Growth Policy Study:	Appendix M –Potential Changes to the APF Tests for Transportation and School Adequacy				
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Summary:

Changes to the APF tests for transportation adequacy should include a revision to PAMR Arterial LOS standards, establishment of new trip generation rates and transportation impact taxes for urban residential uses, and the development of an Alternative Review Procedure for PAMR that will allow satisfaction of PAMR requirements through arterial-specific mobility improvements. Special procedures in White Flint will replace PAMR and LATR with taxes/assessments and a cap on long-term parking spaces. Changes to the APF test for schools will adjust the threshold for school facilities payments.

The retention of the Adequate Public Facilities review for transportation and school facilities remains an important element of the development approval process. Staff analyzed alternatives to LATR and PAMR in both the 2007 Growth Policy and the 2008 subsequent studies and did not find a better framework on which to build the APF process. Therefore, staff recommends the retention of the basic Local Area Transportation Review (LATR) and Policy Area Mobility Review (PAMR) tests as well as the school test.

However, staff did evaluate revisions to the currents tests such as threshold changes for both transportation congestion and school capacity, development of a cordon-line method exemption and a parking cap method exemption from PAMR and LATR, and review of adequacy tests for other public facilities. In addition, impact tax calculations were analyzed with respect to changing the transportation impact tax calculation based on trips to one based on VMT.

Staff believes that the LATR and PAMR processes can be improved through several policyrelated changes that could incentivize high-quality, transit-oriented growth and streamline development review processes where appropriate. Staff has started to pursue some of these recommendations as part of the White Flint and Gaithersburg West master planning processes.

1. Definition of Adequacy

Transportation:

Policy Area Mobility Review establishes criteria for Relative Transit Mobility and Relative Arterial Mobility that are based on Level of Service (LOS) criteria published by the Transportation Research Board in the *Highway Capacity Manual* (2000) and the *Transportation Capacity and Quality of Service Manual* (2003). The details of the PAMR process are contained in the Planning Board's LATR/PAMR Guidelines.

As PAMR was developed in the 2007, both staff and the Planning Board recommended in 2007 that the relationship between Transit LOS and Arterial LOS in the PAMR process be "symmetrical" as shown in Table 1.

Table 1.	PAMR "Symn	netrical" L	OS Standar	ds

If Transit LOS is	Then Arterial LOS			
	Must Be			
F	А			
E	В			
D	С			
С	D			
В	E			
Α	F			

Staff retains the position stated in 2007 that the application of symmetrical LOS supports the argument that the provision of multimodal transportation service is applied equitably throughout the County. Of course, the County Council has the prerogative to establish adequacy thresholds, and jurisdictions nationwide use alternative LOS criteria, including both LOS E (as the Council established as the minimum acceptable PAMR Transit LOS) and LOS D (as the Council established as the minimum acceptable PAMR Arterial LOS).

From a more practical perspective, staff recognizes that on an areawide basis, it is extremely unlikely that any policy area will experience LOS A or LOS F conditions for either Arterial LOS or Transit LOS. The pragmatic question is therefore whether or not LOS E arterial conditions should be appropriate for areas with LOS B transit service. Staff finds that LOS E conditions are appropriate for two reasons. First, from a technical perspective, **LOS E is the condition at which the throughput of a roadway facility is maximized**. This is somewhat counterintuitive simply due to the fact that the LOS grading system is oriented toward the customer. For the customer, LOS A represents the least delay, and therefore the best level of service. Provision of LOS A service to all customers, however, is not practical from either fiscal or community-building perspectives. Most jurisdictions across the country require conditions ranging from LOS C to LOS E.

Second, from a community-building perspective, the establishment of more stringent LOS requirements in urban areas can create pressures to widen roadways to provide auto capacity, an action which not only uses valuable property but also tends to reduce pedestrian comfort and accessibility. In the White Flint Sector Plan, staff has recommended that the end-state conditions, which would result in Transit LOS B and Arterial LOS E conditions, should reflect an appropriate balance between land use and transportation.

Adopting symmetrical LOS standards would reduce the amount of anticipated PAMR mitigation by removing five policy areas (Bethesda/Chevy Chase, Derwood, Kensington/Wheaton, Olney, and Silver Spring/Takoma Park) from the "partial mitigation" category and reducing the percent mitigation requirements in three others (Aspen Hill, Rockville City, and North Bethesda).

Figure 1 shows the current PAMR "chart" identifying Policy Areas requiring both full mitigation and partial mitigation and Figure 2 shows the same chart with the "Symmetrical LOS" standards.

