annapolis.

Figure 9: Anne Arundel County Base Year Employment

Anne Arundel County, Maryland	2022	2023
		Base Year
Employment		
Retail	85,689	87,377
Office	92,637	94,462
Industrial	88,085	89,821
Institutional	88,118	89,855
Total Employment	354,529	361,515

Source: U.S. Bureau of Labor Statistics - Quarterly Census of Employment and Wages - 2022 Annual Averages, All Industry Levels; Baltimore Metropolitan Council Region Traffic Analysis Zones for 2023; TischlerBlse Analysis.

Figure 10: Annapolis Base Year Employment

Annapolis, Maryland	2022	2023
		Base Year
Employment		
Retail	7,831	7,985
Office	9,074	9,253
Industrial	2,802	2,857
Institutional	9,615	9,804
Total Employment	29,322	29,899

Source: Esri Business Analyst Online, 2022 employment; Baltimore Metropolitan Council Region Traffic Analysis Zones for 2023; TischlerBlse Analysis.

Nonresidential Floor Area Estimate

To estimate nonresidential floor area, the analysis applies employment density factors published in Trip Generation, Institute of Transportation Engineers, 11th Edition (2021) to the base year employment estimate discussed in the previous section.

Figure 11: Institute of Transportation Engineers Employee Density Factors

ITE Code	Land Use / Size	Demand Unit	Wkdy Trip Ends Per Dmd Unit ¹	Wkdy Trip Ends Per Employee ¹	Emp Per Dmd Unit	Square Feet Per Emp
110	Light Industrial	1,000 Sq Ft	4.87	3.10	1.57	637
610	Hospital	1,000 Sq Ft	10.77	3.77	2.86	350
710	General Office (avg size)	1,000 Sq Ft	10.84	3.33	3.26	307
820	Shopping Center (avg size)	1,000 Sq Ft	37.01	17.42	2.12	471

1. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Shown below, applying the ITE employment density factors to the base year employment estimates results in a 2023 estimate of 158.82 million square feet of nonresidential floor area in the Anne Arundel County study area. An example calculation for retail development is as follows: 87,377 jobs in 2023 X 471 square feet per retail job = 41,154,687 square feet of retail development in 2023.

Figure 12: Anne Arundel County Base Year Employment and Nonresidential Floor Area

Employment Industry	2023 Jobs ¹	Percent of Total Jobs	Square Feet per Job ²	2023 Floor Area ³ (square feet)	Jobs per 1,000 Sq Ft
Retail	87,377	24%	471	41,154,687	2.12
Office	94,462	26%	307	28,999,896	3.26
Industrial	89,821	25%	637	57,216,021	1.57
Institutional	89,855	25%	350	31,449,206	2.86
Total	361,515	100%		158,819,810	

1. TischlerBise Analysis.

2. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

3. TischlerBise calculation (2023 jobs X square feet per job).

Using the same methodology discussed above, the 2023 estimate for Annapolis includes 11.85 million square feet of nonresidential floor area.

Figure 13: Annapolis Base Year Employment and Nonresidential Floor Area

Employment Industry	2023 Jobs ¹	Percent of Total Jobs	Square Feet per Job ²	2023 Floor Area ³ (square feet)	Jobs per 1,000 Sq Ft
Retail	7,985	27%	471	3,761,034	2.12
Office	9,253	31%	307	2,840,649	3.26
Industrial	2,857	10%	637	1,820,084	1.57
Institutional	9,804	33%	350	3,431,395	2.86
Total	29,899	100%		11,853,162	

1. TischlerBise Analysis.

2. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

3. TischlerBise calculation (2023 jobs X square feet per job).

Nonresidential Development Projections

Anne Arundel County

The analysis uses these projections for transportation development impact fees. To project total employment for Anne Arundel County, TischlerBise applies a straight-line projection to BMC total employment projections of 340,555 jobs in 2020, 375,489 jobs in 2025, 389,833 jobs in 2030, and 404,256 jobs in 2035. To project employment at the industry level, the analysis uses a pro-rata share based on 2022 QCEW data for all sectors. To convert projected employment to floor area, employment multipliers shown in Figure 11 are applied to the employment projections shown below. Over the next 10 years, projected employment increases by 36,971 jobs and nonresidential floor area increases by approximately 16.24 million square feet.

