

TECHNICAL REPORT ON THE METHODOLOGY USED IN UPDATING ROAD, PUBLIC SAFETY AND EDUCATIONAL IMPACT FEES AND IN ESTABLISHING STORMWATER IMPACT FEES

Prepared for Anne Arundel County

By
James C. Nicholas, PhD
April 7, 2008

I. INTRODUCTION

Anne Arundel County has been and is expected to continue experiencing growth. This growth has brought economic prosperity to the citizens of Anne Arundel County while providing thousands of new individuals the opportunity of living and working within the county. This growth also has had its complications and problems. The State of Maryland and local governments within Maryland are not fiscally structured to be able to cope with the degree of growth that has occurred. For a number of years rapid growth exceeded the County's ability to provide necessary capital facilities. This led Anne Arundel County to enact impact fees for roads and schools in 1987. The objective of this policy was not to stop or even to slow growth. Rather, the objective was to provide the new developments within Anne Arundel County with adequate public facilities.

If Anne Arundel County is to remain a desirable place to work and live, the needs of growth must be addressed. This means that new roads, schools, public safety facilities, and stormwater facilities must be planned, designed, and built. But, the prerequisite of providing such facilities is the ability to pay the cost of those improvements. Many communities, of which Anne Arundel is one, do not have access to inflation and growth responsive revenue sources. The result of this situation is that either public facilities must lag behind needs or there must be an ever-increasing tax burden upon all taxpayers. Impact fees are a means that can address the needs of growth while not placing an ever-increasing burden upon taxpayers and thus are an alternative to tax increases.

Impact fees are charges required to be paid on behalf of new developments. The purpose of these charges is to shift a *pro rata* share of public capital improvement costs to the developments that create the need for those improvements. Impact fees arose from the on-going re-structuring of fiscal affairs at the federal, state, and local levels. The inflation of the 1960's through the 1980's greatly increased the cost of providing public infrastructure while increasing the means to finance those improvements by much less than the cost. So much of public infrastructure is financed by "fixed base" taxes, such as the motor fuel tax. Inflation increases the cost of providing roads but it does not increase the means to fund those costs because motor fuel taxes are set on a cent-per-gallon basis. With costs rising and revenues static, the options have been, first, to make fewer public investments, second, to increase taxes or, third, to find alternative sources of funding. The impact fee falls into the latter category.

Most growing parts of the country have had to deal with providing the community with adequate roads, schools, parks, police & fire protection, and other community services. A failure to provide these improvements would lead to congestion and a loss in the "quality of life." In the past, the state or federal governments paid for many of these

improvements. However, those governments have reduced their commitments to fund capital improvements. A significant component of this reduction was the public demand to lessen taxation. The reduction in state and federal funding did not lessen the need for public capital improvements. It did create substantial funding problems of local governments. Many local governments turned to the developments that created the need for capital improvements to fund a portion of those improvement costs by enacting impact fees. This is simply one means of privatizing what previously had been public costs.

Standards have evolved for equitable impact fees. In some instances these standards are within state enabling acts. In most instances the standards for impact fees are found within case law. The general principles for impact fees are:

- There must be a nexus between the particular development to be charged a fee and the need for the expansion of public facilities, and
- That the amount charged to the development must be proportional to the impact of that development.

This nexus requirement is recognized in both state and federal courts.

This technical memorandum will set out the bases for the proposed impact fees and how those fees were established. This memorandum also will show the nexus between new development and the need to expand capital facilities in addition to showing that the proposed fees are proportional to the impacts of new developments. The impact fees developed for Anne Arundel County include roads, public schools, and public safety. Road and school impact fees were adopted in 1987 and updated in 2000. Public safety fees were adopted in 2000. Those fees have remained at their 2000 level. At this time it is appropriate to update the County's road, school, and public safety fees to be in accord with 2007 conditions.

A. COUNTY DEMOGRAPHIC PARAMETERS.

In order to develop equitable impact fees it is first necessary to establish service standards. A standard practice, and the one utilized herein, is to observe the existing provision and to use the resulting current standard of service as the basis for impact fees. The first step in this process is to identify the existing population being served. Anne Arundel County estimates the April 2007 permanent resident population to be 512,574. However, Anne Arundel County must serve a population that is much greater than simply the permanent residents. Therefore, the relevant figure is the peak population. Table 1 sets out the estimated peak population for Anne Arundel County. The peak population is higher than the resident population and amounts to an estimated 524,375 as of April 2007. The 2007 estimated shown here are linear extrapolations of the 2000 to 2006 trends. Note should be taken of the fact that the U.S.

**TABLE 1
ESTIMATE OF PEAK POPULATION
ANNE ARUNDEL COUNTY
2000 TO 2007**

	2000	2006	2007
PERMANENT RESIDENTS (April 1)	489,656	509,300	512,574
YEAR ROUND RESIDENTIAL UNITS:			
Occupied	178,670	188,944	190,656
Vacant	8,267	12,658	13,390
SEASONALLY OCCUPIED UNITS	1,913	2,071	2,097
TOTAL HOUSING UNITS	186,937	203,673	206,144
ESTIMATED SEASONAL POPULATION	5,244	5,583	5,638
TRANSIENT UNITS	5,520	6,073	6,163
ESTIMATED TRANSIENT POPULATION	5,520	6,073	6,163
ESTIMATED NON-PERMANENT RESIDENTS	10,764	11,656	11,801
ESTIMATED PEAK POPULATION	500,420	520,956	524,375
RATIO OF PEAK TO PERMANENT	1.022	1.023	1.023
PERSONS PER UNIT - RESIDENT	2.741	2.696	2.688
PERSONS PER UNIT – PEAK *	2.689	2.643	2.636

SOURCES: U.S. Bureau of the Census, American Factfinder, and American Community Survey, 2006, and Office of Planning and Zoning, Anne Arundel County, July 2007.

*Including transient units

Bureau of the Census reports a 2006 population of 509,300 for Anne Arundel County while the American Community Survey reports 488,480 for the same year. The primary difference between these two data are the number of people not organized into households and do not reside in traditional residences.

**Table 2
DWELLING UNIT OCCUPANCIES
ANNE ARUNDEL COUNTY 2006**

	No. Bed-rooms	Dwelling Units			Population	Public School		Persons per Unit	Students per Unit
		Total	Vacant	Occupied		K	1 - 12		
One-Family Detached									
	1 or less	2,021	473	1,548	2,289	0	0	1.13	0.000
	2	12,967	396	12,571	23,758	302	2,018	1.83	0.179
	3	55,092	2,846	52,246	132,024	740	16,246	2.40	0.308
	4	45,518	432	45,086	137,495	682	19,894	3.02	0.452
	5 or More	13,290	743	12,547	47,071	721	8,619	3.54	0.703
	All SF-D	128,888	4,890	123,998	342,637	2,445	46,777	2.66	0.382
One-Family Attached									
	1 or less	554	0	554	547	0	0	0.99	0.000
	2	8,353	385	7,968	16,625	0	2,236	1.99	0.268
	3	21,969	1,680	20,289	52,043	860	10,117	2.37	0.500
	4 or More	3,866	71	3,795	13,322	0	2,426	3.45	0.628
	All SF-A	34,742	2,136	32,606	82,537	860	14,779	2.38	0.450
Multi-Family									
	1 or less	10,786	1,048	9,738	11,683	405	665	1.08	0.099
	2	18,795	3,423	15,372	31,498	800	3,298	1.68	0.218
	3	4,021	791	3,230	10,495	427	1,577	2.61	0.498
	4 or More	243	0	243	1,127	0	238	4.64	0.979
	ALL MF	33,845	5,262	28,583	54,803	1,632	5,778	1.62	0.219
Mobile Home									
	1 or less	246	0	246	250	0	0	1.02	0.000
	2	1,676	0	1,676	3,150	0	206	1.88	0.123
	3 or More	2,205	370	1,835	5,103	0	850	2.31	0.385
	All MH	4,127	370	3,757	8,503	0	1,056	2.06	0.256
ALL UNITS		201,602	12,658	188,944	488,480	4,937	68,390	2.42	0.364

SOURCE: Bureau of the Census, American Community Survey, 2006.

The data in Table 1 show total population and population per residential unit. Impact fees are derived primarily from per capita costs and these per capita costs are then allocated to new development on the basis of the occupancy of those units of new development. The residential unit occupancies within Anne Arundel County are shown in Table 2 by type of dwelling and by number of bedrooms within the dwelling.

B. CURRENT INFRASTRUCTURE FINANCE

Anne Arundel County has been using a variety of means to finance capital improvements for the facilities discussed herein. The County has authorized bonds, received grants, appropriated general funds, and charged impact fees. Additionally, the County has required developers to donate land and improvements. Given this history, it should be expected that Anne Arundel County may well continue these efforts in the future.

**TABLE 3
OUTSTANDING INDEBTEDNESS
ANNE ARUNDEL COUNTY
2007**

ISSUE/PURPOSE:	AMOUNT (\$000,000)
GENERAL OBLIGATION - ROADS & BRIDGES	
Amount	\$101.45 Million
Annual Debt Service	\$7.80 Million
Interest Rate	4.50%
GENERAL OBLIGATION - SCHOOLS	
Amount	\$219.57 Million
Annual Debt Service	\$16.88 Million
Interest Rate	4.50%
GENERAL OBLIGATION - STORMWATER	
Amount	\$32.39 Million
Annual Debt Service	\$2.49 Million
Interest Rate	4.50%
GENERAL OBLIGATION - PUBLIC SAFETY	
Amount	\$47.81 Million
Annual Debt Service	\$3.67 Million
Interest Rate	4.50%
TOTAL DEBT	\$401.22 Million
GENERALIZED INTEREST RATE	4.50%
GENERALIZED TERM	20

SOURCE: Anne Arundel County, Office of the County Auditor, March 2008.

NOTE: Anne Arundel County has more debt outstanding that shown. Only bonds relevant to roads and bridges, schools, stormwater, and public safety are included.

The outstanding indebtedness of Anne Arundel County (insofar as these facilities and services are concerned) is shown in Table 3. These bond issues are relevant because they are a partial means by which the existing system of infrastructure was financed. The unimproved land, which is the new development of the future, has been required to pay debt service on the general obligation bonds. Typically, unimproved land requires less of these facilities that were financed, in part, with proceeds from such land. After development, the newly developed properties will be on the tax rolls at signifi-

cantly higher taxable values, and thus paying higher ad valorem taxes toward debt service. Additionally, newly occupied properties will begin making payments towards the outstanding indebtedness financed with non-ad valorem revenues. These past and future payments should be given fair consideration if the result is to be a proportionate distribution of costs. For the purposes of these calculations, past property tax payments toward the ad valorem debt shown in Table 3 is accepted to be 3.7% of total real property tax payments. Additionally, future payments toward debt also will be used as offsets against net costs for future payments.

In addition to debt service on general obligation bonds, unimproved land has paid taxes into the general fund. These property taxes have been used, in part, to finance the existing system of infrastructure. It follows that fair consideration should be given to payments by unimproved land toward existing infrastructure in the form of general taxation. Table 4b shows the sources of revenues for Anne Arundel County's general fund. The only payments from unimproved land to the general fund are property taxes. All other sources of income come directly or indirectly from developed property.

Table 4a shows the Anne Arundel County taxable values by type. This table shows that the net taxable value per capita is \$97,717. Table 4b shows Anne Arundel

**TABLE 4a
TAXABLE VALUE BY TYPE OF PROPERTY
ANNE ARUNDEL COUNTY FY2006**

PROPERTY TYPE	AMOUNT (000,000)
Assessed Value Real Property	\$68,395.8
Assessed Value Vacant Property	\$1,881.5
Total Assessed Value Net of Credits	\$51,240.2
Taxable Per Capita *	\$97,717
Vacant Property as % of Total Assessed Value Net of Credits	3.67%

SOURCE: Office of Budget, Office of the County Auditor, March 2008.

* Peak population.

County general fund receipts by source. Property taxes constitute 34.7% of general fund receipts. Table 4a shows that unimproved properties pay 3.76% of all real property taxes, and if property taxes constitute 34.7% of general fund receipts, it follows that unimproved property pays for 1.28% of all general fund associated costs. This amount, 1.28%, will be incorporated as a past payment credit in recognition of the past payments by unimproved land towards Anne Arundel County's infrastructure costs. This credit is applied only to schools and public safety. The reason that roads are treated differently is the substantial funding of roads with motor fuel taxes, which are not paid by unimproved land.

Additionally, new development will pay infrastructure costs in the future as outstanding

debt is retired. The infrastructure costs attributed to new development will be partially offset by these future payments. Offsets for outstanding debt and other similar payments are incorporated into in the calculation of the individual fees. Additionally, developers may be required to dedicate land or improvements. When such dedications are required, those developers should receive credit against the relevant impact fee based upon the reasonable value of those dedications when such dedications are beyond the needs of the subdivision. Because any dedication is a matter of individual situations, the impact fee schedules themselves are not adjusted for possible dedications. Rather, the implementing impact fee ordinances provide that developer dedications are a means of actual payment of the individual fees and appropriate credits for any dedications. Thus dedications are incorporated into impact fees on a case-by-case basis. These various credits should assure fair consideration of payments and contributions of new development toward the cost of infrastructure with the result being impact fees that reflect proportionate shares.

**TABLE 4b
GENERAL FUND RECEIPTS
ANNE ARUNDEL COUNTY FY 2007**

REVENUE SOURCE	AMOUNT(000)	PER CENT
Real Property Taxes	\$400,402,935	34.7%
Personal Property Taxes	\$57,422,427	5.0%
Local Income Tax	\$361,956,043	31.4%
State Shared Revenues	\$37,125,849	3.2%
Grants and Aid - State/Federal	\$45,683,647	4.0%
Recordation and Transfer Tax	\$109,257,440	9.5%
Local Sales Taxes	\$34,604,174	3.0%
Licenses and Permits	\$17,681,827	1.5%
Investment Income	\$10,109,420	0.9%
Other Reimbursements	\$40,807,633	3.5%
Interfund Reimbursements	\$37,853,669	3.3%
Total County Revenue	\$1,152,905,064	100.0%

SOURCE: Anne Arundel County, Office of the County Auditor, March 2008.