Both Figures 1 and 2 show the forecasted conditions for each policy area under the FY 10 conditions approved by the Planning Board in May 2009. In other words, the policy area "dots" on the chart are the same in both Figures 1 and 2, but the lines representing the boundaries between "acceptable", "acceptable with partial mitigation", and "acceptable with full mitigation" are different.

Figures 3 and 4 provide a graphic comparison of the approved FY 10 mitigation requirements by policy area and those that would apply under the staff proposal for symmetrical LOS standards.





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5/29/2009





2013_PAMR_DB_041509\2013c_PAMR_Chart

5/30/2009



Figure 3. Current PAMR Mitigation Requirements for FY 10



Figure 4. PAMR Mitigation Requirements for FY 10 with Proposed "Symmetrical LOS"

Changes to certain Policy Area boundaries to better define transit station services areas are recommended in the draft White Flint, Germantown, and Gaithersburg West master plans as described in Appendix H. These changes would revise LATR congestion standards at intersections within the expanded boundaries.

Schools:

The 2007-2009 Growth Policy established the definition of capacity as the MCPS program capacity in a high school cluster at each level: elementary, middle, and high. The practice of 'borrowing' excess capacity from adjacent clusters at the high school level was eliminated. Borrowing at the middle and elementary school levels was eliminated in the 2003-2005 Growth Policy. In addition, currently, a cluster goes into a residential moratorium if its enrollment 5 years from now would exceed 120 percent of cluster-wide program capacity at any level. For

FY2010, residential development in the B-CC, Clarksburg and Seneca Valley clusters will be in moratorium.

A residential subdivision is required to make a School Facilities Payment if its enrollment 5 years from now would exceed 105 percent of cluster-wide program capacity at any level but would be less than 120 percent. In FY2010, residential development in 9 clusters will require a School Facilities Payment to proceed: Walter Johnson, Richard Montgomery, Northwest, Northwood, Paint Branch, Quince Orchard, Rockville, Wheaton and Whitman.

Staff recommends that the test for the adequacy of public school facilities be revised so that the threshold that triggers a School Facilities Payment is 110 percent of MCPS program capacity. Capacity deficits of 5 percent are typically just below the amount that would prompt an MCPS facility adjustment, such as an addition. At 110 percent, the School Facility Payment threshold more closely relates to facility programming in the CIP.

Staff does not recommend any changes to School Facility Payment rate. For FY2010, the costs per unit type are shown in Table 2:

Cost per unit by housing	Elementary	Middle	High
type			
Single-family detached	\$6,245	\$3,659	\$3,734
Single-family attached	\$4,118	\$3,100	\$3,050
Multi-family garden apt.	\$2,986	\$1,423	\$2,081
High-rise; low-rise	\$820	\$991	\$941
w/structured parking			

Table 2. School Facility Payment Rates for FY 2010

The Planning Board and the Montgomery County School Board recommended a 110 percent School Facility Payment threshold during the 2007-2009 Growth Policy deliberations. Both Boards also proposed a 135 percent capacity ceiling. Staff does not recommend changing the threshold for moratorium at this time.

In addition, staff does not recommend changing the De Minimis, senior housing or enterprise zone exemptions. Currently, subdivisions of three units or fewer are exempt from the school adequacy test, as is senior housing. The School Facilities Payment is waived in an enterprise zone (Wheaton CBD and Long Branch) or an area that was formerly an enterprise zone (Silver Spring CBD). Staff does not recommend changing these parameters.

2. Definition of De-Minimis Thresholds

Transportation

The 2007 Growth Policy established a de-minimis threshold of 3 vehicle trips to trigger PAMR mitigation. The staff and private sector efforts required to define mitigation measures for small (< 30 vehicle trip) applications was not practical, with public sector review costs often exceeding the value of the mitigating action. The Planning Board determined in July 2008 that payment-in-lieu of \$11,000 per vehicle trips for applicants generating between 3 and fewer than 30 vehicle trips is an appropriate solution.

Staff proposes at this time that no change be made to the De-Minimis PAMR threshold, as:

- The Planning Board's 2008 approach to accept payment-in-lieu for applications generating less than 30 peak hour trips improves predictability and efficiency for smaller applications
- Staff proposes to expand the Alternative Review Procedure options to mitigate PAMR requirements, including those described elsewhere in Appendix M and in the smart growth criteria in Appendix N.

Schools

The 2007 Growth Policy established a De Minimis threshold of greater than three units to apply the cluster capacity test.