It is noted that the BMC employment projections were prepared during the early stages of the COVID-19 outbreak, when the long-term impacts of the pandemic on the retail and education sectors were unknown. There remains a level of uncertainty as to how the still-evolving health crisis will impact the demand for retail and office floor area, as corporate and institutional policies related to remote working, learning, and shopping are also evolving.

Figure 14: Anne Arundel County Nonresidential Development Projections

Anne Arundel County, Maryland	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
		Base Year	1	2	3	4	5	6	7	8	9	10	
Employment													
Retail	85,689	87,377	89,066	90,755	91,448	92,141	92,835	93,528	94,222	94,919	95,616	96,313	8,936
Office	92,637	94,462	96,288	98,113	98,863	99,613	100,362	101,112	101,861	102,615	103,369	104,123	9,660
Industrial	88,085	89,821	91,557	93,293	94,006	94,718	95,431	96,144	96,857	97,573	98,290	99,007	9,186
Institutional	88,118	89,855	91,591	93,328	94,041	94,754	95,467	96,180	96,893	97,610	98,327	99,044	9,189
Total Employment	354,529	361,515	368,502	375,489	378,358	381,227	384,095	386,964	389,833	392,718	395,602	398,487	36,971
Nonres. Sq. Ft. (x1,000)													
Retail	40,359	41,155	41,950	42,745	43,072	43,399	43,725	44,052	44,378	44,707	45,035	45,363	4,209
Office	28,439	29,000	29,560	30,121	30,351	30,581	30,811	31,041	31,271	31,503	31,734	31,966	2,966
Industrial	56,110	57,216	58,322	59,428	59,882	60,336	60,790	61,244	61,698	62,154	62,611	63,067	5,851
Institutional	30,841	31,449	32,057	32,665	32,914	33,164	33,414	33,663	33,913	34,164	34,415	34,665	3,216
Total Square Feet	155,750	158,820	161,889	164,959	166,219	167,479	168,740	170,000	171,260	172,527	173,795	175,062	16,242

Source: U.S. Bureau of Labor Statistics - Quarterly Census of Employment and Wages - 2022 Annual Averages, All Industry Levels; Baltimore Metropolitan Council Region Traffic Analysis Zones for 2023; TischlerBise Analysis.

Annapolis

To project total employment for Annapolis, TischlerBise applies a straight-line projection to BMC total employment projections of 28,166 jobs in 2020, 31,055 jobs in 2025, 32,244 jobs in 2030, and 33,435 jobs in 2035. To project employment at the industry level, the analysis uses a pro-rata share based on 2022 Esri Business Analyst Online data for all sectors. To convert projected employment to floor area, employment multipliers shown in Figure 11 are applied to the employment projections shown below. Over the next 10 years, projected employment increases by 3,059 jobs and nonresidential floor area increases by approximately 1.21 million square feet.

Figure 15: Annapolis Nonresidential Development Projections

Annapolis, Maryland	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
		Base Year	1	2	3	4	5	6	7	8	9	10	
Employment													
Retail	7,831	7,985	8,140	8,294	8,357	8,421	8,484	8,548	8,611	8,675	8,739	8,802	817
Office	9,074	9,253	9,432	9,611	9,684	9,758	9,831	9,905	9,979	10,052	10,126	10,200	947
Industrial	2,802	2,857	2,912	2,968	2,990	3,013	3,036	3,059	3,081	3,104	3,127	3,150	292
Institutional	9,615	9,804	9,993	10,183	10,261	10,339	10,417	10,495	10,573	10,651	10,729	10,807	1,003
Total Employment	29,322	29,899	30,477	31,055	31,293	31,531	31,768	32,006	32,244	32,482	32,720	32,959	3,059
Nonres. Sq. Ft. (x1,000)													
Retail	3,688	3,761	3,834	3,906	3,936	3,966	3,996	4,026	4,056	4,086	4,116	4,146	385
Office	2,786	2,841	2,896	2,950	2,973	2,996	3,018	3,041	3,063	3,086	3,109	3,131	291
Industrial	1,785	1,820	1,855	1,890	1,905	1,919	1,934	1,948	1,963	1,977	1,992	2,006	186
Institutional	3,365	3,431	3,498	3,564	3,591	3,619	3,646	3,673	3,700	3,728	3,755	3,782	351
Total Square Feet	11,624	11,853	12,082	12,311	12,406	12,500	12,594	12,688	12,783	12,877	12,972	13,066	1,213

Source: Esri Business Analyst Online, 2022 employment; Baltimore Metropolitan Council Region Traffic Analysis Zones for 2023; TischlerBise Analysis.