II. ROADS

Anne Arundel County first established road impact fees in 1987. The original fees were revised in 2000. Updated costs and revenues have been obtained and integrated into the formulae for impact fees and the respective schedules are revised accordingly. Anne Arundel County has experienced increases in road improvement costs. The increased motor fuel taxes tend to reduce impact fees while increased costs tend to increase impact fees. Additionally, the County continues to issue bonds, the proceeds from which are used to build roads. There are several additional changes from the 1987 methodology. First, the fleet miles per gallon was updated and the discount rate was adjusted to be in accord with current market conditions. The most significant changes are the new road costs shown in Table 7 and the addition of interest. The formula for calculating the road impact fees is:

$$\text{ATTRIBUTABLE TRAVEL} = \{[\text{TRIP RATE} \times (\text{TRIP LENGTH} \times .75)] / 2\} \times \text{\% NEW TRIPS}$$

$$\text{NEW LANE MILES OF ROADS} = (\text{ATTRIBUTABLE TRAVEL} / \text{LANE CAPACITY})$$

$$\text{NEW LANE FEET OF ROADS} = \text{NEW LANE MILES OF ROADS} \times 5,280$$

$$\text{TOTAL COST} = (\text{NEW LANE MILES} \times \text{CONSTRUCTION COST PER LANE MILE RIGHT OF WAY COST}) + (\text{NEW LANE MILES} \times \text{RIGHT OF WAY COST}) + \text{INTEREST}$$

$$\text{OFFSET} = [(\text{ATTRIBUTABLE TRAVEL} \times 365 / \text{MILES PER GALLON})] \times \text{CAPITAL MOTOR FUEL TAX RATE EQUIVALENT} \times \text{PRESENT VALUE FACTOR}$$

$$\text{NET COST} = \text{TOTAL COST} - \text{OFFSET}$$

**Table 5
ROAD PARAMETERS
ANNE ARUNDEL COUNTY**

AVAILABLE REVENUES:			
ENTITY/TAX	RATE	PER CENT CAPITAL	CAPITAL RATE
Federal	\$0.154	47.60%	\$0.074
State of Maryland	\$0.235	42.28%	\$0.099
State Generated Transportation Funds (\$000,000)			\$2,091.00
State Motor Fuel Tax Funds to Maryland (\$000,000)			\$765.00
Motor Fuel Taxes as a % of Total State Sources			36.59%
Maryland Motor Fuel Tax Equivalent (Per Gallon)			\$0.642
State Funded Capital Improvements (\$000,000)			\$884.00
Capital Improvements as % of Total State Funding			42.28%
Maryland Capital Motor Fuel Tax Equivalent (Per Gallon)			\$0.272
Annual Anne Arundel Road Debt Service (\$000,000)			\$7.80
Motor Fuel Tax Equivalent of Annual Debt Service			\$0.026
State Motor Fuel Tax Allocation to Anne Arundel County			\$30,179,680
Allocated to Capital Outlay			42.28%
Motor Fuel Equivalent of State Motor Fuel Allocations			\$0.043
Federal Capital Motor Fuel Tax Equivalent			\$0.074
Motor Fuel Capital Tax Equivalents:			
Federal			\$0.074
State of Maryland			\$0.272
Anne Arundel County			\$0.070
Total Capital Motor Fuel Tax Equivalent - All Levels			\$0.415
OTHER PARAMETERS:			
TRIP LENGTHS (Miles):	TOTAL	ON ARTERIAL & COLLECTOR ROADS	
All Trips	9.87	7.40	
To/From Work	12.08	9.06	
Work Related Business	20.19	15.14	
Shopping	6.74	5.06	
Personal Business	7.45	5.59	
School/Church	7.24	5.43	
Social & Recreational	11.91	8.93	
Travel on Local Roads		0.25	
Miles Per Gallon		16.90	
Interest Rate		4.50%	
Discount Period		20	
Present Value Factor		13.01	
Lane Capacity (Vehicles Per Day)		7,250	

SOURCES: (1) Patricia Hun and Jennifer Young, "Summary of Travel Trends: 2001 Nationwide Personal Transportation Survey," prepared for the US Dept. of Transportation, December 2004, p.12 & 13.

(2). Federal Highway Administration, "Status of Nation's Highways, Bridges and Transit: 2006 Conditions

and Performance," <http://www.fhwa.dot.gov/policy/2006cpr/es06h.htm>, July 22, 2007.

(3) Maryland Department of Transportation, "Summary of Revenues, Expenditures & Fund Balance," 2007.

(4) Statistical Abstract of the US, 1998, p. 628, 644 & 645.

NOTES: (1) The Federal tax of \$.184 is reduced to \$.1544 because \$0286 is transferred to mass transit and \$.001 is used to fund underground storage tank clean-up.

(2) The total trip length is reduced by 25% to calculate travel on the arterial and collector road system. The other travel will be on local roads and local roads are the financial responsibility of the developer.

(3) All revenues are per year during FY 2007.

The road system of Anne Arundel County has been financed by four primary sources: motor fuel taxes, other motor vehicle charges and fees, bond proceeds, and County general funds. These revenues are collected by the federal government, the State of Maryland and Anne Arundel County. The federal government collects motor fuel taxes and allocates those taxes to the states. The states, including Maryland, use federal appropriations, together with the State's transportation revenues, to fund the major transportation system of the state. A portion of state transportation funds is directly allocated to counties. The remainder is spent directly by the state in counties. As new developments are occupied the resulting traffic will consume motor fuels and thus pay motor fuel taxes, the vehicles will be assessed the other types of vehicle fees and the properties themselves will be placed on the tax rolls and begin paying property taxes. Any road impact fee should be offset to reasonably reflect new development's participation in these funding programs. Table 6 contains the state and Anne Arundel County transportation funding data used to calculate the resulting offset.

While motor fuel taxes are the largest single source of road funding, there are several other sources. This would include titling taxes, registration fees and a corporate income tax. In order to equitably allocate offsets for these various revenue sources, a motor fuel tax equivalent is calculated. A motor fuel tax equivalent is that motor fuel tax that would be required to generate all of the transportation revenues. For example, if a state had a motor fuel tax of 20 cents per gallon and total transportation receipts of \$100 million, 50% of which were derived from motor fuel taxes, the motor fuel tax equivalent would be 40 cents per gallon. This means that it would take a motor fuel tax of 40 cents per gallon to generate \$100 million in state transportation revenues.

The State of Maryland received \$2,091 million in state generated transportation funds.

The state's 23.5 cent per gallon motor fuels tax generated \$765 million, 36.6% of total receipts. Thus Maryland would have an effective motor fuel tax equivalent of 64.2 cents per gallon. The state allocates 42.28% of its resources to capital improvements.

Thus, Maryland has a Capital Motor Fuel Tax Equivalent of 27.2 cents per gallon. It is presumed that 9% of state and federal transportation capital outlays will be within Anne Arundel County. This is based upon Anne Arundel County having 9% of total state population. This would be a tendency and would not be expected to occur in any given year.

Table 6
MARYLAND TRANSPORTATION FUNDING PARAMETERS
FY 2007

	STATE OF MARYLAND	ANNE ARUNDEL COUNTY
All Sources of Revenue	\$2,233,000,000	\$201,903,528
Total Less Deductions	\$1,615,000,000	\$146,025,167
Total Less Non-Trans. Misc. Revenue	\$476,000,000	\$43,038,997
State Sources	\$2,091,000,000	\$189,064,164
State Motor Fuel Tax Receipts	\$765,000,000	\$69,169,816
Motor Fuel Taxes as % of State Total	36.6%	36.6%
State Motor Fuel Tax Rate	\$0.235	\$0.235
Effective State MF Tax Rate	\$0.642	\$0.642
Revenue Per One Cent of Motor Fuel Tax	\$32,553,191	\$2,943,396
Total Capital Improvement Funds	\$1,744,000,000	\$157,689,097
Federal Allocations	\$860,000,000	\$77,759,532
State Sources	\$884,000,000	\$79,929,565
State Capital as % of Total State	42.28%	42.28%
State Capital MF Tax Rate	\$0.272	\$0.272
Maryland Population -- 2007	5,668,934	
Anne Arundel County Population		512,574
Anne Arundel as % of State	100%	9.0%

SOURCES: Maryland Department of Transportation, "Summary of Revenues, Expenditures, and Fund Balance," FY 2007. Table 1. Bureau of the Census, American Community Survey, 2006.

There are two motor fuel taxes, state and federal. These receipts are divided between road capital improvements and operations and maintenance. Both of these receipts are split almost evenly between maintenance and capital outlay. The Maryland Transportation Trust Fund receives 36.6% of its state generated revenues from the 23.5 cents per gallon motor fuel tax. The federal government allocates its 15.4 cents per gallon (net after transfers) between operations and capital. With 47.6% of the federal motor fuel tax receipts going to capital, the federal capital motor fuel tax equivalent is 7.4 cents per gallon. The State of Maryland allocates a portion of its motor fuel tax collections to local governments. It is estimated that Anne Arundel County will receive \$31.2 million in 2007 and, applying the state percentage of 42.28% devoted to expansion, \$12.8 million is allocated to capital outlay. This results in an Anne Arundel County motor fuel tax equivalent of 4.3 cents per gallon. Additionally, Anne Arundel County has issued debt to pay for a portion of the cost of road improvements. The annual debt service on this debt amounts to \$7.8 million. If this \$7.8 was to be raised by an Anne Arundel County motor fuel tax, that tax would amount to 2.6 cents per gallon. Therefore, Anne Arundel County has a capital motor fuel tax equivalent of 7.0 cents per gallon, 4.33 cents from state allocations and 2.65 cents for road debt service

(rounded to 7 cents). The total capital motor fuel tax equivalent is the federal (7.4 cents), plus the state (27.2 cents) plus the county (7.0 cents) and amounts to 41.5 cents per gallon.

The Capital Motor Fuel Tax Equivalent is used to calculate an offset to road impact fees. This offset is calculated by dividing annual travel for each land use unit by the average fuel efficiency (miles per gallon) to estimate fuel consumption by unit of land use. The resulting annual gallons of fuel consumed are multiplied by the Capital Motor Fuel Tax Equivalent to arrive at the annual payment towards road capital costs as shown in Table 10. This payment includes actual motor fuel taxes, vehicles titling fees, property taxes and several minor sources. However, these payments are expressed as if they were derived totally from a motor fuels tax. The present value of the annual payments is calculated at a discount rate for 20 years and this present value is the offset shown in Table 10.

The road construction cost shown in Table 7 is the average per lane-mile costs of Anne Arundel road projects. The projects included are:

**Table 7
PER LANE MILE ROAD COSTS
ANNE ARUNDEL COUNTY**

Project	Length	Lanes	Lane Miles	Total Cost	Cost per Lane Mile
Severn Road Curve	0.30	3.00	0.90	\$1,502,065	\$1,668,961
Ft. Smallwood Rd.	0.48	5.00	2.40	\$4,197,515	\$1,748,965
East-West Blvd. Phase III	0.55	4.00	2.20	\$4,038,838	\$1,835,835
Arundel on the Bay Rd	0.19	2.00	0.38	\$1,202,195	\$3,163,672
Adm. Cochrane Rd. Extended	0.67	4.00	2.68	\$8,556,190	\$3,192,608
Riva Road South of South River	0.51	3.00	1.53	\$8,234,322	\$5,381,910
Jumpers Hole Road	0.45	2.00	0.91	\$5,567,258	\$6,123,983
Medical Blvd	0.13	4.00	0.52	\$6,885,786	\$13,172,808
Totals	3.29		11.52	\$40,184,169	\$3,487,659
Total Excluding Medical Blvd	3.15		11.00	\$33,298,383	\$3,027,376

SOURCE: Anne Arundel County, Auditor's Office, March 2008

The resulting average is \$3,487,659 per lane-mile. The per lane-mile cost used to calculate impact costs and fees is \$3,027,376, which excludes the highest cost improvement -- Medical Blvd. The exclusion of the highest cost item is a continuation of a policy established by Anne Arundel County in 2000.

The anticipated means of funding Anne Arundel County's road improvements are shown in Table 8. It is anticipated that 67.88% of all road and bridge capital revenues

**TABLE 8
SOURCES OF ROADS AND BRIDGES CAPITAL FUNDS
ANNE ARUNDEL COUNTY**

SOURCE	FY2008	FY2009	FY2010	FY2011	FY2012	5 YEARS	%
STATE OF MARYLAND	0	0	0	0	0	0	0.00%
LOCAL :							
County Funds	-550,000	0	0	0	0	-550,000	-2.62%
Impact Fees	1,172,000	600,000	0	0	0	1,772,000	8.43%
Developer Contribution	0	0	0	0	0	0	0.00%
Total Local	622,000	600,000	0	0	0	1,222,000	5.81%
Sub-Total (%)	15.41%	16.34%	0.00%	0.00%		5.81%	
County Bonds	1,165,000	2,035,000	4,826,000	6,242,000	0	14,268,000	67.88%
ALL OTHER	2,250,000	1,037,000	1,351,000	892,000	0	5,530,000	26.31%
TOTAL REVENUES	4,037,000	3,672,000	6,177,000	7,134,000	0	21,020,000	100%

SOURCE: Office of Budget, Anne Arundel County, FY 2007 Approved Capital Budget and Program.

will come from county bonds, and thus interest costs will be incurred. The practice of Anne Arundel County is to issue 20 year bonds and the present interest rate is 4.5%. Therefore road costs will be increased by the present value of the interest to be incurred. The revised road cost per lane mile is shown in Table 9.

AGENCY	Amount	Percent
State of Maryland	\$0	0.00%
Anne Arundel County	\$21,020,000	100.00%
Local Taxes	-\$550,000	0.00%
Borrowing	\$14,268,000	67.88%
All Other	\$5,530,000	32.12%
Total Funding	\$21,020,000	100.00%

**TABLE 9
INTEREST COST
ANNE ARUNDEL COUNTY ROADS**

	Cost	% of Initial Total	% of Revised Total
Facility Cost per Land Mile	\$3,027,376	100.00%	79.07%
Financed by Debt	\$2,054,929	67.88%	53.67%
Interest Cost - Present Value	\$801,253	26.47%	20.93%
Revised Total Cost	\$3,828,629	126.47%	100.00%
Paid by The State	\$0	0.00%	0.00%
Interest Rate on Local Debt	4.50%		
Period (Years)	20		
Revised Local Cost Including Interest	\$3,828,629	126.47%	100.00%

**Table 10
ROAD NEEDS AND COSTS BY LAND USE TYPE
ANNE ARUNDEL COUNTY**

LAND USE TYPE (UNIT)	TRIP RATE	TRIP LENGTH	% NEW TRIPS	NEW ROADS*	ANNUAL PAYMENT
One Family - Detached w/o regard to bedrooms	9.57	7.40	100	25.80	\$317.40
1 Bedroom or Less	4.08	7.40	100	11.00	\$135.23
2 Bedrooms	6.60	7.40	100	17.80	\$218.76
3 Bedrooms	8.63	7.40	100	23.30	\$286.12
4 Bedrooms	10.87	7.40	100	29.30	\$360.65
5 Bedrooms or More	12.75	7.40	100	34.40	\$422.88
One Family - Attached w/o regard to bedrooms	5.86	7.40	100	15.80	\$194.35
1 Bedroom or Less	2.44	7.40	100	6.60	\$80.78
2 Bedrooms	4.91	7.40	100	13.20	\$162.82
3 Bedrooms	5.84	7.40	100	15.80	\$193.80
4 Bedrooms or More	8.50	7.40	100	22.90	\$281.91
Multi Family w/o regard to bedrooms	4.20	7.40	100	11.30	\$139.30
1 Bedroom or Less	2.81	7.40	100	7.60	\$93.18
2 Bedrooms	4.35	7.40	100	11.70	\$144.17
3 Bedrooms	6.77	7.40	100	18.20	\$224.54
4 Bedrooms or More	12.03	7.40	100	32.40	\$398.98
Mobile Home w/o regard to bedrooms	4.81	7.40	100	13.00	\$159.53
1 Bedroom or Less	2.37	7.40	100	6.40	\$78.69
2 Bedrooms	4.39	7.40	100	11.80	\$145.53
3 Bedrooms or More	5.40	7.40	100	14.60	\$179.19
Hotel/Motel Room	8.90	7.40	100	24.00	\$295.18
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY					
Per Required Parking Space	3.10	8.93	50	5.00	\$62.03
Industrial Per 1,000 Sq Ft	6.97	9.06	90	20.70	\$254.64
Mini-Warehouse Per 1,000 Sq Ft	2.50	7.40	50	3.40	\$41.46
HOSPITAL, INSTITUTIONAL, NURSING HOME:					
Hospital Per Bed	11.77	7.40	85	27.00	\$331.81
Nursing Home Per Bed	2.61	7.40	85	6.00	\$73.58
Marinas Per Berth	2.96	7.40	85	6.80	\$83.45
OFFICE PER 1,000 Sq Ft:					
Under 100,000 Sq Ft	13.98	7.32	90	33.50	\$412.75
100,000 - 199,999 Sq Ft	12.08	7.32	90	29.00	\$356.74
200,000 Sq Ft & Over	10.73	7.32	90	25.80	\$316.87
Mercantile Per 1,000 Sq Ft	42.92	5.59	40	34.90	\$429.79

* New roads are measured in lane-feet. A lane-foot is one lane of roadway one foot long.

SOURCE: Institute of Transportation Engineers, *Trip Generation*, 7th Edition 2003.

NOTE: The One Family Attached, 2 Family, 3 & 4 Family and 5 or more Family trip rate is an average of the ITE Categories 220, 221, 222 and 230.

The residential trip generation rates shown in Table 10 are derived from ITE. *Trip Generation*, 7th Edition, 2003. The average dwelling unit generation rates are divided by average occupancy to get trip generation rates per capita by dwelling unit type. The per capita generation rates are multiplied by occupancies to arrive at trip generation by unit type and number of bedrooms.