Staff does not recommend changing the De Minimis provision at this time.

3. Adjustments to Acceptable Peak Hour Vehicle Trip Rates

Staff recommends the development of a new peak hour vehicle trip generation rate for residential developments in urban areas as defined by Section 49 of the County Code. These urban areas are locations in the County where street and highway designs are particularly tailored to a pedestrian environment, including wider sidewalks and slower targeted travel speeds. This environment must be created in part by the promotion of urban land uses, development designs, and pedestrian activity levels. Each of the urban areas already has a base of commercial development that provides some basic services and a level of transit service higher than the surrounding suburban development. These urban areas are also locations where appropriately scaled transportation improvements should be based on best available estimates of forecast traffic demand to avoid implementing more capacity for auto travel than will be needed as development comes online.

The LATR/PAMR Guidelines contain vehicle trip generation rates appropriate for developments in Montgomery County. The LATR/PAMR trip generation rates were developed based on data collection efforts conducted for developments countywide, primarily during the 1980s. Separate trip generation rates were developed for the Silver Spring, Bethesda, and

Friendship Heights CBDs as sector plans for those areas were adopted in the 1990s. A discounting factor is available for offices near Metrorail stations to reflect the higher transit mode share at those locations.

The LATR/PAMR Guidelines contain county-specific trip generation rates for 12 land uses:

- General office
- General retail
- Fast food restaurants
- Single-family detached residential
- Townhouses
- Garden and mid-rise apartments
- High rise apartments
- Private schools
- Automobile filling stations
- Independent and assisted living facilities
- Mini-warehouse
- Child day-care center

For other land uses, applicants are directed to data in the report *Trip Generation*, published by the Institute of Transportation Engineers (the 8th edition was published in fall 2008). The ITE *Trip Generation* rates are based on data collected in studies nationwide, and reflect a wide range of socioeconomic environments. The separate rates in the LATR/PAMR Guidelines reflect the fact that conditions in Montgomery County are different from conditions in many areas of the country, particularly considering that Montgomery County's household income, education, and available transit services are above nationwide averages. The LATR/PAMR Guidelines also note that staff may consider case-by-case adjustments from the approved trip generation rates if the adjustment can be documented from reliable sources that reflect the type of use and environmental conditions that are comparable to the proposed development.

During the last two years, there has been interest in developing special trip generation rates that could be applied to other areas such as White Flint or Wheaton. In particular, the dynamics of internal trip capture for mixed-use developments creates potential for reducing vehicle-miles of travel in a suburban activity center. The LATR/PAMR Guidelines support the use of internal capture methodology in the ITE *Trip Generation: A Recommended Practice*, in which the synergy between office, retail, and residential development in a development is reflected by subtracting vehicle trips based on the relative amounts of each type of development. This methodology is based in large part on research conducted as part of NCHRP Report 323, *Travel Characteristics at Large-Scale Suburban Activity Centers*, completed in 1989.

Substantial literature suggests that a diversity of uses is a trip-reducing variable with a stronger relationship for reducing trip generation than is reflected in current NCHRP or ITE documents,

but that further study would be needed to develop a significant relationship appropriate for development review purposes.

This need for more comprehensive and current information on mixed use development is the basis for NCHRP Study 08-51, Enhancing Internal Trip Capture Estimation for Mixed-Use Developments. This study will present a classification system for mixed-use developments to enhance the internal capture estimation process and is scheduled to be completed during the summer of 2009.

Staff has evaluated available data resources on trip generation rates and recommends:

- establishing a new LATR/PAMR Guidelines peak hour trip generation rate for all residential development in the County's urban areas that is 18% lower than that for countywide rates, based on information obtained by the Metropolitan Washington Council Governments (MWCOG) 2008 Household Travel Survey and supported by guidance documents for the use of California Environmental Quality Act environmental assessments.
- conducting **further study for the 2011-2013 Growth Policy on additional changes to trip generation rates for commercial and mixed-use development**, including
 - review and incorporation of NCHRP Project 08-51 findings,
 - collection of selected local trip generation data based on gaps anticipated in NCHRP Project 08-51, particularly relating to differences between communityserving retail and regional destination retail uses.

Comparison of Local Trip Generation Guidelines with TCRP Report 128

Staff also reviewed Transit Cooperative Research Project (TRCP) Report 128, *Effects of TOD on Housing, Parking, and Travel*. This research report, released by the Transportation Research Board in fall 2008, contains data collected at 17 transit-oriented developments nationwide, including two sites in Montgomery County (the Avalon at Grovesnor Station and the Lenox Apartments in the Silver Spring CBD), and derives certain trip generation relationships that are similar to those already incorporated in our LATR/PAMR Guidelines.