Unincorporated Anne Arundel County

The analysis uses these projections for fire and police development impact fees. Shown below, projections for unincorporated Anne Arundel County use the same methodology used for Anne Arundel County. Over the next 10 years, projected employment increases by 33,912 jobs and nonresidential floor area increases by approximately 15.03 million square feet.

Figure 16: Unincorporated Anne Arundel County Nonresidential Development Projections

Unincorporated Anne Arundel County,	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
		Base Year	1	2	3	4	5	6	7	8	9	10	
Employment													
Retail	77,858	79,392	80,926	82,461	83,091	83,721	84,350	84,980	85,610	86,244	86,877	87,511	8,119
Office	83,562	85,209	86,856	88,503	89,179	89,855	90,531	91,207	91,883	92,563	93,243	93,923	8,714
Industrial	85,283	86,964	88,644	90,325	91,015	91,705	92,395	93,085	93,775	94,469	95,163	95,857	8,893
Institutional	78,504	80,051	81,598	83,145	83,780	84,415	85,050	85,685	86,320	86,959	87,598	88,237	8,186
Total Employment	325,207	331,616	338,025	344,434	347,065	349,696	352,327	354,958	357,589	360,235	362,882	365,528	33,912
Nonres. Sq. Ft. (x1,000)													
Retail	36,671	37,394	38,116	38,839	39,136	39,432	39,729	40,026	40,322	40,621	40,919	41,218	3,824
Office	25,654	26,159	26,665	27,170	27,378	27,585	27,793	28,001	28,208	28,417	28,626	28,834	2,675
Industrial	54,325	55,396	56,467	57,537	57,977	58,416	58,856	59,295	59,735	60,177	60,619	61,061	5,665
Institutional	27,476	28,018	28,559	29,101	29,323	29,545	29,768	29,990	30,212	30,436	30,659	30,883	2,865
Total Square Feet	144,126	146,967	149,807	152,647	153,813	154,979	156,145	157,312	158,478	159,650	160,823	161,996	15,029

FUNCTIONAL POPULATION

Both residential and nonresidential developments increase the demand on County services and facilities. To calculate the proportionate share between residential and nonresidential demand on services and facilities, a functional population approach is used. The functional population approach allocates the cost of the facilities to residential and nonresidential development based on the activity of residents and workers in the County through the 24 hours in a day. Based on available data, the functional population calculation includes countywide totals.

Residents that do not work are assigned 20 hours per day to residential development and four hours per day to nonresidential development (annualized averages). Residents that work in Anne Arundel County are assigned 14 hours to residential development and 10 hours to nonresidential development. Residents that work outside the County are assigned 14 hours to residential development, and the remaining hours in the day are assumed to be spent outside of the County working. Inflow commuters are assigned 10 hours to nonresidential development. Based on 2020 functional population data, residential development accounts for 71 percent of the functional population, and nonresidential development accounts for the remaining 29 percent.

Figure 17: Anne Arundel County Functional Population

Demand Units in 2020				
			Demand Hours/Day	Person Hours
Residential				
Population	568,439			
Residents Not Working	300,084		20	6,001,680
Employed Residents	268,355			
Employed in Anne Arundel		110,417	14	1,545,838
Employed outside Anne Arundel		157,938	14	2,211,132
				Residential Subtotal 9,758,650
				Residential Share 71%
Nonresidential				
Non-working Residents	300,084		4	1,200,336
Jobs Located in Anne Arundel	270,513			
Residents Employed in Anne Arundel		110,417	10	1,104,170
Non-Resident Workers (inflow commuters)		160,096	10	1,600,960
				Nonresidential Subtotal 3,905,466
				Nonresidential Share 29%
				Total 13,664,116

Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates (population), U.S. Census Bureau, OnTheMap 6.1.1 Application and LEHD Origin-Destination Employment Statistics (employment).