	Trip Rate	Occupancy	Trips per Person	Weight
Single Family De-tached	9.57	2.66	3.60	63.93%
Single Family Attached	5.86	2.38	2.47	17.23%
Multi Family	4.20	1.62	2.59	16.79%
Mobile Home	4.81	2.06	2.33	2.05%
Weighted Average			3.21	100.00%

SOURCE: Table 2 and Table 10

Table 11
NET ROAD COSTS BY LAND USE TYPE
ANNE ARUNDEL COUNTY

LAND USE TYPE (UNIT)	COST	OFFSET	NET COST
One Family - Detached w/o regard to bedrooms	\$18,708.07	\$4,129	\$14,579.07
1 Bedroom or Less	\$7,976.31	\$1,759	\$6,217.31
2 Bedrooms	\$12,907.12	\$2,846	\$10,061.12
3 Bedrooms	\$16,895.28	\$3,722	\$13,173.28
4 Bedrooms	\$21,245.99	\$4,692	\$16,553.99
5 Bedrooms or More	\$24,944.10	\$5,501	\$19,443.10
One Family - Attached w/o regard to bedrooms	\$11,456.88	\$2,528	\$8,928.88
1 Bedroom or Less	\$4,785.79	\$1,050	\$3,735.79
2 Bedrooms	\$9,571.57	\$2,118	\$7,453.57
3 Bedrooms	\$11,456.88	\$2,521	\$8,935.88
4 Bedrooms or More	\$16,605.23	\$3,667	\$12,938.23
Multi Family w/o regard to bedrooms	\$8,193.85	\$1,812	\$6,381.85
1 Bedroom or Less	\$5,510.91	\$1,212	\$4,298.91
2 Bedrooms	\$8,483.89	\$1,875	\$6,608.89
3 Bedrooms	\$13,197.17	\$2,921	\$10,276.17
4 Bedrooms or More	\$23,493.86	\$5,190	\$18,303.86
Mobile Home w/o regard to bedrooms	\$9,426.55	\$2,075	\$7,351.55
1 Bedroom or Less	\$4,640.76	\$1,023	\$3,617.76
2 Bedrooms	\$8,556.41	\$1,893	\$6,663.41
3 Bedrooms or More	\$10,586.74	\$2,331	\$8,255.74
Hotel/Motel Room	\$17,402.86	\$3,840	\$13,562.86
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY			
Per Required Parking Space	\$3,625.60	\$807	\$2,818.60

**Table 11
NET ROAD COSTS BY LAND USE TYPE
ANNE ARUNDEL COUNTY**

LAND USE TYPE (UNIT)	COST	OFFSET	NET COST
Industrial Per 1,000 Sq Ft	\$15,009.97	\$3,312	\$11,697.97
Mini-Warehouse Per 1,000 Sq Ft	\$2,465.41	\$539	\$1,926.41
HOSPITAL, INSTITUTIONAL, NURSING HOME:			
Hospital Per Bed	\$19,578.22	\$4,316	\$15,262.22
Nursing Home Per Bed	\$4,350.72	\$957	\$3,393.72
Marinas Per Berth	\$4,930.81	\$1,085	\$3,845.81
OFFICE PER 1,000 Sq Ft:			
Under 100,000 Sq Ft	\$24,291.49	\$5,369	\$18,922.49
100,000 - 199,999 Sq Ft	\$21,028.46	\$4,641	\$16,387.46
200,000 Sq Ft & Over	\$18,708.07	\$4,122	\$14,586.07
Mercantile Per 1,000 Sq Ft	\$25,306.66	\$5,591	\$19,715.66

The net costs shown in Table 11 are the expected costs to Anne Arundel County to accommodate the additional traffic from new developments, including interest.

Anne Arundel County will incur interest costs in meeting the needs of new development with expanded road capacity. Some jurisdictions choose not to charge interest because impact fees are an “up front” payment. The following Table 12 shows the Anne Arundel net road costs without interest.

**Table 12
NET ROAD COSTS WITHOUT INTEREST
ANNE ARUNDEL COUNTY**

LAND USE TYPE (UNIT)	COST	OFFSET	NET COST
One Family - Detached w/o regard to bedrooms	\$14,792.86	\$4,129	\$10,663.86
1 Bedroom or Less	\$6,307.03	\$1,759	\$4,548.03
2 Bedrooms	\$10,205.93	\$2,846	\$7,359.93
3 Bedrooms	\$13,359.44	\$3,722	\$9,637.44
4 Bedrooms	\$16,799.64	\$4,692	\$12,107.64
5 Bedrooms or More	\$19,723.81	\$5,501	\$14,222.81
One Family - Attached w/o regard to bedrooms	\$9,059.19	\$2,528	\$6,531.19
1 Bedroom or Less	\$3,784.22	\$1,050	\$2,734.22
2 Bedrooms	\$7,568.44	\$2,118	\$5,450.44
3 Bedrooms	\$9,059.19	\$2,521	\$6,538.19
4 Bedrooms or More	\$13,130.10	\$3,667	\$9,463.10
Multi Family w/o regard to bedrooms	\$6,479.04	\$1,812	\$4,667.04
1 Bedroom or Less	\$4,357.59	\$1,212	\$3,145.59
2 Bedrooms	\$6,708.39	\$1,875	\$4,833.39
3 Bedrooms	\$10,435.27	\$2,921	\$7,514.27
4 Bedrooms or More	\$18,577.08	\$5,190	\$13,387.08

**Table 12
NET ROAD COSTS WITHOUT INTEREST
ANNE ARUNDEL COUNTY**

LAND USE TYPE (UNIT)	COST	OFFSET	NET COST
Mobile Home w/o regard to bedrooms	\$7,453.77	\$2,075	\$5,378.77
1 Bedroom or Less	\$3,669.55	\$1,023	\$2,646.55
2 Bedrooms	\$6,765.73	\$1,893	\$4,872.73
3 Bedrooms or More	\$8,371.15	\$2,331	\$6,040.15
Hotel/Motel Room	\$13,760.80	\$3,840	\$9,920.80
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY			
Per Required Parking Space	\$2,866.83	\$807	\$2,059.83
Industrial Per 1,000 Sq Ft	\$11,868.69	\$3,312	\$8,556.69
Mini-Warehouse Per 1,000 Sq Ft	\$1,949.45	\$539	\$1,410.45
HOSPITAL, INSTITUTIONAL, NURSING HOME:			
Hospital Per Bed	\$15,480.90	\$4,316	\$11,164.90
Nursing Home Per Bed	\$3,440.20	\$957	\$2,483.20
Marinas Per Berth	\$3,898.89	\$1,085	\$2,813.89
OFFICE PER 1,000 Sq Ft:			
Under 100,000 Sq Ft	\$19,207.78	\$5,369	\$13,838.78
100,000 - 199,999 Sq Ft	\$16,627.63	\$4,641	\$11,986.63
200,000 Sq Ft & Over	\$14,792.86	\$4,122	\$10,670.86
Mercantile Per 1,000 Sq Ft	\$20,010.50	\$5,591	\$14,419.50

In the process of development review and approval many developers are required to dedicate land and make improvements to accommodate traffic from their developments. In such circumstances, developers should receive credit against any roads impact fee for the reasonable value of such dedications or improvements. However, the improvements to be credited must add capacity to the road systems rather than being for purposes of entrance or exit from the development.

III. EDUCATIONAL IMPACT FEES

Anne Arundel County has been collecting public educational impact fees since 1987. The public educational impact of residential units is set out in Tables 1 and 2 while Table 13 sets out the relevant residential occupancy rates. Table 14 sets out the capital cost to provide a place for a student in the Anne Arundel County school system. Table 15 contains the sources and amounts of school funding. The interest cost is shown in Table 16 and Table 17 contains the offset calculations for available revenues and the amounts that new residences are expected to pay toward the cost of school capital improvements. Tables 18 and 19 show the net school cost by type of residence.

The formula for the School Impact Fee is:

- FACILITY COST PER STUDENT = CONSTRUCTION COST OF NEW SCHOOL CAPITAL FACILITIES / STUDENT CAPACITY = \$33,360
- TOTAL COST PER STUDENT = FACILITY COST + INTEREST COST = \$42,196
- LOST COST PER STUDENT = TOTAL COST PER STUDENT * (1 – STATE %) = \$32,998
- OFFSET FOR PAST PAYMENT PER STUDENT = 1.28% OF LOCAL COST = \$421
- OFFSET FOR FUTURE PROPERTY TAXES = \$3,565 PER STUDENT
- NET COST PER STUDENT = LOCAL COST – OFFSET FOR PAST PAYMENT - OFFSET FOR FUTURE PAYMENT = \$32,998 - \$421 - \$3,565 = \$29,012.
- NET COST PER RESIDENCE = NET LOCAL COST PER STUDENT * STUDENT OCCUPANCY PER UNIT

The projected costs of providing public educational facilities per student are estimated in Table 14. The costs shown in Table 14 are those experienced in Anne Arundel County with recent school construction projects. The costs shown in Table 14 are divided among the various revenue sources as shown in Table 15. However, the cost of interest was not included in Table 14, and it is necessary to include this important cost.

Table 15 (following) shows that, on the average, 67.9% of school capital costs are financed by debt and thus interest costs will be incurred. Using this average together with the costs from Table 17 yields a revised facilities cost that includes interest.

The revised net local facilities cost per student is multiplied by public school enrollment per residential units to arrive at facility cost per unit. See Table 18. The offsets for school funding and payments are set out in Table 17. The total local cost per student is reduced by the per student offset to determine the net local educational facility cost per student. This net cost determines the amount of any impact fee.

**TABLE 13
PUBLIC SCHOOL ENROLLMENT BY UNIT TYPE
ANNE ARUNDEL COUNTY**

DWELLING TYPE & SIZE	PUBLIC SCHOOL STUDENTS PER UNIT
One Family - Detached w/o regard to bedrooms	0.382
1 Bedroom or Less	0.000
2 Bedrooms	0.179
3 Bedrooms	0.308
4 Bedrooms	0.452
5 Bedrooms or More	0.703
One Family – Attached	0.450
1 Bedroom or Less	0.000
2 Bedrooms	0.268
3 Bedrooms	0.500
4 Bedrooms or More	0.628
Multi Family w/o regard to bedrooms	0.219
1 Bedroom or Less	0.099
2 Bedrooms	0.218
3 Bedrooms	0.498
4 Bedrooms or More	0.979
Mobile Home w/o regard to bedrooms	0.256
1 Bedroom or Less	0.000
2 Bedrooms	0.123
3 Bedrooms or More	0.385
Hotel/Motel Room	0.000

SOURCE: Table 2.

**TABLE 14
FACILITY COSTS PER STUDENT
ANNE ARUNDEL COUNTY
2007**

School	Cost	Student Capacity	Cost per Student
Harmans Elementary School *	\$18,108,338	676	\$26,787
Marley Elementary School	\$19,623,191	555	\$35,357
Marley Middle School	\$34,123,740	1,034	\$33,002
Mayo Elementary School *	\$16,436,257	385	\$42,692
Pasadena Elementary School *	\$20,240,000	484	\$41,818
Seven Oaks Elementary School*	\$19,676,708	687	\$28,641
Totals	\$128,208,234	3,821	\$33,554
Elementary	94,084,494	2,787	\$33,758
Middle/High	\$34,123,740	1,034	\$33,002
Weighted Average			\$33,360

SOURCE: Anne Arundel County County Auditor, March 2008.

* Capital Projects Account for these schools are still open.

The school costs shown in Table 14 use best available data. Additionally, the costs shown are based on a policy of keeping renovated schools in their existing locations.

TABLE 15
SOURCES OF EDUCATIONAL CAPITAL FUNDS
ANNE ARUNDEL COUNTY

SOURCE	FY2008	FY2009	FY2010	FY2011	FY2012	5 YEARS	%
STATE OF MARYLAND	\$23,671,000	\$32,288,000	\$5,445,000	\$15,297,000	\$20,099,000	\$96,800,000	27.57%
LOCAL :							
County Funds	1,015,000	1,865,000	1,865,000	1,865,000	1,865,000	8,475,000	2.41%
Impact Fees	\$3,850,000	\$2,750,000	\$250,000	\$250,000	\$250,000	\$7,350,000	2.09%
Developer Contribution	\$0	\$0	\$0	\$0	\$0	\$0	0.00%
Total Local	\$4,865,000	\$4,615,000	\$2,115,000	\$2,115,000	\$2,115,000	\$15,825,000	4.51%
Sub-Total (%)	5.53%	5.74%	3.70%	4.47%	2.70%	4.51%	
County Bonds	\$59,505,000	\$43,481,000	\$49,542,000	\$29,931,000	\$56,012,000	\$238,471,000	67.92%
ALL OTHER	\$0	\$0	\$0	\$0	\$0	\$0	0.00%
TOTAL CAPITAL REVENUES	\$88,041,000	\$80,384,000	\$57,102,000	\$47,343,000	\$78,226,000	\$351,096,000	100.00%

SOURCE: Office of Budget, Anne Arundel County, FY 2007 *Approved Capital Budget and Program*.

Over 70% of the cost of educational capital falls on Anne Arundel. The largest source of funding for educational capital is county borrowing. Borrowing, of necessity, results

AGENCY	Amount per Student	Percent
State of Maryland	\$9,197.68	27.57%
Anne Arundel County	\$24,162.53	72.43%
Local Taxes	\$805.27	2.41%
Borrowing	\$22,658.88	67.92%
All Other	\$698.38	2.09%
Total Facility Cost	\$33,360.20	100.00%

in interest costs, which are shown in Table 16.

**TABLE 16
INTEREST COST
ANNE ARUNDEL COUNTY SCHOOLS**

	Cost	% of Initial Total	% of Revised Total
Facility Cost per Student	\$33,360	100.00%	79.06%
Financed by Debt	\$22,659	67.92%	53.70%
Interest Cost – Present Value	\$8,835	26.48%	20.94%
Revised Total Cost, Including Interest	\$42,196	126.48%	100.00%
Paid by The State	\$9,198	27.57%	21.80%
Interest Rate on Local Debt	4.50%		
Period (Years)	20		
Revised Local Cost Including Interest	\$32,998	98.91%	78.20%

While debt is used to pay for schools, new developments will also help to pay for that debt in their taxes. Table 17 calculates a future payment credit, which is the present value of annual debt service on outstanding debt per student for the next 20 years. Table 17 also presents a reduction for past payments of property taxes. The properties that are becoming new developments have paid property taxes for years. Those taxes have gone, in part, to pay for the existing education facilities that have served existing development. The past payment credit, 1.28%, is introduced in recognition of past financial contributions of new development toward Anne Arundel County's educational infrastructure.

**TABLE 17
EDUCATIONAL OFFSET CALCULATIONS
ANNE ARUNDEL COUNTY**

Outstanding School Debt (\$000,000)	\$219.6
Term	20
Interest Rate	4.50%
Taxable Value (\$000,000)	\$51,240.2
Annual Debt Service (\$000,000)	\$16.88
Public School Students	73,814
Annual Debt Service Per Student	\$228.68
Escalation Rate of Taxable Value	2.00%
Discount Rate	4.50%
Net Discount Rate	2.5%
Discount Period	20
Local Cost Per Student	\$32,997.91
Present Value of Future Payments -- Offset	\$3,564.91
Past Payment Credit	\$420.81
Net Local Cost Per Student	\$29,012.18

SOURCE: Table 3.

In Table 17 a 2% per year real rate of increase in taxable value per student is introduced. Taxable property values will escalate in the future. This analysis escalates real property taxable values at 2% per year. In recognition of increased risk associated with unstable taxable values, the discount rate has been increased to 4.5%. Thus a net discount rate of 2.5% is used to calculate the future payment credit.

Table 18 shows the net costs of educational facilities per residence. The net cost is based on Anne Arundel County actual experience and has been adjusted for State of Maryland participation, future payments of taxes to retire outstanding debt, and past payments toward school costs. Past payments are credited by a 1.28% reduction.

If developers made dedications or land or improvements for education purpose, the reasonable value of such dedications should be credited against any educational impact fees otherwise due.