Staff concurs with the basic findings of TCRP Report 128:

- Vehicle trip generation rates for transit-oriented development are substantially lower than those in the ITE *Trip Generation*
- A positive relationship should be expected between lowered trip generation rates and each of the following independent variables: accessibility to high-quality transit, restricted on-site parking, and proximity to the regional center.
- A reduction in parking requirements for TOD can improve development efficiency by reallocating scarce resources (both in terms of physical space and

construction/maintenance costs) from parking to either additional smart growth development or other on-site amenities.

Staff has drawn three additional conclusions that are not included in TCRP Report 128:

- For the most urban densities, the LATR/PAMR Guidelines already have trip generation rates substantially lower than the ITE *Trip Generation* rates, and our current rates remain appropriate.
- For TOD in more suburban locations, the LATR/PAMR Guidelines rates are lower than ITE rates, but slightly higher than the average rates found in TCRP 128.
- TCRP Report 128 concludes that the lower vehicle trip generation rates for TOD should result in a lowering of traffic-related impact fees or exactions. Staff finds that because TOD generate a higher amount of transit ridership, the prudent course of action may be not to lower transportation fees, but rather to shift both the fee assessment basis and the application of fee and exaction revenue for TOD toward transit service improvements, particularly in considering funding for capital expansion projects such as the Corridor Cities Transitway and BRT improvements that are planned along Veirs Mill Road and Georgia Avenue and being studied on other corridors throughout the county.

For comparison purposes, consider the relationship between the two sites observed in Montgomery County.

	Avalon	Lenox Apartments	Average of TCRP		
	(Grosvenor)	osvenor) (Silver Spring CBD)			
Number of units	497	406	288 (median)		
Height (floors)	4	16	4 (median)		
Distance to rail transit	1,000'	400' 920' (median)			
AM Peak Hour Trip Generation Rate (vehicle trips per unit)					
TCRP Report Observed	0.44	0.18	0.28		
ITE Trip Generation Rate	0.55	0.55	0.54		
LATR/PAMR Trip Generation	0.41	0.30	0.36		
Rate					
PM Peak Hour Trip Generation R	ate (vehicle trips per	unit)			
TCRP Report Observed	0.37	0.22	0.39		
ITE Trip Generation Rate	0.67	0.67	0.66		
LATR/PAMR Trip Generation 0.47		0.30	0.39		
Rate					

Table 3. Montgomery County Sites in TCRP Report 128

Table 3 indicates that the LATR Trip Generation Rates are appropriate for high rise residential units (which are almost by definition located in areas well served by transit) and the Bethesda,

Silver Spring, and Friendship Heights CBDs. The average results from the two sites in Montgomery County have exactly the same observed peak hour trip generation rate (0.39 for the PM peak period) as the LATR/PAMR Guidelines would yield. The Lenox Apartments have a lower observed trip generation rate than the LATR/PAMR Guidelines would yield, but are located only 420' from the Silver Spring Metrorail station and have only one on-site parking space per unit, both characteristics that would be expected to lower trip generation rates even below the average TOD trip generation rate.

The LATR/PAMR Guidelines PM peak period trip generation rate outside of Bethesda, Silver Spring, or Friendship Heights are 0.48 trips per unit for apartments and 0.83 trips per unit for townhouse developments, higher than the TCRP Report averages but lower than the ITE *Trip Generation* rates.

TCRP 128 contains suggested adjustments to ITE trip generation rates for TOD that would appear to be promising in reflecting independent variables such as the walking distance to transit and the number of parking spaces per unit. Unfortunately, the regression formulae developed have very limited application to Montgomery County development. The most promising trendline linked trip rates to density and walking distance to transit, but would result in a negative trip generation rate for communities with a density of more than 25 units per acre (such as Bethesda and Silver Spring). The conclusions regarding walking distance to transit, parking ratios, and distance to the regional core appear somewhat supported by anecdotal evidence, although none of the regression analyses cited have an R-squared value of more than 0.21 for both AM and PM peak hours. Staff therefore does not recommend directly adopting any of the trip generation rates for wholesale use in development review.