VEHICLE TRIP GENERATION

Residential Trip Generation Rates

Development impact fees must be proportionate to the demand for infrastructure. Because averages per housing unit for vehicle trip ends have a positive correlation to the number of bedrooms, TischlerBise recommends residential fee schedules that increase by dwelling unit size. Custom tabulations of demographic data by bedroom range can be created from individual survey responses provided by the U.S. Census Bureau in files known as Public Use Microdata Samples (PUMS). PUMS files are only available for areas of at least 100,000 persons with Anne Arundel County included in Public Use Microdata Areas (PUMA) 1201 - 1204.

Cells shaded yellow are survey results for the PUMA. Rather than rely on one methodology, the recommended trip generation rates shown at the bottom of Figure 18, shaded gray, are an average of trip rates based on persons and vehicles available for all types of housing units. In Anne Arundel County, each housing unit is expected to yield an average of 8.86 Average Weekday Vehicle Trip Ends (AWVTE), compared to the national average of 8.95 trip ends.

Figure 18: Average Weekday Vehicle Trip Ends by Bedroom Range

Bedroom Range	Persons ¹	Vehicles Available ¹	Housing Units ¹	Anne Arundel Housing Mix	Unadjusted PPHU	Adjusted PPHU ²	Unadjusted VPHU	Adjusted VPHU ²
0-2	3,609	2,956	2,157	23%	1.67	1.68	1.37	1.31
3	8,618	7,162	3,650	40%	2.36	2.37	1.96	1.87
4	7,775	6,371	2,664	29%	2.92	2.93	2.39	2.28
5+	2,610	2,063	757	8%	3.45	3.46	2.73	2.60
Total	22,612	18,552	9,228	100%	2.45	2.46	2.01	1.92

National Averages According to ITE

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HU	Anne Arundel Housing Mix	Persons per Housing Unit	Vehicles per Housing Unit
210 SFD	2.65	6.36	9.43	82%	3.56	1.48
220 Apt	1.86	4.40	6.74	18%	3.62	1.53
Wtd Avg	2.51	6.01	8.95	100%	3.57	1.49

Recommended AWVTE per Housing Unit by Type

Dwelling Type	AWVTE per HU Based on Persons ³	AWVTE per HU Based on Vehicles ⁴	AWVTE per Housing Unit ⁵	Adjusted PPHU	Adjusted VPHU
Single Family	6.58	12.08	9.33	2.62	2.01
Multi-Family	4.27	9.08	6.68	1.70	1.51
Average	6.17	11.54	8.86	2.46	1.92

1. American Community Survey, Public Use Microdata Sample for Maryland PUMA's 1201-1204 (2017-2021 5-Year unweighted data).

2. Adjusted multipliers are scaled to make the average PUMS values match control totals for Maryland based on 2017-2021 American Community Survey 5-Year Estimates.

3. Adjusted persons per housing unit multiplied by national weighted average trip rate per person.

4. Adjusted vehicles available per housing unit multiplied by national weighted average trip rate per vehicle.

5. Average trip rates based on persons and vehicles per housing unit.

Nonresidential Trip Generation Rates

For nonresidential development, TischlerBise uses trip generation rates published in Trip Generation, Institute of Transportation Engineers (ITE), 11th Edition (2021). The prototype for industrial development is Light Industrial (ITE 110) which generates 4.87 average weekday vehicle trip ends per 1,000 square feet of floor area. Institutional development uses Hospital (ITE 610) and generates 10.77 average weekday vehicle trip ends per 1,000 square feet of floor area. For office development, the proxy is General Office (ITE 710), and it generates 10.84 average weekday vehicle trip ends per 1,000 square feet of floor area. The prototype for retail development is Shopping Center (ITE 820) which generates 37.01 average weekday vehicle trips per 1,000 square feet of floor area.

Figure 19: Average Weekday Vehicle Trip Ends by Land Use

ITE Code	Land Use / Size	Demand Unit	Wkdy Trip Ends Per Dmd Unit ¹	Wkdy Trip Ends Per Employee ¹	Emp Per Dmd Unit	Square Feet Per Emp
110	Light Industrial	1,000 Sq Ft	4.87	3.10	1.57	637
610	Hospital	1,000 Sq Ft	10.77	3.77	2.86	350
710	General Office (avg size)	1,000 Sq Ft	10.84	3.33	3.26	307
820	Shopping Center (avg size)	1,000 Sq Ft	37.01	17.42	2.12	471

1. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Trip Rate Adjustments

Trip generation rates require an adjustment factor to avoid double counting each trip at both the origin and the destination points. Therefore, the basic trip adjustment factor is 50 percent.