**TABLE 18
EDUCATIONAL NET COSTS
ANNE ARUNDEL COUNTY**

UNIT TYPE	OCCUPANCY	TOTAL COST	STATE OFFSET	LOCAL COST	PAST OFFSET	FUTURE OFFSET	NET COST
One Family - Detached w/o regard to bedrooms	0.382	\$16,114	\$3,513	\$12,602	\$161	\$1,361	\$11,080
1 Bedroom or Less	0.000	\$0	\$0	\$0	\$0	\$0	\$0
2 Bedrooms	0.179	\$7,549	\$1,646	\$5,904	\$75	\$638	\$5,191
3 Bedrooms	0.308	\$13,010	\$2,836	\$10,174	\$130	\$1,099	\$8,945
4 Bedrooms	0.452	\$19,074	\$4,158	\$14,916	\$190	\$1,611	\$13,115
5 Bedrooms or More	0.703	\$29,654	\$6,464	\$23,190	\$296	\$2,505	\$20,389
One Family - Attached w/o regard to bedrooms	0.450	\$18,994	\$4,140	\$14,854	\$189	\$1,605	\$13,060
1 Bedroom or Less	0.000	\$0	\$0	\$0	\$0	\$0	\$0
2 Bedrooms	0.268	\$11,295	\$2,462	\$8,833	\$113	\$954	\$7,766
3 Bedrooms	0.500	\$21,083	\$4,596	\$16,488	\$210	\$1,781	\$14,496
4 Bedrooms or More	0.628	\$26,479	\$5,772	\$20,707	\$264	\$2,237	\$18,206
Multi Family w/o regard to bedrooms	0.219	\$9,238	\$2,014	\$7,225	\$92	\$780	\$6,352
1 Bedroom or Less	0.099	\$4,186	\$912	\$3,273	\$42	\$354	\$2,878
2 Bedrooms	0.218	\$9,200	\$2,005	\$7,195	\$92	\$777	\$6,326
3 Bedrooms	0.498	\$21,030	\$4,584	\$16,446	\$210	\$1,777	\$14,459
4 Bedrooms or More	0.979	\$41,327	\$9,008	\$32,319	\$412	\$3,492	\$28,415
Mobile Home w/o regard to bedrooms	0.256	\$10,797	\$2,353	\$8,443	\$108	\$912	\$7,424
1 Bedroom or Less	0.000	\$0	\$0	\$0	\$0	\$0	\$0
2 Bedrooms	0.123	\$5,186	\$1,131	\$4,056	\$52	\$438	\$3,566
3 Bedrooms or More	0.385	\$16,266	\$3,546	\$12,720	\$162	\$1,374	\$11,184
Hotel/Motel Room	0.000	\$0	\$0	\$0	\$0	\$0	\$0

The existing Anne Arundel County educational impact fee methodology includes interest cost because some portion of education capital improvements are routinely financed with debt. Some jurisdictions choose not to charge interest because impact fees are an “up front” payment. The following Table 19 shows the Anne Arundel net educational costs without interest.

**TABLE 19
EDUCATIONAL NET COSTS WITHOUT INTEREST
ANNE ARUNDEL COUNTY**

UNIT TYPE	OCCUPANCY	TOTAL COST	STATE OFFSET	LOCAL COST	PAST OFFSET	FUTURE OFFSET	NET COST
One Family - Detached w/o regard to bedrooms	0.382	\$12,740	\$3,513	\$9,228	\$118	\$1,361	\$7,748
1 Bedroom or Less	0.000	\$0	\$0	\$0	\$0	\$0	\$0
2 Bedrooms	0.179	\$5,969	\$1,646	\$4,323	\$55	\$638	\$3,630
3 Bedrooms	0.308	\$10,286	\$2,836	\$7,450	\$95	\$1,099	\$6,256
4 Bedrooms	0.452	\$15,080	\$4,158	\$10,922	\$139	\$1,611	\$9,172
5 Bedrooms or More	0.703	\$23,445	\$6,464	\$16,981	\$217	\$2,505	\$14,259
One Family - Attached w/o regard to bedrooms	0.450	\$15,017	\$4,140	\$10,877	\$139	\$1,605	\$9,133
1 Bedroom or Less	0.000	\$0	\$0	\$0	\$0	\$0	\$0
2 Bedrooms	0.268	\$8,930	\$2,462	\$6,468	\$82	\$954	\$5,431
3 Bedrooms	0.500	\$16,669	\$4,596	\$12,073	\$154	\$1,781	\$10,138
4 Bedrooms or More	0.628	\$20,934	\$5,772	\$15,163	\$193	\$2,237	\$12,732
Multi Family w/o regard to bedrooms	0.219	\$7,304	\$2,014	\$5,290	\$67	\$780	\$4,442
1 Bedroom or Less	0.099	\$3,309	\$912	\$2,397	\$31	\$354	\$2,013
2 Bedrooms	0.218	\$7,274	\$2,005	\$5,268	\$67	\$777	\$4,424
3 Bedrooms	0.498	\$16,626	\$4,584	\$12,042	\$154	\$1,777	\$10,112
4 Bedrooms or More	0.979	\$32,674	\$9,008	\$23,665	\$302	\$3,492	\$19,872
Mobile Home w/o regard to bedrooms	0.256	\$8,536	\$2,353	\$6,183	\$79	\$912	\$5,192
1 Bedroom or Less	0.000	\$0	\$0	\$0	\$0	\$0	\$0
2 Bedrooms	0.123	\$4,100	\$1,131	\$2,970	\$38	\$438	\$2,494
3 Bedrooms or More	0.385	\$12,860	\$3,546	\$9,314	\$119	\$1,374	\$7,821
Hotel/Motel Room	0.000	\$0	\$0	\$0	\$0	\$0	\$0

I. PUBLIC SAFETY

Anne Arundel County first established public safety impact fees in 2000. The original fees have not been revised since. Updated costs and revenues have been obtained and integrated into the formulae for impact fees and the respective schedules are revised accordingly. The formula for calculating the public safety impact fees is

$$\text{COST PER CAPITA} = \frac{\text{TOTAL PUBLIC SAFETY CAPITAL FACILITIES VALUE}}{\text{POPULATION} + \text{INTEREST}} = \$715$$

$$\text{COST PER UNIT} = \text{PERSONS PER UNIT} \times \text{COST PER CAPITA}$$

$$\text{OFFSETS} = (\$109.25 \times \text{PERSONS PER UNIT}) + (1.28\% \times \text{COST PER UNIT})$$

$$\text{NET COST} = \text{COST PER UNIT} - \text{OFFSETS}$$

The public safety impact calculations use a concept of "functional Population." This method is used in order to equitably spread the costs between residential and non-residential sectors. People at businesses place demands upon police and fire/rescue services in exactly the same manner as people at their places of residence. Businesses are simply people in another facet of their lives. The goal is to equitably distribute police and fire facility costs to both residential and non-residential development. Allocating these costs is done differently for residential and non-residential land uses.

For residential, the police and fire cost allocation is done using the residents per unit as determined by analyzing census data. The individuals in residence are assigned 33% to the residence. This means that 67% of people's time is allocated to other land uses such as employment, shopping, entertainment, etc. For non-residential land uses the allocation is accomplished by using traffic generation rates. Trip rates will indicate how many people are present per day at the several land uses. The people present are then divided between employees and visitors. Employees are assigned to their place of work for 8 hours per day, 5 days per week. Visitors are allocated to a particular land use for differing lengths of time and days per week depending on the land use. The total number of person hours per week attributed to individual land uses is then divided by the total number of person hours per week to arrive at a percentage allocation. The resulting time allocation is multiplied by the number of people present at the site to get the functional population.

An example of this method may help. Take 1,000 square feet of floor area of an industrial building. There would be a total of 6.97 vehicles per day coming to and departing from the site per 1,000 feet. At 1.2 persons per vehicle, a total of 4.182 persons would be on site per day per 1,000 square feet. A ratio of 1.4 employees per 1,000 square feet is utilized which means that there will be 1.4 employees per 1,000 feet of floor area. It would follow that 2.78 of the 4.182 persons would be visitors. It is taken that employees spend 8

hours per day, 5 days per week at an industrial site and visitors spend 1 hour per visit, 5 days per week. This means that there would be 69.9 persons-hours per week spent at an industrial site per 1,000 square feet. The 4.182 persons per 1,000 square feet would have a total of 702.6 person-hours per week. Thus, the 4.182 persons per week spending a total of 69.9 hours at a warehouse site would devote 9.95% of their time to that site. With 4.182 persons spending 9.95% of their time at an industrial site, the functional population per 1,000 feet of floor area would be 0.4161. This example is worked out below:

**FUNCTIONAL POPULATION EXAMPLE
1,000 FEET OF INDUSTRIAL**

Automotive Trips To & From Site	6.97	
Arriving Trips	3.49	
Persons Per Vehicle	1.20	
PERSONS PER 1,000 FT²		4.18
Employees	1.40	
Visitors	2.78	
Hours On Site Per Employee Per Day	8.00	
Hours On Site Per Visitor Per Day	1.00	
Days Open Per Week	5.00	
TOTAL PERSON HOURS ON SITE PER WEEK		69.91
Employee Hours Per Week	56.00	
Visitor Hours Per Week	13.91	
TOTAL PERSON HOURS PER WEEK		702.58
PERCENT OF TIME AT SITE		9.95%
TOTAL PERSONS AT SITE		4.182
FUNCTIONAL POPULATION PER 1,000 FEET		0.4161

The functional populations for all of the land use categories are set out below.

**TABLE 20
FUNCTIONAL POPULATION
ANNE ARUNDEL COUNTY**

LAND USE TYPE (UNIT)	PERSONS PER UNIT	DAYS PER WEEK	% Allocated				FUNCTIONAL POPULATION
One Family - Detached	2.74	7.00	0.33				0.91
One Family - Attached	2.59	7.00	0.33				0.86
2 Family	2.18	7.00	0.33				0.73
3 & 4 Family	2.17	7.00	0.33				0.72
5 or More Family	1.85	7.00	0.33				0.62
Mobile Home	2.29	7.00	0.33				0.76
Hotel/Motel Room	1.00	7.00	0.33				0.33
VEHICLE OCCUPANCY	1.20	Persons Per Vehicle					
NON-RESIDENTIAL:	HOURS PER DAY		NO. PER DAY		TRIP RATE	DAYS PER WEEK	FUNCTIONAL POPULATION
	EMPLO-YEE	VISITOR	EMPLO-YEE	VISITOR			
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY							
Per Required Parking Space	8	1.00	0.10	1.76	3.10	7	0.11
Industrial Per 1,000 Sq Ft	8	1.00	1.40	2.78	6.97	5	0.42
Mini-Warehouse Per 1,000 Sq Ft	8	1.00	0.10	1.40	2.50	7	0.09
HOSPITAL, INSTITUTIONAL, NURSING HOME:							
Hospital Per Bed	8	1.00	0.50	6.56	11.77	7	0.44
Nursing Home Per Bed	8	1.00	1.00	0.57	2.61	7	0.36
Marinas Per Berth	8	1.00	0.20	1.58	2.96	7	0.13
OFFICE PER 1,000 Sq Ft:							
Under 100,000 Sq Ft	8	0.33	4.00	4.39	13.98	5	1.00
100,000 - 199,999 Sq Ft	8	0.50	3.50	3.75	12.08	5	0.89
200,000 Sq Ft & Over	8	1.00	3.00	3.44	10.73	5	0.82
Mercantile Per 1,000 Sq Ft	8	1.00	5.00	20.75	42.92	7	2.53

SOURCES: 2000 Anne Arundel County Impact Fee Methodology; J. Nicholas, et al, *A Practitioner's Guide to Development Impact Fees*, Chicago: Planners Press, 1992, page 114ff; and J. Nicholas, "Impact Exactions: Economic Theory, Practice and Incidence," *Law and Contemporary Problems*, 50:1, 1987. Also see A. Nelson, *Planner's Estimating Guide: Projecting Land-use And Facility Needs*, Chicago: Planners Press, 2004.

Tables 21 and 22 set out the police and fire & rescue capital investments in Anne Arundel County. Table 23 summarizes these costs and calculates a per capita cost of \$524.28. As with other infrastructure capital funding in Anne Arundel County, offsets to the cost are appropriate.

**Table 21
POLICE PROTECTION
ANNE ARUNDEL COUNTY**

INVENTORY OF FACILITIES:	No.	UNIT COST	CAPITAL VALUE
Police Stations	4	\$5,700,000	\$22,800,000
Police/Fire Headquarters			\$18,160,080
Police Training Facility			\$2,850,422
Emergency Operations Center			\$1,900,000
Other Police facility			\$675,969
Patrol Vehicles			\$11,200,000
Helicopter			\$2,443,168
Police & Law Enforcement Capital Investment			\$60,029,639
Population Served			524,375
Value Per Capita			\$114.48

SOURCES: Anne Arundel County, Auditor's Office, March 2008.

**Table 22
FIRE PROTECTION & RESCUE
ANNE ARUNDEL COUNTY**

INVENTORY OF FACILITIES:	No.	UNIT COST	CAPITAL VALUE
Stations	31	\$4,279,338	\$132,659,478
Fire Training Facility	1	\$1,047,935	\$1,047,935
Engines	55	\$381,000	\$20,955,000
Heavy Rescue Squads	9	\$381,000	\$3,429,000
Tankers	4	\$381,000	\$1,524,000
Ladder Trucks	13	\$690,000	\$8,970,000
Ambulances	43	\$160,000	\$6,880,000
Other Equipment:			
Other Vehicles & Boats			\$2,200,000
Fire Boat			\$529,347
Mobile Commend Vehicle			\$1,157,335
Fire/Rescue Capital Investments			\$179,352,095
Population Served			524,375
Total Capital Cost Per Capita			\$342.03

SOURCES: Anne Arundel County, Auditor's Office, March 2008.

**Table 23
PUBLIC SAFETY PARAMETERS
ANNE ARUNDEL COUNTY**

Police	\$60,029,639
Fire/Rescue	\$179,352,095
Communications	\$35,538,000
TOTAL PUBLIC SAFETY CAPITAL INVESTMENT	\$274,919,734
POPULATION SERVED	524,375
INVESTMENT PER CAPITA	\$524.28

**TABLE 24
SOURCES OF PUBLIC SAFETY CAPITAL FUNDS
ANNE ARUNDEL COUNTY**

SOURCE	FY2008	FY2009	FY2010	FY2011	FY2012	5 YEARS	%
STATE OF MARYLAND	0	0	0	0	0	0	0.00%
LOCAL :							
County Funds	-50,000	350,000	350,000	350,000	350,000	1,350,000	4.29%
Impact Fees	400,000	400,000	0	0	0	800,000	2.54%
Developer Contribution	0	0	0	0	0	0	0.00%
Total Local	350,000	750,000	350,000	350,000	350,000	2,150,000	6.83%
Sub-Total (%)	10.01%	6.28%	6.54%	6.54%		6.83%	
County Bonds	3,145,000	11,188,000	5,000,000	5,000,000	5,000,000	29,333,000	93.17%
ALL OTHER	0	0	0	0	0	0	0.00%
TOTAL REVENUES	3,495,000	11,938,000	5,350,000	5,350,000	5,350,000	31,483,000	100%

SOURCE: Office of Budget, Anne Arundel County, FY 2007 Approved Capital Budget and Program.

AGENCY	Amount	Percent
State of Maryland	\$0	0.00%
Anne Arundel County	\$31,483,000	100.00%
Local Taxes	\$1,350,000	4.29%
Borrowing	\$29,333,000	93.17%
All Other	\$800,000	2.54%
Total Facility Revenues	\$31,483,000	100.00%

**TABLE 25
PUBLIC SAFETY INTEREST COST
ANNE ARUNDEL COUNTY**

	Cost	% of Initial Total	% of Revised Total
Facility Cost per Capita	\$524	100.00%	73.35%
Financed by Debt	\$488	93.17%	68.34%
Interest Cost - Present Value	\$190	36.33%	26.65%
Revised Total Cost	\$715	136.33%	100.00%
Paid by The State	\$0	0.00%	0.00%
Interest Rate on Local Debt	4.50%		
Period (Years)	20		
Revised Local Cost Including Interest	\$715	136.33%	100.00%

Table 26 shows the outstanding general obligation debt incurred for public safety capital facilities. Because this are paid largely by property taxes a net discount rate of 2.5% is used to calculate the net present value of the future payments per capita toward the cost of interest and retirement of this outstanding debt.