Review of URBEMIS Application

URBEMIS (short for Urban Emissions) is an air quality application tool developed in 2005 by the California Air Resources Board for use in the evaluation of California Environmental Quality Act (CEQA) environmental analysis of land use projects. The tool allows users to adjust ITE trip generation rates to reflect the effect of local environmental variables such as density, diversity, and design elements as well as other travel demand mitigation proposals. The URBEMIS model itself is very complex, applying hundreds of input variables (including development construction phases in addition to end-state conditions) calibrated for use in California jurisdictions.

The URBEMIS model does provide insight as to the state-of-the-practice for CEQA applications. Figure 5 shows a summary of trip reduction potential credits for different physical and operating measures excerpted from an URBEMIS user's guidebook, "Crediting Low Traffic Developments", published by Nelson-Nygaard Consultants in 2005.

	Residential (1)	Non-Residential
Physical Measures		
Net Residential Density	Up to 55%	N/A
Mix of Uses	Up to 9%	Up to 9%
Local-Serving Retail	2%	2%
Transit Service	Up to 15%	Up to 15%
Pedestrian/Bicycle Friendliness	Up to 9%	Up to 9%
Physical Measures subtotal	Up to 90%	Up to 35%
Demand Management and Similar Mea	asures	
Affordable Housing	Up to 4%	N/A
Parking Supply (2)	N/A	No limit
Parking Pricing/Cash Out	N/A	Up to 25%
Free Transit Passes	25% * reduction for	25% * reduction for transit
	transit service	service
Telecommuting (3)	N/A	No limit
Other TDM Programs	N/A	Up to 2%, plus 10% of the credit
		for transit and ped/bike
		friendliness
Demand Management subtotal (4)	Up to 7.75%	Up to 31.65%

Figure 5. Summary of URBEMIS Trip Reduction Potential

Notes:

(1) For residential uses, the percentage reductions shown apply to the ITE average trip generation rate for single-family detached housing. For other residential land use types, some level of these mitigation measures is implicit in ITE average trip generation rates, and the percentage reduction will be lower.

(2) Only if greater than sum of other trip reduction measures.

(3) Not additive with other trip reduction measures.

(4) Excluding credits for parking supply and telecommuting, which have no limit.

The LATR/PAMR Guidelines rates already account for the residential density credits (as noted in the footnote, the 55% percentage reduction is taken from a single-family detached housing rate). Figure 5 does indicate the potential for trip generation reductions for mix of uses (up to 9%), local serving retail (2%) and pedestrian/bicycle friendliness (up to 9%), elements that are not explicit in the LATR/PAMR Guidelines rates. This information supports the staff recommendation that standard trip generation rates in the County's urban areas be reduced by 18% from the general Countywide rates.

MWCOG Household Travel Survey

The Metropolitan Washington Council of Governments (MWCOG) conducted a survey of 11,000 households between February 2007 and March 2008 to identify areawide travel patterns. Preliminary reports from the survey effort are being released during spring and summer 2009. One of the initial results is the report on daily vehicle trip generation and VMT comparisons between residents in the region's Regional Activity Centers and Clusters compared to those who reside outside of the activity center areas.

Figure 6 shows the areas in the MWCOG region identified as Regional Activity Centers and Clusters. In Montgomery County, these areas include:

- Most of the Silver Spring/Takoma Park policy area west of Sligo Creek
- The Georgia Avenue corridor from Forest Glen to Glenmont
- The MD 355 corridor from Friendship Heights through Rockville Town Center, including Rock Spring Park
- Much of the City of Gaithersburg and the Life Sciences Center
- Most of the Germantown Sector Plan area and the Clarksburg Town Center.





Residents in Regional Activity Centers and Clusters are found to generate:

- About 18% fewer auto trips (4.6 per day as compared to 5.6 per day), and
- About 33% less VMT (19.6 per day as compared to 29.3 per day).

A substantial portion of this difference in trip-making is due to demographic differences. Residents in Regional Activity Centers and Clusters typically have:

- Fewer persons per household (24% of center/cluster households have three or more residents compared to 45% of households outside these areas)
- Fewer workers per household (37% of center/cluster households have two or more workers compared to 51% of households outside these areas)
- Fewer autos per household (18% of center/cluster households do not own a vehicle, compared to 3% of households outside these areas)

Information to normalize the trip generation and VMT findings to account for variables such as household size are not yet available. Some of the differences in the survey results could be due to the fact that multifamily dwelling units, with lower trip generation rates, are slightly over-represented in the activity centers. Nonetheless, staff recommends that the MWCOG household survey information, combined with the URBEMIS information, support the reduction of expected residential trip generation rates in the County's urban areas.