Adjustment for Pass-By Trips

For retail development, the trip adjustment factor is less than 50 percent because this type of development attracts vehicles as they pass by on arterial roads. For example, when someone stops at a convenience store on the way home from work, the convenience store is not the primary destination. For the average shopping center, ITE data indicate 24 percent of the vehicles that enter are passing by on their way to some other primary destination. The remaining 76 percent of attraction trips have the retail site as their primary destination. Because attraction trips are half of all trips, the trip adjustment factor is 76 percent multiplied by 50 percent, or approximately 38 percent of the trip ends.

Vehicle Trip Generation Rates

Multiplying average weekday vehicle trip ends and trip adjustment factors by existing development units provides average weekday vehicle trips generated by existing development. As shown in Figure 20, existing development generates 2,123,481 average weekday vehicle trips.

VEHICLE TRIP PROJECTIONS

Anne Arundel County

These projections are used to calculate transportation development impact fees. The base year vehicle trip totals and vehicle trip projections are calculated by combining the vehicle trip end factors, the trip adjustment factors, and the residential and nonresidential assumptions for housing stock and floor area. In Anne Arundel County, residential land uses account for 1,078,836 average weekday vehicle trips and nonresidential land uses account for 1,044,646 average weekday vehicle trips in the base year. Future development generates an additional 191,900 average weekday vehicle trips.

Figure 20: Anne Arundel County Vehicle Trip Projections

Development Type	Develop. Unit	ITE Code	Avg Wkday VTE	Trip Adjustment	2023 Dev Units	2023 Veh Trips
Single Family	DU	210	9.33	50%	200,173	933,807
Multi-Family	DU	220	6.68	50%	43,422	145,028
Retail	KSF	820	37.01	38%	41,155	578,791
Office	KSF	710	10.84	50%	29,000	157,179
Industrial	KSF	110	4.87	50%	57,216	139,321
Institutional	KSF	610	10.77	50%	31,449	169,354
Total						2,123,481

Anne Arundel County, Maryland	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
	Base	1	2	3	4	5	6	7	8	9	10	
Single Family Units	200,173	202,025	203,896	205,419	206,954	208,502	210,061	211,633	212,752	213,877	215,008	14,835
Multi-Family Units	43,422	44,015	44,613	45,101	45,593	46,088	46,587	47,090	47,449	47,809	48,171	4,749
Retail KSF	41,155	41,950	42,745	43,072	43,399	43,725	44,052	44,378	44,707	45,035	45,363	4,209
Office KSF	29,000	29,560	30,121	30,351	30,581	30,811	31,041	31,271	31,503	31,734	31,966	2,966
Industrial KSF	57,216	58,322	59,428	59,882	60,336	60,790	61,244	61,698	62,154	62,611	63,067	5,851
Institutional KSF	31,449	32,057	32,665	32,914	33,164	33,414	33,663	33,913	34,164	34,415	34,665	3,216
Single Family Trips	933,807	942,448	951,174	958,280	965,442	972,661	979,936	987,270	992,488	997,735	1,003,012	69,204
Multi-Family Trips	145,028	147,009	149,009	150,637	152,279	153,934	155,601	157,282	158,478	159,681	160,890	15,862
Residential Trips	1,078,836	1,089,457	1,100,182	1,108,917	1,117,721	1,126,594	1,135,538	1,144,552	1,150,966	1,157,416	1,163,902	85,066
Retail Trips	578,791	589,977	601,163	605,756	610,349	614,942	619,535	624,128	628,746	633,365	637,983	59,192
Office Trips	157,179	160,217	163,255	164,502	165,749	166,997	168,244	169,491	170,746	172,000	173,254	16,074
Industrial Trips	139,321	142,014	144,706	145,812	146,917	148,023	149,128	150,234	151,346	152,457	153,569	14,248
Institutional Trips	169,354	172,627	175,900	177,244	178,588	179,932	181,276	182,620	183,971	185,322	186,673	17,319
Nonresidential Trips	1,044,646	1,064,835	1,085,024	1,093,314	1,101,604	1,109,894	1,118,183	1,126,473	1,134,809	1,143,144	1,151,479	106,834
Total Vehicle Trips	2,123,481	2,154,292	2,185,206	2,202,231	2,219,325	2,236,488	2,253,721	2,271,025	2,285,774	2,300,560	2,315,381	191,900