**Table 26
PUBLIC SAFETY FUNDING AND OFFSETS
ANNE ARUNDEL COUNTY**

Total Taxable Value (000,000)	\$51,240.24
Public Safety General Obligation Debt (000,000)	\$47.81
Average Annual Debt Service (000,000)	\$3.67
Debt Service Per Capita	\$7.01
Escalation Rate of Taxable Value	2.00%
Discount Rate	4.50%
Net Discount Rate	2.50%
Period	20
Offset for Future Payments Per Capita	\$109.25
Offset for Past Payments	1.28%
Net Cost per Capita	\$597.79

Table 27 contains the net public safety cost by land use type.

**Table 27
PUBLIC SAFETY COSTS BY LAND USE
TYPE ANNE ARUNDEL COUNTY**

	PERSONS PER UNIT	COST PER UNIT	OFFSET	NET COST
One Family - Detached w/o regard to bedrooms	0.912	\$652.17	\$106.73	\$545.44
1 Bedroom or Less	0.389	\$277.85	\$45.47	\$232.38
2 Bedrooms	0.629	\$449.48	\$73.56	\$375.92
3 Bedrooms	0.823	\$587.90	\$96.21	\$491.69
4 Bedrooms	1.037	\$741.04	\$121.27	\$619.77
5 Bedrooms or More	1.216	\$868.89	\$142.20	\$726.70
One Family - Attached w/o regard to bedrooms	0.862	\$616.47	\$100.89	\$515.58
1 Bedroom or Less	0.358	\$256.21	\$41.93	\$214.28
2 Bedrooms	0.723	\$516.46	\$84.52	\$431.94
3 Bedrooms	0.860	\$614.71	\$100.60	\$514.11
4 Bedrooms or More	1.251	\$894.17	\$146.33	\$747.84
Multi Family w/o regard to bedrooms	0.616	\$440.30	\$72.05	\$368.24
1 Bedroom or Less	0.412	\$294.53	\$48.20	\$246.33
2 Bedrooms	0.638	\$455.70	\$74.58	\$381.12
3 Bedrooms	0.993	\$709.71	\$116.15	\$593.57
4 Bedrooms or More	1.764	\$1,261.11	\$206.38	\$1,054.73
Mobile Home w/o regard to bedrooms	0.763	\$545.37	\$89.25	\$456.12
1 Bedroom or Less	0.320	\$228.74	\$37.43	\$191.31
2 Bedrooms	0.592	\$423.03	\$69.23	\$353.80
3 Bedrooms or More	0.729	\$520.90	\$85.25	\$435.65
Hotel/Motel Room	0.333	\$238.02	\$38.95	\$199.07
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY				
Per Required Parking Space	0.107	\$76.24	\$12.48	\$63.76
Industrial Per 1,000 Sq Ft	0.416	\$297.44	\$48.68	\$248.76
Mini-Warehouse Per 1,000 Sq Ft	0.092	\$65.52	\$10.72	\$54.80
HOSPITAL, INSTITUTIONAL, NURSING HOME:				
Hospital Per Bed	0.440	\$314.56	\$51.48	\$263.08
Nursing Home Per Bed	0.357	\$255.11	\$41.75	\$213.36
Marinas Per Berth	0.132	\$94.59	\$15.48	\$79.11
OFFICE PER 1,000 Sq Ft:				
Under 100,000 Sq Ft	0.995	\$711.52	\$116.44	\$595.08
100,000 - 199,999 Sq Ft	0.889	\$635.50	\$104.00	\$531.50
200,000 Sq Ft & Over	0.817	\$583.68	\$95.52	\$488.16
Mercantile Per 1,000 Sq Ft	2.531	\$1,809.31	\$296.10	\$1,513.22

As with the other facilities, Table 28 shows the public safety costs without interest.

**Table 28
PUBLIC SAFETY COSTS WITHOUT INTEREST BY LAND USE TYPE
ANNE ARUNDEL COUNTY**

	PERSONS PER UNIT	COST PER UNIT	OFFSET	NET COST
One Family - Detached w/o regard to bedrooms	0.912	\$478.36	\$105.78	\$372.58
1 Bedroom or Less	0.389	\$203.81	\$45.07	\$158.74
2 Bedrooms	0.629	\$329.69	\$72.91	\$256.79
3 Bedrooms	0.823	\$431.22	\$95.36	\$335.86
4 Bedrooms	1.037	\$543.55	\$120.20	\$423.35
5 Bedrooms or More	1.216	\$637.33	\$140.94	\$496.40
One Family - Attached w/o regard to bedrooms	0.862	\$452.18	\$99.99	\$352.19
1 Bedroom or Less	0.358	\$187.93	\$41.56	\$146.37
2 Bedrooms	0.723	\$378.82	\$83.77	\$295.05
3 Bedrooms	0.860	\$450.89	\$99.71	\$351.18
4 Bedrooms or More	1.251	\$655.88	\$145.04	\$510.84
Multi Family w/o regard to bedrooms	0.616	\$322.96	\$71.42	\$251.54
1 Bedroom or Less	0.412	\$216.04	\$47.77	\$168.26
2 Bedrooms	0.638	\$334.25	\$73.91	\$260.34
3 Bedrooms	0.993	\$520.58	\$115.12	\$405.46
4 Bedrooms or More	1.764	\$925.02	\$204.55	\$720.47
Mobile Home w/o regard to bedrooms	0.763	\$400.03	\$88.46	\$311.57
1 Bedroom or Less	0.320	\$167.78	\$37.10	\$130.68
2 Bedrooms	0.592	\$310.29	\$68.62	\$241.68
3 Bedrooms or More	0.729	\$382.08	\$84.49	\$297.59
Hotel/Motel Room	0.333	\$174.59	\$38.61	\$135.98
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY				
Per Required Parking Space	0.107	\$55.92	\$12.37	\$43.56
Industrial Per 1,000 Sq Ft	0.416	\$218.17	\$48.24	\$169.92
Mini-Warehouse Per 1,000 Sq Ft	0.092	\$48.06	\$10.63	\$37.43
HOSPITAL, INSTITUTIONAL, NURSING HOME:			\$0.00	
Hospital Per Bed	0.440	\$230.73	\$51.02	\$179.71
Nursing Home Per Bed	0.357	\$187.12	\$41.38	\$145.75
Marinas Per Berth	0.132	\$69.38	\$15.34	\$54.04
OFFICE PER 1,000 Sq Ft:				
Under 100,000 Sq Ft	0.995	\$521.90	\$115.41	\$406.49
100,000 - 199,999 Sq Ft	0.889	\$466.14	\$103.08	\$363.06
200,000 Sq Ft & Over	0.817	\$428.13	\$94.67	\$333.46
Mercantile Per 1,000 Sq Ft	2.531	\$1,327.13	\$293.47	\$1,033.66

The 2007 calculations yield a net cost 37.9% greater than that calculated in 2000. In fact, the 2007 calculations facility costs are 5.8% less than 2000. The reason that the total cost rose was the inclusion of interest in 2007 while it was not included in 2000.

	NET COST - 2007	NET COST - 2000	% Change
One Family - Detached w/o regard to bedrooms	\$545.44	\$395.54	37.90%
One Family - Attached w/o regard to bedrooms	\$515.58	\$373.88	37.90%
Multi Family w/o regard to bedrooms	\$368.24	\$267.06	37.89%
Mobile Home w/o regard to bedrooms	\$456.12	\$330.57	37.98%
Hotel/Motel Room	\$199.07	\$144.36	37.90%
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY			
Per Required Parking Space	\$63.76	\$46.24	37.90%
Industrial Per 1,000 Sq Ft	\$248.76	\$180.39	37.90%
Mini-Warehouse Per 1,000 Sq Ft	\$54.80	\$39.74	37.89%
HOSPITAL, INSTITUTIONAL, NURSING HOME:			
Hospital Per Bed	\$263.08	\$190.78	37.90%
Nursing Home Per Bed	\$213.36	\$154.72	37.90%
Marinas Per Berth	\$79.11	\$57.37	37.89%
OFFICE PER 1,000 Sq Ft:			
Under 100,000 Sq Ft	\$595.08	\$431.53	37.90%
100,000 - 199,999 Sq Ft	\$531.50	\$385.43	37.90%
200,000 Sq Ft & Over	\$488.16	\$354.00	37.90%
Mercantile Per 1,000 Sq Ft	\$1,513.22	\$1,097.34	37.90%

IV. STORMWATER

The improvements necessary to cope with stormwater runoff are proposed for funding by impact fees. In order to establish an Anne Arundel County basis for extrapolating countywide stormwater costs required for stormwater reduction, control, mitigation and restoration, costs were developed for a subset of the County's 12 watersheds, or drainage area basins. All of these watersheds are on the state's list for potential Total Maximum Daily Loads (TMDLs), or water quality limits for aquatic impairments. As part of the evaluation for this project, 2 watersheds were selected for detailed water quality evaluation: the Patapsco Non-tidal Watershed (PN) and the Patapsco Tidal Watershed (PT). These two watersheds make-up approximately 17 % (45,000 acres) of the County and are used as a basis to extrapolate to countywide stormwater costs. These watersheds are listed for water quality impairments consisting of excess nutrients, sediments, metals, toxics, bacteria, and biological impairments. The Patapsco Tidal and Non-tidal Watersheds, in fact, have draft TMDLs for nutrients.

The Patapsco Tidal and Non-tidal Watersheds can be further divided into 16 sub-watersheds. See Table 29. Each of these sub-watersheds is diverse, and coping with

**TABLE 29
SUB-WATERSHEDS AREAS
ANNE ARUNDEL COUNTY**

Sub-watershed Name	Sub-watershed ID	Area of Sub-watershed (acres)
Holly Creek	PN1	2,343
Unnamed Patapsco NT Tributary	PN2	1,518
Stony Run	PN4	6,426
Unnamed Patapsco NT Tributary	PN5	723
Piny Run	PN6	4,153
Stony Creek	PT0	4,130
Unnamed Patapsco Tidal Tributary	PT2	721
Cabin Branch Creek	PT3	2,628
Swan Creek	PT4	872
Furnace Creek	PT5	3,234
Curtis Creek	PT6	649
Sawmill Creek	PT7	5,746
Marley Creek	PT8	8,473
Cox Creek	PT9	900
Unnamed Patapsco Tidal Tributary	PTA	137
Rock Creek	PTB	2,584

SOURCE: Department of Public Works, Anne Arundel County, July 2007.

stormwater runoff will be somewhat different in each. Additional impervious surfaces are what increases stormwater runoff and thus create the need to mitigate the consequences of that increased runoff. Two primary concerns with stormwater runoff include increased phosphorus and increased nitrogen. The additional loadings of phosphorus and nitrogen will have to be treated or otherwise mitigated in order to avoid increased pollution and degradation of water bodies. Table 30 shows the existing and anticipated impervious surfaces by sub-watershed. It is the increase in

**TABLE 30
EXISTING AND ANTICIPATED IMPERVIOUS SURFACES BY SUB-WATERSHED
ANNE ARUNDEL COUNTY**

Sub-watershed ID	Existing Impervious Surfaces (Acres)	Future Impervious Surfaces (Acres)	Change in Impervious Surfaces (Acres)	% Change
PN1	850	940	90	10%
PN2	430	600	170	40%
PN4	1,980	2,430	450	20%
PN5	40	160	120	300%
PN6	870	1,680	810	90%
PT0	1,000	1,280	280	30%
PT2	310	340	30	10%
PT3	890	1,120	230	30%
PT4	110	260	150	140%
PT5	1,450	1,630	180	10%
PT6	250	330	80	30%
PT7	1,960	2,420	460	20%
PT8	2,590	3,440	850	30%
PT9	370	510	140	40%
PTA	60	60	0	0%
PTB	630	680	50	10%
Total (Patapsco)	13,790	17,880	4,090	30%
County Extrapolation	44,900	58,220	13,320	30%

SOURCE: Department of Public Works, Anne Arundel County, July 2007.

Impervious surfaces, as shown in Table 31 that must be mitigated. The percentage changes from sub-area to sub-area vary dramatically. It would be expected that pollutants associated with runoff from the increased impervious surfaces will also vary dramatically.

Tables 31 and 32 show the existing and projected phosphorus (TP) and nitrogen (TN) loadings by sub-watershed. These are the pollutants that will have to be mitigated. The values shown in the columns for future loads take into consideration mitigation that will already be provided through the current stormwater management regulations.

Even when stormwater management is applied, there is still an amount of pollutant load produced as the treatment methods, known as best management practices, are not 100% effective.

**TABLE 31
EXISTING AND ANTICIPATED PHOSPHORUS LOADINGS BY SUB-WATERSHED
ANNE ARUNDEL COUNTY**

Sub-watershed ID	Existing TP Load (lbs/yr)	Future TP Load (lbs/ yr)	Change in TP Load (lbs/yr)	% Change
PN1	2,260	2,370	110	0%
PN2	950	1,150	200	20%
PN4	4,560	5,380	820	20%
PN5	170	280	110	60%
PN6	2,150	3,300	1,150	50%
PT0	2,860	3,260	400	10%
PT2	840	880	40	0%
PT3	2,260	2,580	320	10%
PT4	210	390	180	90%
PT5	3,390	3,600	210	10%
PT6	440	500	60	10%
PT7	4,640	5,430	790	20%
PT8	6,910	8,260	1,350	20%
PT9	620	780	160	30%
PTA	160	160	0	0%
PTB	1,810	1,910	100	10%

SOURCE: Department of Public Works, Anne Arundel County, July 2007.

**TABLE 32
EXISTING AND ANTICIPATED NITROGEN LOADINGS BY SUB-WATERSHED
ANNE ARUNDEL COUNTY**

Sub-watershed ID	Existing TN Load (lbs/yr)	Future TN Load (lbs/ yr)	Change in TN Load (lbs/yr)	% Change
PN1	18,800	20,180	1,380	10%
PN2	8,880	11,020	2,140	20%
PN4	42,390	47,110	4,720	10%
PN5	1,670	2,830	1,160	70%
PN6	22,550	29,780	7,230	30%
PT0	25,770	28,510	2,740	10%
PT2	6,670	7,350	680	10%
PT3	18,460	21,910	3,450	20%
PT4	2,540	4,270	1,730	70%
PT5	27,560	31,160	3,600	10%
PT6	4,740	5,340	600	10%
PT7	43,580	47,310	3,730	10%
PT8	57,260	69,600	12,340	20%
PT9	6,570	8,640	2,070	30%
PTA	1,350	1,360	10	0%
PTB	20,750	20,620	(130)	0%

SOURCE: Department of Public Works, Anne Arundel County, July 2007.

The largest absolute increases in pollutant loading is in sub-area PT8 (Marley Creek) while the greatest percentage increases are for PN5 (an unnamed Patapsco NT tributary) and PT4 (Swan Creek).

The cost of watershed restoration as a consequence of increased stormwater runoff will vary by individual area characteristics. Nevertheless, some generalized cost estimates are possible based upon a prototype urban watershed restoration within Anne Arundel County. Based on this prototype, the restoration costs per pound per acre per year are:

Phosphorus = \$37,500 per lb/acre/yr

Nitrogen = \$5,300 lb/acre/yr.

Table 33 applies these costs to the increase in pollutant loadings and then calculates the resulting costs on the basis of a per square foot of increased impervious surface.