4. Value of Trip Mitigation Actions

Transportation:

The value of providing transit services needs to be reviewed. The PAMR process introduced the concept of buying a transit vehicle for Ride-On to operate as a mitigating measure. The value (one vehicle plus 12 years of operating costs equals 30 peak hour vehicle trips) reflected our estimates of costs and benefits but was not found to be a practical option by any applicants.

Table 5 in the LATR Guidelines for Non-Automobile Transportation Facilities is shown in Figure 7.

Figure 7. Current value of Non-Auto Facilitie	Figure 7.	Current V	alue of	Non-Auto	Facilities
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Non Automobile Transportation Easility	Trip Credit vs Congestion Standard				
Non-Automobile transportation raciity	1350-1500	1550-1600	1800		
100 linear feet of five-foot wide sidewalk	0.5	0.75	1.0		
100 linear feet of eight-foot wide bike path	0.5	0.75	1.0		
Curb Extension/Pedestrian Refuge Island/Handicap Ramp	2.0	3.0	4.0		
Accessible or Countdown Pedestrian Signals/ Intersection	1.0	2.0	3.0		
Bus Shelter	5.0	7.5	10.0		
"Super" Bus Shelter	10.0	15.0	20.0		
Bus Bench with Pad	0.5	0.75	1.0		
Information Kiosk	1.5	3.0	4.5		
Bike Locker (set of eight)	2.0	3.0	4.0		
Real-Time Transit Information Sign	10.0	15.0	20.0		
Static Transit Information Sign	0.25	0.4	0.5		
Maximum Trip Credits	60	90	120		

Staff recommends the following changes:

- Elimination of all measures in above table except the provisions of sidewalks and bikeways. Any applicant wishing or unable to provide sidewalks and bikeways must develop a mitigation proposal based on an \$11,000 per vehicle trip value as established by the Planning Board.
- Establishment of a formal system of collecting and spending the revenue generated from the \$11,000 per trip payment-in-lieu fees. Staff is currently working with the Montgomery County Department of Transportation to resolve the difficulties of applicants choosing non-auto transportation amenities including payment-in-lieu fees for applications mitigation fewer than 30 trips to satisfy PAMR requirements.

 The staff intent in summer 2008 was to update the \$11,000 per vehicle trip value annually based on the Construction Cost Index. While the Engineering News Record CCI rose 5.1% from April 2008 to April 2009 (higher than the general rate of inflation), staff recommends no increase to the \$11,000 value at this time based on our observation of County efforts to avoid actions that might dampen economic stimulus activities.

5. Alternative Review Procedures for Urban Areas

Transportation:

This Growth Policy should examine additional methods to incentivize development in our urban areas, where our transit investment and potential for non-auto commuting is greatest. Allocating development capacity to Metro Station Policy Areas (MSPAs) has been a part of the Growth Policy in Montgomery County for more than a decade. Over the years, the Planning Board has evaluated different ways to optimize the balance between the allocated development and adequacy of transportation capacity to accommodate that land use.

Currently, the LATR/PAMR Guidelines contain one Alternative Review Procedure. It allows development to satisfy both LATR and PAMR requirements by paying additional impact taxes and committing through a binding Traffic Mitigation Agreement to reduce 50% of their vehicle trips. The Alternative Review Procedure has been in place for over eight years and has not yet been tested (only the LCOR North Bethesda Project has entered into an agreement). Our understanding is that the risk of non-performance in the Traffic Mitigation Agreement process creates a level of risk that reduces the attractiveness of this Alternative Review Procedure.

Other Alternative Review Procedures could allow development to satisfy the adequacy of transportation facility tests without taking action under PAMR. The options listed below would create incentives to channel development into urban areas.

• Replace the LATR / PAMR tests in urban areas with replacement adequacy definitions per concepts outlined in the following bullets

Some have suggested that there be no mobility adequacy requirement for development in MSPAs. However, even if traffic congestion in the MSPAs is determined to be not a concern from a policy perspective, development within the MSPAs also increases traffic on major highways, arterials and primary residential streets connecting to the MSPAs. Therefore, staff finds that Alternative Review Procedures for PAMR in urban areas

• Establish congested operating speed requirements for arterials serving urban areas

Staff recommends that PAMR could be satisfied for development in urban areas if arterials affected by site traffic can be shown to maintain an adequate Arterial LOS as defined by PAMR

standards. Staff proposes to pursue the following elements for this Alternative Review Procedure:

- The Arterial LOS standard appropriate for each policy area would be applied to any arterial examined under this Alternative Review Procedure.
- An arterial will require analysis if the application will add more than 5 peak hour trips per lane at the MSPA boundary (mirroring the 5 CLV de-minimis policy already in the Growth Policy) in the peak direction.
- Both the peak hour in the AM and PM peak periods and in both directions will be analyzed (with removal of off-peak direction analysis considered at discretion of staff).
- A minimum of three runs must be made between 9 PM and midnight to establish the free flow speed.
- Sufficient runs need to be made during the peak hour to establish a 95% confidence level within +/- 3 MPH.
- SYNCHRO analysis software must be used to forecast the future volume and speed on the arterial with background traffic and site trip generation added to the existing traffic as an input into SYNCHRO to determine the arterial mobility under total future traffic conditions and any proposed mitigation actions needed to achieve an acceptable Arterial LOS.

• Establish cordon line caps (vehicles or seats) and/or long-term parking space caps to limit in-commuting to MSPAs to a maximum amount supported by the adjacent network

A cordon line limit of traffic volume for all major highways, arterials and primary residential streets at the boundary of the MSPAs was considered. In theory, as long as observed counts remained below the cordon line capacity, development can continue in the MSPAs. The limit could be set by allowing adjacent policy areas to "sink" to the lowest allowable levels of mobility as defined by PAMR.

The current Growth Policy has such a cordon line capacity for the Silver Spring CBD; development is ultimately capped by a PM peak hour outbound cap of 17,500 vehicles. This limit was established in conjunction with the master planning process. However, there are no interim staging requirements that phase development toward the ultimate cordon line cap, and all LATR and PAMR requirements still apply to Silver Spring CBD development. This cap provides a set of "suspenders" in addition to the LATR/PAMR "belt".

A future growth policy could examine combining the capacity of transit and highway systems to arrive at a "seats per hour" capacity ceiling for development within the MSPA. This could be accomplished by establishing a multi modal cordon line limit of transportation capacity around the MSPAs or urban area. For example, suppose the average traffic volume to capacity ratio of all roadways leaving an MSPA is 95%. A parallel measure of the volume to capacity ratio of all

transit modes could be calculated by counting the ratio of occupied seats in each transit mode to the total number of available seats. Suppose in the same MSPA, this ratio is 75%. The average transportation capacity of all modes in this area could be estimated to be 85% (the average of the two). With this policy, development can occur until the established limit of combined transportation capacity for the area is reached even if one of the two systems is operating above its congestion standard. Cordon line capacity could also then be increased by adding transit service.

Limit the number of parking spaces in the MSPAs to limit traffic increase in the MSPAs. A periodical inventory of long-term parking space capacity and utilization would be necessary to ensure that the demand does not exceed supply.

The Growth Policy should incorporate a parking cap in the White Flint Sector Plan area, per the recommendations of the White Flint Sector Plan:

- Establish an end-state long-term parking cap of 0.61 spaces (public and private) per employee
- Conduct an initial inventory of long-term parking spaces to establish a current baseline
- Establish interim parking cap ratios that interpolate between the baseline rate and the end-state ratio to use during transportation analysis needed to support moving from Stage 1 to Stage 2 and from Stage 2 to Stage 3.

The Growth Policy should also incorporate the White Flint Sector Plan proposal to replace LATR and PAMR with an implementation district that would assess transportation impact fees on a pro-rata trip generation basis to implement transportation system improvements recommended in the Plan.

In White Flint, therefore, the Growth Policy parking cap would have a staged implementation level (to be determined in Stage 1 of the Plan) and would replace the LATR/PAMR "belt" with the parking cap "suspenders".

6. Expansion of MSPA Alternative Review Procedures to additional urban areas

The entire North Bethesda Transportation Management District could be allowed to use Alternative Review Procedure (ARP) as a permitted procedure for APF testing. This area contains three MSPAs with permitted ARP testing for APF and the remaining area of North Bethesda surrounding these MSPAs could be permitted for use of ARP under the umbrella of the TMD to monitor traffic mitigation.

Staff recommends allowing all Urban Areas of the county as defined by the County Council in 2007 as part of the Road Code to be able to be tested for APF by the Alternative Review Procedure.