Unincorporated Anne Arundel County

These projections are used to calculate fire and police development impact fees. The base year vehicle trip totals and vehicle trip projections are calculated by combining the vehicle trip end factors, the trip adjustment factors, and the residential and nonresidential assumptions for housing stock and floor area. In unincorporated Anne Arundel County, residential land uses account for 1,000,198 average weekday vehicle trips and nonresidential land uses account for 953,445 average weekday vehicle trips in the base year. Future development generates an additional 97,502 average weekday vehicle trips.

Figure 21: Unincorporated Anne Arundel County Vehicle Trip Projections

Unincorporated Anne Arundel County, Maryland	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10-Year Increase
	Base	1	2	3	4	5	6	7	8	9	10	
Single Family Units	188,073	189,850	191,645	193,110	194,585	196,073	197,573	199,085	200,174	201,270	202,372	14,299
Multi-Family Units	36,778	37,347	37,921	38,390	38,862	39,339	39,819	40,303	40,652	41,002	41,355	4,578
Retail KSF	37,394	38,116	38,839	39,136	39,432	39,729	40,026	40,322	40,621	40,919	41,218	3,824
Office KSF	26,159	26,665	27,170	27,378	27,585	27,793	28,001	28,208	28,417	28,626	28,834	2,675
Industrial KSF	55,396	56,467	57,537	57,977	58,416	58,856	59,295	59,735	60,177	60,619	61,061	5,665
Institutional KSF	28,018	28,559	29,101	29,323	29,545	29,768	29,990	30,212	30,436	30,659	30,883	2,865
Single Family Trips	877,360	885,652	894,026	900,856	907,741	914,682	921,678	928,730	933,813	938,924	944,065	66,705
Multi-Family Trips	122,837	124,738	126,657	128,223	129,801	131,391	132,995	134,611	135,776	136,948	138,126	15,289
Residential Trips	1,000,198	1,010,390	1,020,683	1,029,079	1,037,542	1,046,073	1,054,673	1,063,342	1,069,589	1,075,872	1,082,191	81,993
Retail Trips	525,897	536,061	546,224	550,397	554,569	558,741	562,914	567,086	571,283	575,480	579,677	53,780
Office Trips	141,783	144,523	147,263	148,388	149,513	150,638	151,763	152,888	154,019	155,151	156,282	14,499
Industrial Trips	134,889	137,496	140,103	141,173	142,244	143,314	144,384	145,455	146,531	147,607	148,684	13,795
Institutional Trips	150,876	153,792	156,708	157,905	159,102	160,299	161,496	162,692	163,897	165,101	166,305	15,429
Nonresidential Trips	953,445	971,872	990,299	997,863	1,005,427	1,012,992	1,020,556	1,028,121	1,035,730	1,043,338	1,050,947	97,502
Total Vehicle Trips	1,953,642	1,982,261	2,010,982	2,026,942	2,042,969	2,059,065	2,075,229	2,091,462	2,105,319	2,119,211	2,133,138	179,496

DEMAND INDICATORS BY DWELLING SIZE

Development impact fees must be proportionate to the demand for infrastructure. Because averages per housing unit, for both persons and vehicle trip ends, have a strong, positive correlation to the number of bedrooms, TischlerBise recommends residential fee schedules that increase by dwelling unit size. Custom tabulations of demographic data by bedroom range can be created from individual survey responses provided by the U.S. Census Bureau in files known as Public Use Microdata Samples (PUMS). PUMS files are only available for areas of at least 100,000 persons with Anne Arundel included in Public Use Microdata Areas (PUMA) 1201-1204.