**TABLE 33
RESTORATION COSTS BY SUB-WATERSHED
ANNE ARUNDEL COUNTY**

Sub-watershed ID	Change in TP Load (lbs/ yr)	Change in TN Load (lbs/yr)	Change in Impervious Surface (Acres)	Treatment & Restoration Cost per Sub-Watershed			Cost per Square Foot of Impervious Surface
				Phosphorus	Nitrogen	Total	
PN1	110	1,380	90	\$4,125,000	\$7,314,000	\$11,439,000	\$2.92
PN2	200	2,140	170	\$7,500,000	\$11,342,000	\$18,842,000	\$2.54
PN4	820	4,720	450	\$30,750,000	\$25,016,000	\$55,766,000	\$2.84
PN5	110	1,160	120	\$4,125,000	\$6,148,000	\$10,273,000	\$1.97
PN6	1,150	7,230	810	\$43,125,000	\$38,319,000	\$81,444,000	\$2.31
PT0	400	2,740	280	\$15,000,000	\$14,522,000	\$29,522,000	\$2.42
PT2	40	680	30	\$1,500,000	\$3,604,000	\$5,104,000	\$3.91
PT3	320	3,450	230	\$12,000,000	\$18,285,000	\$30,285,000	\$3.02
PT4	180	1,730	150	\$6,750,000	\$9,169,000	\$15,919,000	\$2.44
PT5	210	3,600	180	\$7,875,000	\$19,080,000	\$26,955,000	\$3.44
PT6	60	600	80	\$2,250,000	\$3,180,000	\$5,430,000	\$1.56
PT7	790	3,730	460	\$29,625,000	\$19,769,000	\$49,394,000	\$2.47
PT8	1,350	12,340	850	\$50,625,000	\$65,402,000	\$116,027,000	\$3.13
PT9	160	2,070	140	\$6,000,000	\$10,971,000	\$16,971,000	\$2.78
PTA	0	10	0	\$0	\$53,000	\$53,000	\$0.00
PTB	100	(130)	50	\$3,750,000	\$0	\$3,750,000	\$1.72

Anne Arundel County has \$30.1 million in outstanding debt for stormwater projects. New development will pay a portion of that outstanding debt along with all existing developments. Anne Arundel County has established a practice of crediting impact fees for the present value of that portion of existing outstanding debt that is expected to be paid by new development. This practice is continued with stormwater fees. Table 34 presents a credit that should be deducted from the restoration costs in order to establish a net stormwater runoff cost of new development.

**TABLE 34
CREDIT FOR OUTSTANDING DEBT
ANNE ARUNDEL COUNTY**

Outstanding Debt (000,000)	\$32.39
Existing Impervious Surface (Acres)	44,900
Debt per Acre	\$721.38
Debt per Square Foot	\$0.017

The net costs per square foot of impervious surface for stormwater by sub-watershed are set out in Table 35. These net costs are what could be enacted as impact fees.

**TABLE 35
NET COST TO RESTORE STORMWATER RUNOFF
ANNE ARUNDEL COUNTY**

Sub-watershed Name	ID	Restoration Cost per Foot of Impervious Surface	Credit	Net Cost
Holly Creek	PN1	\$2.92	\$0.017	\$2.90
Unnamed Patapsco NT Tributary	PN2	\$2.54	\$0.017	\$2.53
Stony Run	PN4	\$2.84	\$0.017	\$2.83
Unnamed Patapsco NT Tributary	PN5	\$1.97	\$0.017	\$1.95
Piny Run	PN6	\$2.31	\$0.017	\$2.29
Stony Creek	PT0	\$2.42	\$0.017	\$2.40
Unnamed Patapsco Tidal Tributary	PT2	\$3.91	\$0.017	\$3.89
Cabin Branch Creek	PT3	\$3.02	\$0.017	\$3.01
Swan Creek	PT4	\$2.44	\$0.017	\$2.42
Furnace Creek	PT5	\$3.44	\$0.017	\$3.42
Curtis Creek	PT6	\$1.56	\$0.017	\$1.54
Sawmill Creek	PT7	\$2.47	\$0.017	\$2.45
Marley Creek *	PT8	\$3.13	\$0.017	\$3.12
Cox Creek	PT9	\$2.78	\$0.017	\$2.77
Unnamed Patapsco Tidal Tributary	PTA	\$0.00	\$0.017	\$0.00
Rock Creek	PTB	\$1.72	\$0.017	\$1.71
Weighted Average		\$2.68		\$2.66
Weighted Average without PT8		\$2.56		\$2.54

*not includes in the calculation of weighted average.

The 16 individual sub-watersheds are used as a sample in order to extrapolate storm-water remediation costs to the entirety of Anne Arundel County. The net costs shown in Table 35 yield a weighted cost of \$2.66 per additional square foot of impervious surface. Weighting was done on the basis of the change in impervious surface within an individual sub-watershed as a percent of the total change in all of the listed sub-watersheds. Anne Arundel has established a practice of dropping the most expensive improvement from calculating the general cost parameter. This practice is carried over to stormwater. The most expensive element in Table 35 is for PT8, Marley Creek. The resulting cost of \$2.54 per square foot is the expected cost to Anne Arundel County per additional square foot of impervious surface in the county.

In the process of development review and approval many developers are required to dedicate land or make improvements to lessen, remove, or mitigate stormwater runoff from their developments. In such circumstances, developers should receive credit against any stormwater impact fee for the reasonable value of such dedications or improvements.

V. SUMMARY

As stated in the beginning, the role of impact fees is to shift a portion of public capital facility costs to new development. The method of calculating costs and the portion of those costs that may be recouped with impact fees was discussed at length in the preceding sections. Table 36 restates the data in totals, including interest. It displays total costs, offsets and net costs. The net costs could be used to establish impact fees. Table 37 presents the total cost, offsets and net costs excluding interest.

**TABLE 36
TOTAL AND NET COSTS BY LAND USE
ANNE ARUNDEL COUNTY**

DEVELOPMENT TYPE	ROADS			SCHOOLS			PUBLIC SAFETY			TOTAL		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
One Family - Detached w/o regard to bedrooms	\$18,708	\$4,129	\$14,579	\$16,114	\$5,035	\$11,080	\$652	\$107	\$545	\$35,475	\$9,270	\$26,204
1 Bedroom or Less	\$7,976	\$1,759	\$6,217	\$0	\$0	\$0	\$278	\$45	\$232	\$8,254	\$1,804	\$6,450
2 Bedrooms	\$12,907	\$2,846	\$10,061	\$7,549	\$2,359	\$5,191	\$449	\$74	\$376	\$20,906	\$5,278	\$15,628
3 Bedrooms	\$16,895	\$3,722	\$13,173	\$13,010	\$4,065	\$8,945	\$588	\$96	\$492	\$30,493	\$7,883	\$22,610
4 Bedrooms	\$21,246	\$4,692	\$16,554	\$19,074	\$5,959	\$13,115	\$741	\$121	\$620	\$41,061	\$10,773	\$30,288
5 Bedrooms or More	\$24,944	\$5,501	\$19,443	\$29,654	\$9,265	\$20,389	\$869	\$142	\$727	\$55,467	\$14,908	\$40,559
One Family - Attached w/o regard to bedrooms	\$11,457	\$2,528	\$8,929	\$18,994	\$5,934	\$13,060	\$616	\$101	\$516	\$31,068	\$8,563	\$22,504
1 Bedroom or Less	\$4,786	\$1,050	\$3,736	\$0	\$0	\$0	\$256	\$42	\$214	\$5,042	\$1,092	\$3,950
2 Bedrooms	\$9,572	\$2,118	\$7,454	\$11,295	\$3,529	\$7,766	\$516	\$85	\$432	\$21,383	\$5,732	\$15,652
3 Bedrooms	\$11,457	\$2,521	\$8,936	\$21,083	\$6,587	\$14,496	\$615	\$101	\$514	\$33,155	\$9,209	\$23,946
4 Bedrooms or More	\$16,605	\$3,667	\$12,938	\$26,479	\$8,273	\$18,206	\$894	\$146	\$748	\$43,978	\$12,086	\$31,892
Multi Family w/o regard to bedrooms	\$8,194	\$1,812	\$6,382	\$9,238	\$2,886	\$6,352	\$440	\$72	\$368	\$17,872	\$4,770	\$13,102
1 Bedroom or Less	\$5,511	\$1,212	\$4,299	\$4,186	\$1,308	\$2,878	\$295	\$48	\$246	\$9,991	\$2,568	\$7,423
2 Bedrooms	\$8,484	\$1,875	\$6,609	\$9,200	\$2,874	\$6,326	\$456	\$75	\$381	\$18,140	\$4,824	\$13,316
3 Bedrooms	\$13,197	\$2,921	\$10,276	\$21,030	\$6,570	\$14,459	\$710	\$116	\$594	\$34,936	\$9,608	\$25,329
4 Bedrooms or More	\$23,494	\$5,190	\$18,304	\$41,327	\$12,912	\$28,415	\$1,261	\$206	\$1,055	\$66,082	\$18,309	\$47,774
Mobile Home w/o regard to bedrooms	\$9,427	\$2,075	\$7,352	\$10,797	\$3,373	\$7,424	\$545	\$89	\$456	\$20,769	\$5,538	\$15,231
1 Bedroom or Less	\$4,641	\$1,023	\$3,618	\$0	\$0	\$0	\$229	\$37	\$191	\$4,870	\$1,060	\$3,809
2 Bedrooms	\$8,556	\$1,893	\$6,663	\$5,186	\$1,620	\$3,566	\$423	\$69	\$354	\$14,166	\$3,583	\$10,583
3 Bedrooms or More	\$10,587	\$2,331	\$8,256	\$16,266	\$5,082	\$11,184	\$521	\$85	\$436	\$27,374	\$7,498	\$19,875
Hotel/Motel Room	\$17,403	\$3,840	\$13,563	\$0	\$0	\$0	\$238	\$39	\$199	\$17,641	\$3,879	\$13,762
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY												
Per Required Parking Space	\$3,626	\$807	\$2,819	\$0	\$0	\$0	\$76	\$12	\$64	\$3,702	\$819	\$2,882
Industrial Per 1,000 Sq Ft	\$15,010	\$3,312	\$11,698	\$0	\$0	\$0	\$297	\$49	\$249	\$15,307	\$3,361	\$11,947
Mini-Warehouse Per 1,000 Sq Ft	\$2,465	\$539	\$1,926	\$0	\$0	\$0	\$66	\$11	\$55	\$2,531	\$550	\$1,981
HOSPITAL, INSTITUTIONAL, NURSING HOME:												

**TABLE 36
TOTAL AND NET COSTS BY LAND USE
ANNE ARUNDEL COUNTY**

DEVELOPMENT TYPE	ROADS			SCHOOLS			PUBLIC SAFETY			TOTAL		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
Hospital Per Bed	\$19,578	\$4,316	\$15,262	\$0	\$0	\$0	\$315	\$51	\$263	\$19,893	\$4,367	\$15,525
Nursing Home Per Bed	\$4,351	\$957	\$3,394	\$0	\$0	\$0	\$255	\$42	\$213	\$4,606	\$999	\$3,607
Marinas Per Berth	\$4,931	\$1,085	\$3,846	\$0	\$0	\$0	\$95	\$15	\$79	\$5,025	\$1,100	\$3,925
OFFICE PER 1,000 Sq Ft:												
Under 100,000 Sq Ft	\$24,291	\$5,369	\$18,922	\$0	\$0	\$0	\$712	\$116	\$595	\$25,003	\$5,485	\$19,518
100,000 - 199,999 Sq Ft	\$21,028	\$4,641	\$16,387	\$0	\$0	\$0	\$636	\$104	\$532	\$21,664	\$4,745	\$16,919
200,000 Sq Ft & Over	\$18,708	\$4,122	\$14,586	\$0	\$0	\$0	\$584	\$96	\$488	\$19,292	\$4,218	\$15,074
Mercantile Per 1,000 Sq Ft	\$25,307	\$5,591	\$19,716	\$0	\$0	\$0	\$1,809	\$296	\$1,513	\$27,116	\$5,887	\$21,229

**TABLE 37
TOTAL AND NET COSTS BY LAND USE WITHOUT INTEREST
ANNE ARUNDEL COUNTY**

DEVELOPMENT TYPE	ROADS			SCHOOLS			PUBLIC SAFETY			TOTAL		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
One Family - Detached w/o regard to bedrooms	\$14,793	\$4,129	\$10,664	\$12,740	\$4,992	\$7,748	\$478	\$106	\$373	\$28,011	\$9,226	\$18,785
1 Bedroom or Less	\$6,307	\$1,759	\$4,548	\$0	\$0	\$0	\$204	\$45	\$159	\$6,511	\$1,804	\$4,707
2 Bedrooms	\$10,206	\$2,846	\$7,360	\$5,969	\$2,339	\$3,630	\$330	\$73	\$257	\$16,504	\$5,257	\$11,247
3 Bedrooms	\$13,359	\$3,722	\$9,637	\$10,286	\$4,030	\$6,256	\$431	\$95	\$336	\$24,076	\$7,847	\$16,229
4 Bedrooms	\$16,800	\$4,692	\$12,108	\$15,080	\$5,909	\$9,172	\$544	\$120	\$423	\$32,423	\$10,721	\$21,703
5 Bedrooms or More	\$19,724	\$5,501	\$14,223	\$23,445	\$9,186	\$14,259	\$637	\$141	\$496	\$43,806	\$14,828	\$28,978
One Family - Attached w/o regard to bedrooms	\$9,059	\$2,528	\$6,531	\$15,017	\$5,884	\$9,133	\$452	\$100	\$352	\$24,528	\$8,512	\$16,017
1 Bedroom or Less	\$3,784	\$1,050	\$2,734	\$0	\$0	\$0	\$188	\$42	\$146	\$3,972	\$1,092	\$2,881
2 Bedrooms	\$7,568	\$2,118	\$5,450	\$8,930	\$3,499	\$5,431	\$379	\$84	\$295	\$16,877	\$5,701	\$11,177
3 Bedrooms	\$9,059	\$2,521	\$6,538	\$16,669	\$6,531	\$10,138	\$451	\$100	\$351	\$26,179	\$9,152	\$17,027
4 Bedrooms or More	\$13,130	\$3,667	\$9,463	\$20,934	\$8,202	\$12,732	\$656	\$145	\$511	\$34,720	\$12,014	\$22,706
Multi Family w/o regard to bedrooms	\$6,479	\$1,812	\$4,667	\$7,304	\$2,862	\$4,442	\$323	\$71	\$252	\$14,106	\$4,745	\$9,361
1 Bedroom or Less	\$4,358	\$1,212	\$3,146	\$3,309	\$1,297	\$2,013	\$216	\$48	\$168	\$7,883	\$2,556	\$5,327
2 Bedrooms	\$6,708	\$1,875	\$4,833	\$7,274	\$2,850	\$4,424	\$334	\$74	\$260	\$14,316	\$4,799	\$9,518
3 Bedrooms	\$10,435	\$2,921	\$7,514	\$16,626	\$6,514	\$10,112	\$521	\$115	\$405	\$27,582	\$9,550	\$18,032
4 Bedrooms or More	\$18,577	\$5,190	\$13,387	\$32,674	\$12,802	\$19,872	\$925	\$205	\$720	\$52,176	\$18,196	\$33,980
Mobile Home w/o regard to bedrooms	\$7,454	\$2,075	\$5,379	\$8,536	\$3,344	\$5,192	\$400	\$88	\$312	\$16,390	\$5,508	\$10,882
1 Bedroom or Less	\$3,670	\$1,023	\$2,647	\$0	\$0	\$0	\$168	\$37	\$131	\$3,837	\$1,060	\$2,777
2 Bedrooms	\$6,766	\$1,893	\$4,873	\$4,100	\$1,607	\$2,494	\$310	\$69	\$242	\$11,176	\$3,568	\$7,608
3 Bedrooms or More	\$8,371	\$2,331	\$6,040	\$12,860	\$5,039	\$7,821	\$382	\$84	\$298	\$21,613	\$7,454	\$14,159
Hotel/Motel Room	\$13,761	\$3,840	\$9,921	\$0	\$0	\$0	\$175	\$39	\$136	\$13,935	\$3,879	\$10,057
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY												
Per Required Parking Space	\$2,867	\$807	\$2,060	\$0	\$0	\$0	\$56	\$12	\$44	\$2,923	\$819	\$2,103
Industrial Per 1,000 Sq Ft	\$11,869	\$3,312	\$8,557	\$0	\$0	\$0	\$218	\$48	\$170	\$12,087	\$3,360	\$8,727
Mini-Warehouse Per 1,000 Sq Ft	\$1,949	\$539	\$1,410	\$0	\$0	\$0	\$48	\$11	\$37	\$1,998	\$550	\$1,448
HOSPITAL, INSTITUTIONAL, NURSING HOME:												

**TABLE 37
TOTAL AND NET COSTS BY LAND USE WITHOUT INTEREST
ANNE ARUNDEL COUNTY**

DEVELOPMENT TYPE	ROADS			SCHOOLS			PUBLIC SAFETY			TOTAL		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
Hospital Per Bed	\$15,481	\$4,316	\$11,165	\$0	\$0	\$0	\$231	\$51	\$180	\$15,712	\$4,367	\$11,345
Nursing Home Per Bed	\$3,440	\$957	\$2,483	\$0	\$0	\$0	\$187	\$41	\$146	\$3,627	\$998	\$2,629
Marinas Per Berth	\$3,899	\$1,085	\$2,814	\$0	\$0	\$0	\$69	\$15	\$54	\$3,968	\$1,100	\$2,868
OFFICE PER 1,000 Sq Ft:												
Under 100,000 Sq Ft	\$19,208	\$5,369	\$13,839	\$0	\$0	\$0	\$522	\$115	\$406	\$19,730	\$5,484	\$14,245
100,000 - 199,999 Sq Ft	\$16,628	\$4,641	\$11,987	\$0	\$0	\$0	\$466	\$103	\$363	\$17,094	\$4,744	\$12,350
200,000 Sq Ft & Over	\$14,793	\$4,122	\$10,671	\$0	\$0	\$0	\$428	\$95	\$333	\$15,221	\$4,217	\$11,004
Mercantile Per 1,000 Sq Ft	\$20,010	\$5,591	\$14,419	\$0	\$0	\$0	\$1,327	\$293	\$1,034	\$21,338	\$5,884	\$15,453

**TABLE 38
NET COST TO RESTORE STORMWATER RUNOFF**

	Restoration Cost per Foot of Impervious Surface	Credit	Net Cost
Countywide	\$2.56	\$0.02	\$2.54

**EXISTING IMPACT FEES
ANNE ARUNDEL COUNTY**

TYPE OF DEVELOPMENT	Existing Fee			
	Transportation	Schools	Safety	Total
One Family Detached	\$969	\$3,810	\$125	\$4,904
One Family Attached	\$882	\$2,407	\$96	\$3,385
Two Family	\$773	\$3,382	\$119	\$4,274
Three & Four Family	\$756	\$2,254	\$87	\$3,097
Five or More Families	\$693	\$1,727	\$72	\$2,492
Mobile Home	\$691	\$3,097	\$116	\$3,904
Hotel/Motel Room	\$1,202	\$0	\$41	\$1,243
AMUSEMENT, RECREATION, PLACE OF ASSEMBLY				
Per Required Parking Space	\$196	\$0	\$10	\$206
Industrial Per 1,000 Sq Ft	\$451	\$0	\$20	\$471
Mini-Warehouse Per 1,000 Sq Ft	\$394	\$0	\$27	\$421
HOSPITAL, INSTITUTIONAL, NURSING HOME:				
Hospital Per Bed	\$1,736	\$0	\$70	\$1,806
Nursing Home Per Bed	\$329	\$0	\$48	\$377
Marinas Per Berth	\$378	\$0	\$18	\$396
OFFICE PER 1,000 Sq Ft:				
Under 100,000 Sq Ft	\$2,015	\$0	\$141	\$2,156
100,000 - 199,999 Sq Ft	\$1,628	\$0	\$118	\$1,746
200,000 Sq Ft & Over	\$1,241	\$0	\$93	\$1,334
Mercantile Per 1,000 Sq Ft	\$2,568	\$0	\$453	\$3,021

COMPARATIVE EXISTING MARYLAND FEES

	Roads	Schools	Pub Safety
AA	\$969	\$3,810	\$125
Calvert	\$3,500	\$7,800	
Carroll		\$6,303	
Charles		\$11,400	
Frederick	\$220	\$12,298	
Harford		\$8,269	
Howard	\$1,760		
Montgomery	\$10,649	\$20,456	
Queen Anne's		\$5,440	\$1,166
St Mary's	\$450	\$3,375	
Average	\$2,925	\$8,795	\$646
Average Without Anne Arundel	\$3,316	\$9,418	\$1,166

COMPARATIVE IMPACT FEES

	Anne Arundel 2000	Maryland Average 2007	US Average 2007	Anne Arundel as %	
				Md	US
Roads	\$969	\$2,925	\$2,867	33.1%	33.8%
Schools	\$3,810	\$8,795	\$4,463	43.3%	85.4%
Public Safety	\$125	\$646	\$773	19.4%	16.2%
Stormwater	\$0		\$1,360	0.0%	0.0%
Total	\$4,904	\$12,365	\$9,463	39.7%	51.8%

COMPARATIVE IMPACT FEES

	Anne Arundel 2007	Maryland Average 2007	US Average 2007	Anne Arundel as %	
				Md	US
Roads	\$14,579	\$2,925	\$2,867	498.5%	508.5%
Schools	\$11,080	\$8,795	\$4,463	126.0%	248.3%
Public Safety	\$545	\$646	\$773	84.5%	70.6%
Total	\$26,204	\$12,365	\$8,103	211.9%	323.4%

VI. Appendix

The Anne Arundel County Council directed, first, that the number of bedrooms within a dwelling be used as a basis to assess residential impact fees. The Council further directed that the size of a residential dwelling, in terms of number of gross square feet of floor area, be used as a basis for assessing residential impact fees. Both methods are shown herein. In this manner the Council will have several options to consider.

Residential development impact fees, as they are commonly applied, are a single amount for each type of residence. Anne Arundel County's existing fees are typical:

TYPE OF DEVELOPMENT	Total Fee
One Family Detached	\$4,904
One Family Attached	\$3,385
Two Family	\$4,274
Three & Four Family	\$3,097
Five or More Families	\$2,492
Mobile Home	\$3,904

The fee would be the same for a 1 bedroom 750 square foot single family detached home as it was for a 10,000 foot six bedroom home. This is equally true for the other types of residences. This approach presents two concerns:

1. Whether it is reasonable to assume that there are no differences in impact between different sized homes of the same type and,
2. The economic burden of the fee would be expected to be greater on smaller and presumably more affordable dwellings.

Many jurisdictions have shared this concern. Beginning in the late 1980s, some jurisdictions began to assess their residential impact fees on the basis of the number of bedrooms and also on the basis of the floor area within homes. The number of bedroom assumes that there is a positive correlation between population and the number of bedrooms. Simple observation of the data in Table 2 will confirm this tendency. While assessing residential impact fees on the basis of the type of dwelling and the number of bedrooms appears to more accurately assess impacts, it leaves much to be desired in terms of alleviating the economic burden on smaller dwellings. This is why many have turned to dwelling unit size.

The threshold question is whether larger homes have more people and thus create greater impacts. Extensive research has determined that larger homes do in fact have

more occupants.¹ The American Housing Survey of the United States (2003), undertaken by the Bureau of the Census, US Department of Commerce², reports characteristics of housing including the size of dwellings in square feet of floor area. The National Association of Home Builders did an analysis of these data and reported the relationship between dwelling size and occupancy as shown in Table A-1. These

**Table A-1
DWELLING UNIT OCCUPANCY BY UNIT SIZE**

Unit Type	Square Foot Range	Persons Per Unit
All Types of Dwellings		
	<1,000	2.03
	1,000-1,500	2.49
	1,500-2,000	2.67
	2,000-2,500	2.83
	2,500-3,000	2.95
	3,000+	3.05
Single Family Detached		
	<1,000	2.35
	1,000-1,500	2.57
	1,500-2,000	2.70
	2,000-2,500	2.86
	2,500-3,000	2.96
	3,000+	3.07
Single Family Attached		
	<1,000	2.03
	1,000-1,500	2.33
	1,500-2,000	2.42
	2,000-2,500	2.50
	2,500-3,000	2.62
	3,000+	2.66
Multi-Family		
	<1,000	1.89
	1,000-1,500	2.27
	1,500-2,000	2.42
	2,000-2,500	2.30
	2,500-3,000	2.43
	3,000+	2.29

SOURCE: *Impact Fees: Equity And Housing Affordability*, L. Bowles and A. Nelson, U.S. Department of Housing and Urban Development April 2007, page 42.

data confirm the tendency for larger homes to have more occupants. The data shown in Table A-1 are national. These data confirm the tendency but do not provide any

¹ The first discussion of the relationship between occupancy and unit size in the professional literature was J. Nicholas, "On the Progression of Impact Fees," *Journal of the American Planning Association*, Vol. 58, No.4, 1992.

² The American Housing Survey can be found at www.census.gov/hhes/www/housing/ahs/ahs.html

insight into occupancy by unit type for Anne Arundel County. A number of studies prepared by individual local governments have confirmed the size to occupant relationship. See *Impact Fees and Affordable Housing*.³ This appendix will report on size to occupancy data for Anne Arundel County.

In order to establish the relationship between dwelling unit size and occupancy the unit occupancy data from the 2006 American Community Survey, shown in Table 2, was blended with unit type and size data from Anne Arundel County building permit data. The building permit data were all of the dwellings permitted between January 1, 2005 and December 27, 2007. A total of 3,926 units were included in this survey. The character of these units is summarized in Table A-2. The distribution of units permitted by Anne Arundel County is contrasted with the distribution of housing types

Table A-2
CHARACTERISTICS OF DWELLING UNITS PERMITTED
ANNE ARUNDEL COUNTY Jan 2005 – Dec 2007

	SF-D	SF-A	MF	ALL
Number	2,335	685	906	3,926
%	59.48%	17.45%	23.08%	100.00%
ACS *	65.27%	17.59%	17.14%	100.00%
Bedrooms	3.75	3.00	1.89	3.19
Floor Area				
Mean	4,877	2,868	1,484	3,743
Median	4,620	2,790	1,360	3,270
Std Dev	2,128	596	501	2,211
AHS **				2,259

SOURCE: Department of Building, Anne Arundel County, March 2008.

*American Community Survey

**American Housing Survey.

reported in the 2006 American Community Survey. This was done in order to determine whether the units permitted were roughly approximate to the existing housing stock. While there is consistency, a tendency towards single family and away from multi-family is apparent. Additionally, the average size of the dwelling constructed in Anne Arundel County is much larger than for that of the nation as determined in the American Housing Survey – a median size of 3,270 square feet of floor area as contrasted with a national median of 2,259 square feet.

The 2006 American Community Survey occupancy data, both total and those in public school, were used in conjunction with the 2005-2007 building permit data to establish Anne Arundel County dwelling unit occupancy by size of dwelling. Regression analysis was used to identify the precise relationship. The regression equations for Anne Arundel County are:

³ *Impact fees and Affordable Housing*, A. Nelson, J. Juergensmeyer, And J. Nicholas, Washington DC: Island Press, 2008.

TOTAL OCCUPANTS

The statistical hypothesis is that there will be a positive relationship (correlation) between the number of occupants of Anne Arundel County dwellings and the size of those dwellings in terms of square feet of gross floor area. The form of the regression equation is:

$$\text{Total Occupants} = A^{(123)} + \left[b^{(1224)} \left(\text{Ln}(\text{Size in Feet}^2) \right) \right]$$

The number of total occupants is the dependent variable and the size of the dwelling is the independent variable. That is, it is hypothesized that the number of total occupants is dependent on the size of the dwelling. The regression equation has an intercept, A, and a coefficient for the independent variable, b. Our interest is focused on the coefficient of the independent variable, for it specifies the statistical relationship between occupancy and dwelling unit size. The number in parentheses above the scalars are t-Ratios. The t-Ratio is a measure of the statistical significance of the item, in this case the value of the intercept, A, and the value of the coefficient, b. As a general rule of thumb, a t-Ratio greater than 2 indicates a statistical significance of 95% or greater and thus a 5% or less chance that the value of the variable is not significantly different from zero. Note should be taken of the size of the dwelling being expressed in natural logarithms (Ln). This means that the expected relationship is a semi-logarithmic one. A semi-logarithmic relationship is one where the value of the dependent variable will increase with the value of the independent variable, but at a decreasing rate. In English, this means that the hypothesis is that the number of occupants will increase with floor area but that the rate of increase will diminish as the floor area becomes greater. A natural logarithm uses a base 2.718 rather than the base number 10, which is the base of common logarithms. A natural log is the preferred form when economic or quasi-economic relationships are involved, which they are herein.⁴

There are two statistics used herein. The first is R Square which is adjusted for sample size and referred to as Adjusted R Square. The second is the F Statistic. R Square and Adjusted R Square are measures of the explanatory power of the equation. That is, it is the percentage of the variation in the dependent variable (Total Occupants) that is explained by variation in the independent variable (dwelling size). There is association between the magnitude of R Square and some degree of statistical significance. Each is left to draw his/her own conclusion. The F-Statistic measures the extent of co-variation between the dependent and independent variables. As a rule of thumb, an F Statistic greater than 5 would indicate a level of significance of 5% or greater. There are a total of three statistical measures employed:

⁴ Using a log base 10 will change the absolute value of the coefficient but will yield the same conclusion. The value of the datasets regressed would be changed by the same magnitude.

t-Ratio – which assesses the statistical significance of the value of the intercept, A, and the coefficient, b;

Adjusted R Square – which expresses the percentage of explained variation; and

F-Statistic – which assesses the covariation of the dependent and independent variables.

The regression results are:

$$\text{Total Occupants} = -4.029^{(52.1)} + \left[0.8103^{(86.7)} (\text{Ln}(\text{Size in Feet}^2)) \right]$$

Regression Statistics	
Multiple R	0.80393
R Square	0.64631
Adjusted R Square	0.64622
Standard Error	0.36217
Observations	3926
F Statistic	2421

Interpretation of these results yields the following:

1. The values of the intercept, A, and the coefficient, b, are highly significant, 1% or less chance of error;
2. The F Statistic is highly significant, 1% or less chance of error; and
3. The Adjusted R Square indicates that 65% of all variation is the number of occupants is explained by the size of the dwelling.

PUBLIC SCHOOL OCCUPANTS

The number of public school enrollees is statistically analyzed in the same manner as total occupants. The Regression equation is:

$$\text{K - 12 Occupants} = A^{123} + \left[b^{(1224)} (\text{Ln}(\text{Size in Feet}^2)) \right]$$

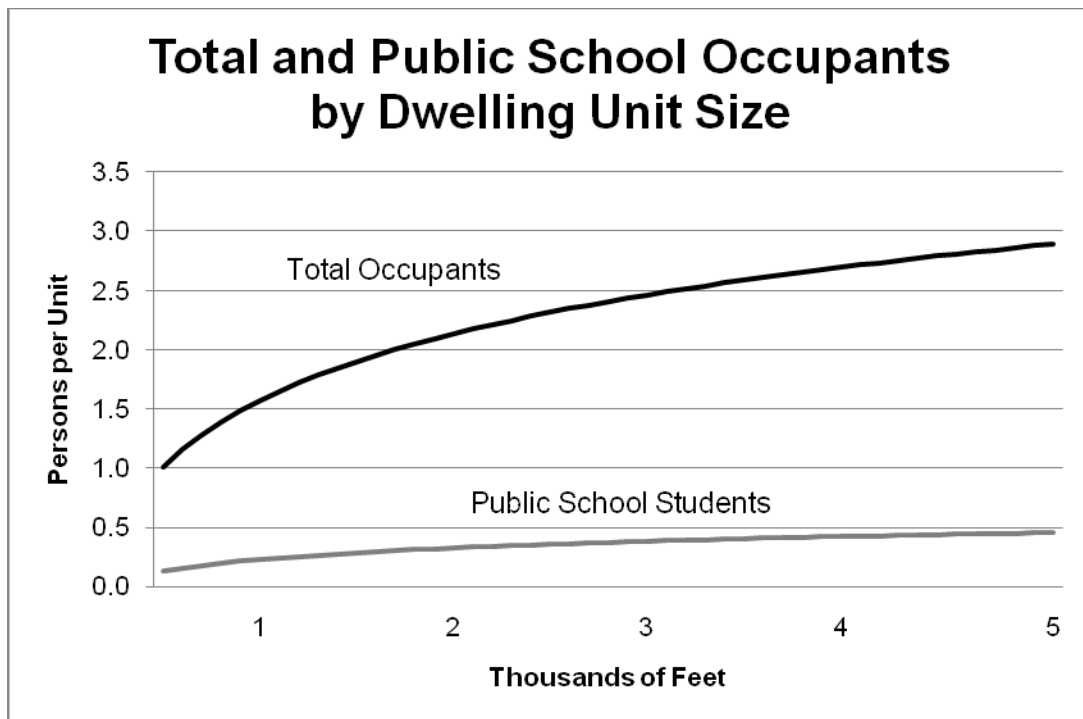
The resulting equation and statistical results are:

$$\text{K - 12 Occupants} = -0.73 + \left[0.139 \left(\text{Ln}(\text{Size in Feet}^2) \right) \right]$$

Regression Statistics	
Multiple R	0.617750
R Square	0.381615
Adjusted R Square	0.381457
Standard Error	0.107134
Observations	3926
F Statistic	2421

The results for public school attendees are very similar to those for total occupancy. The t-Ratios and F Statistic are highly significant, indicating a statistically significant relationship between the number of public school enrollees and dwelling unit size. The only difference is the magnitude of the Adjusted R Square. This statistic would suggest that the size of the dwelling will explain 38% of the variation in public school enrollees per dwelling. This suggests that there are other factors influencing the number of public school students in residence. In many ways this is to be expected. However, the test statistics clearly show that there is a positive correlation between dwelling unit size and the number of public school students.