Cells shaded yellow in the figure below are survey results for the PUMA. For occupancy, the unadjusted persons per housing unit average of 2.45 is adjusted upward to match the control total of 2.46 for Anne Arundel County (see Figure 3). For vehicle trip ends, the recommended trip generation rates shown at the bottom of Figure 22, shaded gray, are an average of trip rates based on persons and vehicles available for all types of housing units. In Anne Arundel County, each housing unit is expected to yield an average of 8.86 average weekday vehicle trip ends (AWVTE), compared to the national average of 8.95 trip ends.

Figure 22: Persons and Vehicle Trip Ends by Bedroom Range

Bedroom Range	Persons ¹	Vehicles Available ¹	Housing Units ¹	Anne Arundel Housing Mix	Unadjusted PPHU	Adjusted PPHU ²	Unadjusted VPHU	Adjusted VPHU ²
0-2	3,609	2,956	2,157	23%	1.67	1.68	1.37	1.31
3	8,618	7,162	3,650	40%	2.36	2.37	1.96	1.87
4	7,775	6,371	2,664	29%	2.92	2.93	2.39	2.28
5+	2,610	2,063	757	8%	3.45	3.46	2.73	2.60
Total	22,612	18,552	9,228	100%	2.45	2.46	2.01	1.92

National Averages According to ITE

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HU	Anne Arundel Housing Mix	Persons per Housing Unit	Vehicles per Housing Unit
210 SFD	2.65	6.36	9.43	82%	3.56	1.48
220 Apt	1.86	4.40	6.74	18%	3.62	1.53
Wtd Avg	2.51	6.01	8.95	100%	3.57	1.49

Recommended AWVTE per Housing Unit by Bedroom

Bedroom Range	AWVTE per HU Based on Persons ³	AWVTE per HU Based on Vehicles ⁴	AWVTE per Housing Unit ⁵
0-2	4.22	7.87	6.05
3	5.95	11.24	8.60
4	7.35	13.70	10.53
5+	8.68	15.63	12.16
Average	6.17	11.54	8.86

1. American Community Survey, Public Use Microdata Sample for Maryland PUMA's 1201-1204 (2017-2021 5-Year unweighted data).
2. Adjusted multipliers are scaled to make the average PUMS values match control totals for Anne Arundel County based on 2017-2021 American Community Survey 5-Year Estimates.
3. Adjusted persons per housing unit multiplied by national weighted average trip rate per person.
4. Adjusted vehicles available per housing unit multiplied by national weighted average trip rate per vehicle.
5. Average trip rates based on persons and vehicles per housing unit.

Recommended AWVTE per Housing Unit by Type

Dwelling Type	AWVTE per HU Based on Persons ³	AWVTE per HU Based on Vehicles ⁴	AWVTE per Housing Unit ⁵
Single Family	6.58	12.08	9.33
Multi-Family	4.27	9.08	6.68
Average	6.17	11.54	8.86

Adjusted PPHU	Adjusted VPHU
2.62	2.01
1.70	1.51
2.46	1.92

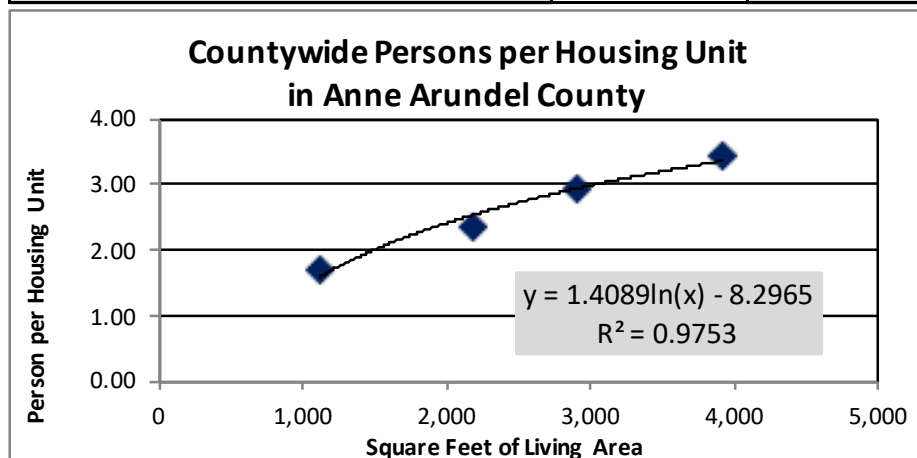
Persons by Dwelling Size

Average floor area and number of persons by bedroom range are plotted in Figure 23 with a logarithmic trend line derived from 2021 square footage estimates provided by the U.S. Census Bureau (South Atlantic division). Dwellings with two bedrooms or less average 1,123 square feet of floor area—based on multi-family dwellings constructed in South Atlantic census region. Three-bedroom dwellings average 2,180 square feet, four-bedroom dwellings average 2,916 square feet, and dwellings with five or more bedrooms average 3,924 square feet—based on single-family dwellings constructed in South Atlantic census division. Using the trend line formula shown in the figure below, TischlerBise derived the estimated average number of persons, by dwelling size, to match Anne Arundel County’s existing size thresholds.

As shown in the upper-right corner of the figure below, the smallest floor area range (under 500 square feet) has an estimated average of 0.46 persons per dwelling unit. The largest floor area range (6,000 square feet or more) has an estimated average of 4.07 persons per dwelling unit.

Figure 23: Persons by Dwelling Size

Actual Averages per Housing Unit			Fitted-Curve Values	
Bedrooms	Square Feet	Persons	Sq Ft Range	Persons
0-2	1,123	1.68	Under 500	0.46
3	2,180	2.37	500 to 999	1.43
4	2,916	2.93	1,000 to 1,499	2.01
5+	3,924	3.46	1,500 to 1,999	2.41
Average persons per housing unit derived from 2017-2021 ACS PUMS data for the area that includes Anne Arundel County. Unit size for 0-2 bedroom is from the 2021 U.S. Census Bureau average for all multi-family units constructed in the Census South region. Unit size for all other bedrooms is from the 2021 U.S. Census Bureau average for single-family units constructed in the Census South Atlantic division.			2,000 to 2,499	2.73
			2,500 to 2,999	2.98
			3,000 to 3,499	3.20
			3,500 to 3,999	3.39
			4,000 to 4,499	3.55
			4,500 to 4,999	3.70
			5,000 to 5,499	3.84
			5,500 to 5,999	3.96
			6,000 or More	4.07



Vehicle Trip Ends by Dwelling Size

To derive AWWTE by dwelling size, TischlerBise matches trip generation rates and average floor area by bedroom range, as shown in Figure 24, with a logarithmic trend line derived from 2021 square footage estimates published by the U.S. Census Bureau (South Atlantic region). Dwellings with two bedrooms or less average 1,123 square feet of floor area—based on multi-family dwellings constructed in South Atlantic census region. Three-bedroom dwellings average 2,180 square feet, four-bedroom dwellings average 2,916 square feet, and dwellings with five or more bedrooms average 3,924 square feet—based on single-family dwellings constructed in South Atlantic census division. Using the trend line formula shown in the figure below, TischlerBise derives the estimated average weekday vehicle trip ends, by dwelling size, to match Anne Arundel County’s existing development impact fee size thresholds.

As shown in the upper-right corner of the table below, the smallest floor area range (under 500 square feet) generates an estimated average of 1.88 vehicle trip ends per dwelling. The largest floor area range (6,000 square feet or more) generates an estimated average of 14.40 vehicle trip ends per dwelling.

Figure 24: Vehicle Trip Ends by Dwelling Size

Actual Averages per Housing Unit			Fitted-Curve Values	
Bedrooms	Square Feet	Trip Ends	Sq Ft Range	Trip Ends
0-2	1,123	6.05	Under 500	1.88
3	2,180	8.60	500 to 999	5.27
4	2,916	10.53	1,000 to 1,499	7.25
5+	3,924	12.16	1,500 to 1,999	8.65
Average weekday trip ends per housing unit derived from 2017-2021 ACS 5-Year data. Unit size for 0-2 bedroom is from the 2021 U.S. Census Bureau average for all multi-family units constructed in the Census South region. Unit size for all other bedrooms is from the 2021 U.S. Census Bureau average for single-family units constructed in the Census South Atlantic division.			2,000 to 2,499	9.74
			2,500 to 2,999	10.63
			3,000 to 3,499	11.38
			3,500 to 3,999	12.03
			4,000 to 4,499	12.61
			4,500 to 4,999	13.12
			5,000 to 5,499	13.59
			5,500 to 5,999	14.01
			6,000 or More	14.40