Graphically depicting these results may make them easier to follow. This graphic plots the two equations set out above. The logarithmic shape of both lines is apparent. The data suggest that there is no significant increase in either total occupants or public school occupants above 6,000 square feet of gross floor area. Therefore



SIZE BASED IMPACT FEES

Using the facility costs and offsets set out above it is possible to calculate sized based impact fees. The relevant size is the number of gross square feet of floor area within a residential structure. The road fees use the weighted average of per capita number of vehicular trips, 3.21, times the occupancy using the above formula for total occupancy. The resulting vehicular trips are used to calculate the road impact fee in exactly the same manner set out in Section II. The calculation of the size based school fee uses the number of public school occupants using the above regression formula. The school costs and offsets used to calculate the size based school fee are the same as in Section III. The public safety fees attribute 34% of the population, as calculated using the above regression formula, to get the functional population. The public safety cost and offset data shown in Section IV. The size based impact fees are shown with the unit type and number of bedroom approaches in Table A-1. The calculated fees without interest are shown in Table A-2.

TABLE A-1

RESIDENTIAL TOTAL AND NET COSTS BY TYPE AND SIZE OF DWELLING

DEVELOPMENT TYPE	ROADS			SCHOOLS			Public Safety			Total		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
One Family - Detached w/o regard to bedrooms	\$18,708	\$4,129	\$14,579	\$16,114	\$5,035	\$11,080	\$652	\$107	\$545	\$35,475	\$9,270	\$26,204
1 Bedroom or Less	\$7,976	\$1,759	\$6,217	\$0	\$0	\$0	\$278	\$45	\$232	\$8,254	\$1,804	\$6,450
2 Bedrooms	\$12,907	\$2,846	\$10,061	\$7,549	\$2,359	\$5,191	\$449	\$74	\$376	\$20,906	\$5,278	\$15,628
3 Bedrooms	\$16,895	\$3,722	\$13,173	\$13,010	\$4,065	\$8,945	\$588	\$96	\$492	\$30,493	\$7,883	\$22,610
4 Bedrooms	\$21,246	\$4,692	\$16,554	\$19,074	\$5,959	\$13,115	\$741	\$121	\$620	\$41,061	\$10,773	\$30,288
5 Bedrooms or More	\$24,944	\$5,501	\$19,443	\$29,654	\$9,265	\$20,389	\$869	\$142	\$727	\$55,467	\$14,908	\$40,559
One Family - Attached w/o regard to bedrooms	\$11,457	\$2,528	\$8,929	\$18,994	\$5,934	\$13,060	\$616	\$101	\$516	\$31,068	\$8,563	\$22,504
1 Bedroom or Less	\$4,786	\$1,050	\$3,736	\$0	\$0	\$0	\$256	\$42	\$214	\$5,042	\$1,092	\$3,950
2 Bedrooms	\$9,572	\$2,118	\$7,454	\$11,295	\$3,529	\$7,766	\$516	\$85	\$432	\$21,383	\$5,732	\$15,652
3 Bedrooms	\$11,457	\$2,521	\$8,936	\$21,083	\$6,587	\$14,496	\$615	\$101	\$514	\$33,155	\$9,209	\$23,946
4 Bedrooms or More	\$16,605	\$3,667	\$12,938	\$26,479	\$8,273	\$18,206	\$894	\$146	\$748	\$43,978	\$12,086	\$31,892
Multi Family w/o regard to bedrooms	\$8,194	\$1,812	\$6,382	\$9,238	\$2,886	\$6,352	\$440	\$72	\$368	\$17,872	\$4,770	\$13,102
1 Bedroom or Less	\$5,511	\$1,212	\$4,299	\$4,186	\$1,308	\$2,878	\$295	\$48	\$246	\$9,991	\$2,568	\$7,423
2 Bedrooms	\$8,484	\$1,875	\$6,609	\$9,200	\$2,874	\$6,326	\$456	\$75	\$381	\$18,140	\$4,824	\$13,316
3 Bedrooms	\$13,197	\$2,921	\$10,276	\$21,030	\$6,570	\$14,459	\$710	\$116	\$594	\$34,936	\$9,608	\$25,329
4 Bedrooms or More	\$23,494	\$5,190	\$18,304	\$41,327	\$12,912	\$28,415	\$1,261	\$206	\$1,055	\$66,082	\$18,309	\$47,774
Mobile Home w/o regard to bedrooms	\$9,427	\$2,075	\$7,352	\$10,797	\$3,373	\$7,424	\$545	\$89	\$456	\$20,769	\$5,538	\$15,231
1 Bedroom or Less	\$4,641	\$1,023	\$3,618	\$0	\$0	\$0	\$229	\$37	\$191	\$4,870	\$1,060	\$3,809
2 Bedrooms	\$8,556	\$1,893	\$6,663	\$5,186	\$1,620	\$3,566	\$423	\$69	\$354	\$14,166	\$3,583	\$10,583
3 Bedrooms or More	\$10,587	\$2,331	\$8,256	\$16,266	\$5,082	\$11,184	\$521	\$85	\$436	\$27,374	\$7,498	\$19,875
ALL RESIDENTIAL UNITS BY SIZE												
Under 500 Feet	\$5,148	\$1,143	\$4,005	\$4,397	\$1,374	\$3,023	\$186	\$30	\$155	\$9,732	\$2,547	\$7,184
500 - 999 feet	\$8,411	\$1,849	\$6,562	\$8,092	\$2,528	\$5,564	\$301	\$49	\$251	\$16,804	\$4,427	\$12,378
1,000 - 1,499 feet	\$10,949	\$2,422	\$8,527	\$11,095	\$3,466	\$7,629	\$394	\$64	\$329	\$22,438	\$5,953	\$16,485
1,500 - 1,999 feet	\$12,690	\$2,800	\$9,890	\$13,073	\$4,084	\$8,988	\$455	\$74	\$381	\$26,217	\$6,959	\$19,259
2,000 - 2,499 feet	\$13,995	\$3,082	\$10,913	\$14,550	\$4,546	\$10,004	\$501	\$82	\$419	\$29,046	\$7,710	\$21,336
2,500 - 2,999 feet	\$15,010	\$3,307	\$11,703	\$15,730	\$4,914	\$10,815	\$537	\$88	\$450	\$31,277	\$8,309	\$22,968

TABLE A-1

RESIDENTIAL TOTAL AND NET COSTS BY TYPE AND SIZE OF DWELLING

DEVELOPMENT TYPE	ROADS			SCHOOLS			Public Safety			Total		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
3,000 - 3,499 feet	\$15,808	\$3,494	\$12,314	\$16,711	\$5,221	\$11,490	\$568	\$93	\$475	\$33,087	\$8,808	\$24,279
3,500 - 3,999 feet	\$16,533	\$3,655	\$12,878	\$17,553	\$5,484	\$12,069	\$594	\$97	\$497	\$34,679	\$9,236	\$25,443
4,000 - 4,499 feet	\$17,185	\$3,795	\$13,390	\$18,288	\$5,714	\$12,574	\$617	\$101	\$516	\$36,091	\$9,610	\$26,481
4,500 - 4,999 feet	\$17,765	\$3,920	\$13,845	\$18,942	\$5,918	\$13,024	\$637	\$104	\$533	\$37,345	\$9,942	\$27,402
5,000 - 5,499 feet	\$18,273	\$4,033	\$14,240	\$19,530	\$6,102	\$13,428	\$655	\$107	\$548	\$38,459	\$10,242	\$28,217
5,500 - 5,999 feet	\$18,708	\$4,135	\$14,573	\$20,065	\$6,269	\$13,796	\$672	\$110	\$562	\$39,445	\$10,514	\$28,931
6,000 feet and over	\$18,926	\$4,182	\$14,744	\$20,315	\$6,347	\$13,968	\$680	\$111	\$569	\$39,921	\$10,640	\$29,280

TABLE A-2

RESIDENTIAL TOTAL AND NET COSTS BY TYPE AND SIZE OF DWELLING WITHOUT INTEREST

DEVELOPMENT TYPE	ROADS			SCHOOLS			Public Safety			Total		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
One Family - Detached w/o regard to bedrooms	\$14,793	\$4,129	\$10,664	\$12,740	\$4,992	\$7,748	\$478	\$106	\$373	\$28,011	\$9,226	\$18,785
1 Bedroom or Less	\$6,307	\$1,759	\$4,548	\$0	\$0	\$0	\$204	\$45	\$159	\$6,511	\$1,804	\$4,707
2 Bedrooms	\$10,206	\$2,846	\$7,360	\$5,969	\$2,339	\$3,630	\$330	\$73	\$257	\$16,504	\$5,257	\$11,247
3 Bedrooms	\$13,359	\$3,722	\$9,637	\$10,286	\$4,030	\$6,256	\$431	\$95	\$336	\$24,076	\$7,847	\$16,229
4 Bedrooms	\$16,800	\$4,692	\$12,108	\$15,080	\$5,909	\$9,172	\$544	\$120	\$423	\$32,423	\$10,721	\$21,703
5 Bedrooms or More	\$19,724	\$5,501	\$14,223	\$23,445	\$9,186	\$14,259	\$637	\$141	\$496	\$43,806	\$14,828	\$28,978
One Family - Attached w/o regard to bedrooms	\$9,059	\$2,528	\$6,531	\$15,017	\$5,884	\$9,133	\$452	\$100	\$352	\$24,528	\$8,512	\$16,017
1 Bedroom or Less	\$3,784	\$1,050	\$2,734	\$0	\$0	\$0	\$188	\$42	\$146	\$3,972	\$1,092	\$2,881
2 Bedrooms	\$7,568	\$2,118	\$5,450	\$8,930	\$3,499	\$5,431	\$379	\$84	\$295	\$16,877	\$5,701	\$11,177
3 Bedrooms	\$9,059	\$2,521	\$6,538	\$16,669	\$6,531	\$10,138	\$451	\$100	\$351	\$26,179	\$9,152	\$17,027
4 Bedrooms or More	\$13,130	\$3,667	\$9,463	\$20,934	\$8,202	\$12,732	\$656	\$145	\$511	\$34,720	\$12,014	\$22,706
Multi Family w/o regard to bedrooms	\$6,479	\$1,812	\$4,667	\$7,304	\$2,862	\$4,442	\$323	\$71	\$252	\$14,106	\$4,745	\$9,361
1 Bedroom or Less	\$4,358	\$1,212	\$3,146	\$3,309	\$1,297	\$2,013	\$216	\$48	\$168	\$7,883	\$2,556	\$5,327
2 Bedrooms	\$6,708	\$1,875	\$4,833	\$7,274	\$2,850	\$4,424	\$334	\$74	\$260	\$14,316	\$4,799	\$9,518
3 Bedrooms	\$10,435	\$2,921	\$7,514	\$16,626	\$6,514	\$10,112	\$521	\$115	\$405	\$27,582	\$9,550	\$18,032
4 Bedrooms or More	\$18,577	\$5,190	\$13,387	\$32,674	\$12,802	\$19,872	\$925	\$205	\$720	\$52,176	\$18,196	\$33,980
Mobile Home w/o regard to bedrooms	\$7,454	\$2,075	\$5,379	\$8,536	\$3,344	\$5,192	\$400	\$88	\$312	\$16,390	\$5,508	\$10,882
1 Bedroom or Less	\$3,670	\$1,023	\$2,647	\$0	\$0	\$0	\$168	\$37	\$131	\$3,837	\$1,060	\$2,777
2 Bedrooms	\$6,766	\$1,893	\$4,873	\$4,100	\$1,607	\$2,494	\$310	\$69	\$242	\$11,176	\$3,568	\$7,608
3 Bedrooms or More	\$8,371	\$2,331	\$6,040	\$12,860	\$5,039	\$7,821	\$382	\$84	\$298	\$21,613	\$7,454	\$14,159
ALL RESIDENTIAL UNITS BY SIZE												
Under 500 Feet	\$4,071	\$1,143	\$2,928	\$3,477	\$1,362	\$2,114	\$136	\$30	\$106	\$7,684	\$2,535	\$5,149
500 - 999 feet	\$6,651	\$1,849	\$4,802	\$6,398	\$2,507	\$3,891	\$220	\$49	\$172	\$13,269	\$4,404	\$8,865
1,000 - 1,499 feet	\$8,658	\$2,422	\$6,236	\$8,772	\$3,437	\$5,335	\$289	\$64	\$225	\$17,718	\$5,923	\$11,796
1,500 - 1,999 feet	\$10,034	\$2,800	\$7,234	\$10,335	\$4,049	\$6,286	\$334	\$74	\$260	\$20,703	\$6,923	\$13,780
2,000 - 2,499 feet	\$11,066	\$3,082	\$7,984	\$11,503	\$4,507	\$6,996	\$367	\$81	\$286	\$22,937	\$7,670	\$15,266

TABLE A-2

RESIDENTIAL TOTAL AND NET COSTS BY TYPE AND SIZE OF DWELLING WITHOUT INTEREST

DEVELOPMENT TYPE	ROADS			SCHOOLS			Public Safety			Total		
	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost	Total	Offset	Net Cost
2,500 - 2,999 feet	\$11,869	\$3,307	\$8,562	\$12,436	\$4,872	\$7,563	\$394	\$87	\$307	\$24,699	\$8,267	\$16,432
3,000 - 3,499 feet	\$12,499	\$3,494	\$9,005	\$13,212	\$5,177	\$8,036	\$417	\$92	\$324	\$26,128	\$8,763	\$17,365
3,500 - 3,999 feet	\$13,073	\$3,655	\$9,418	\$13,877	\$5,437	\$8,440	\$436	\$96	\$339	\$27,386	\$9,189	\$18,197
4,000 - 4,499 feet	\$13,589	\$3,795	\$9,794	\$14,459	\$5,665	\$8,794	\$452	\$100	\$352	\$28,500	\$9,560	\$18,940
4,500 - 4,999 feet	\$14,047	\$3,920	\$10,127	\$14,976	\$5,868	\$9,108	\$467	\$103	\$364	\$29,491	\$9,891	\$19,600
5,000 - 5,499 feet	\$14,449	\$4,033	\$10,416	\$15,441	\$6,050	\$9,391	\$481	\$106	\$374	\$30,370	\$10,189	\$20,181
5,500 - 5,999 feet	\$14,793	\$4,135	\$10,658	\$15,864	\$6,215	\$9,648	\$493	\$109	\$384	\$31,149	\$10,459	\$20,690
6,000 feet and over	\$14,965	\$4,182	\$10,783	\$16,061	\$6,293	\$9,768	\$499	\$110	\$388	\$31,525	\$10,585	\$20,940