7. Proposed Revision to the Transportation and School Impact Tax

Transportation:

In the 2007 Growth Policy the Planning Board recommended structuring the transportation impact tax by land use and geographic location in the County, with lower rates for uses or locations that generated fewer vehicle trips and lower vehicle miles traveled (VMT). Examples of lower vehicle demand land uses are senior and high rise residential housing, where general retail generates considerably higher demand. The rates recommended by the Board also reflected an updated total cost of County portion of the Constrained Long Range Plan, effectively "what the transportation system would cost." The intent was to portion the tax to match the land use's average impact to the transportation system, so that new development would be levied a tax proportionate to that need. The rates were in some cases significantly higher than prior tax rates, and so the Council chose to not implement the higher VMT based rates as proposed, but did modify the rates to reflect a proportion of impact, if not the total amount.

Staff proposes to further refine the transportation impact tax rate to reflect geographic location in the county, and nest with other policies that reflect a proportionate benefit to locating closer to transit, based on the literature reviewed in considering changes to the LATR/PAMR trip generation rates. The housing schedule for the transportation impact tax should include a new category for housing in urban areas (other than Metro Station Policy Areas).

As described above, the MWCOG Travel Survey conducted in 2007 and 2008 found that housing proximate to regional activity centers generated both fewer trips-per-household and shorter vehicle-miles-traveled, reflecting higher non-automobile use and the proximity of jobs and services prevalent in land use clusters. An equitable approach to taxing the households in these areas would reduce the per capita tax for new dwellings appropriately, similar to the lower rates available in Metro Station Policy Areas. We therefore recommend a new category for these residences to coincide with Urban Areas classified in Chapter 49 of the County Code that are not in MSPAs.

Data from the 2008 MWCOG household survey shows a VMT rate of approximately two-thirds that of a residence located outside of an activity cluster. Households in MWCOG activity centers generated 19.6 VMT per day, compared to 29.3 VMT per day generated by households outside of the activity centers. Therefore, rates proposed are calculated as two-thirds that of the 2007-2009 adopted rate for general residential. These rates are shown in the table below, with the prior rates for MSPA and non-MSPA shown for context.

Figure 8. Proposed Transportation Impact Tax rates per Dwelling Unit for New Residential Development (FY 2010)

(proposed changes highlighted in *italic* text)

Building Type	Metro	Clarksburg	Other	General
	Station		Urban	
			Area	
Single-family detached residential	\$5,325	\$15,973	\$7,135	\$10,649
Single-family attached residential	\$4,357	\$13,070	\$5,809	\$8,713
Multifamily residential (garden apartments)	\$3,338	\$10,164	\$4,517	\$6,776
High-rise residential	\$2,420	\$7,261	\$3,226	\$4,840
Multifamily-senior residential	\$968	\$2,904	\$1,291	\$1,936

Schools:

Several jurisdictions nationwide have used square footage of new construction as the basis for assessing impact fees. Staff investigated the calculation of school impact taxes on dwelling unit size rather than type.

GIS was used to link parcel file data (which contains housing unit size) with data on household demographic characteristics. Student generation rates were calculated for single-family dwelling units by size and type. These student generation rates were multiplied by the per seat cost of school construction in order to calculate school construction cost impact by unit size and type.

Data limitations did not allow for a calculation of the school construction cost per square foot for multi-family dwelling units. In addition, linking the parcel file and demographic data yielded results that encouraged further investigation of the process.

Staff found that, although a shift to administration of the tax on a square foot basis could provide a more fine-grained methodology, preliminary analysis indicates that for all but the smallest single-family units this would result in an increase in the school impact tax. Current economic conditions reflect poor timing to recommend higher tax rates, even if the calculation is equitably proposed. This shift in methodology could be revisited again in the next Growth Policy.

Growth Policy Study: Appendix N – Smart Growth Criteria and Exemption

Lead Staff:	Pam Dunn, Mark Pfefferle, and Cathy Conlon
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Summary:

- The Smart Growth Criteria establishes an Alternative Review Procedure for Policy Area Mobility Review (PAMR) such that PAMR obligations can be offset for smart growth mixed-use projects near transit or basic services that exceed otherwise required energy efficiency and affordable housing criteria.
- In addition, the Smart Growth Criteria proposes an expansion of the Alternative Review Procedures into (Road Code) urban areas thereby encouraging mixed-use development and placemaking through the fulfillment of already planned density in areas with basic services designated as urban (town) centers.

The current adequate public facilities ordinance focuses on transportation tests, school tests and impact taxes that are designed to ensure that necessary facilities are provided as development occurs. This approach limits the locations where development can occur and in doing so, potentially limits the ability to create the types of sustainable, well-designed and strategic development that is desired.

Based on a review of best practices in the area of Smart Growth, great potential exists for development of an exemption process similar to California's SB375 legislation. In addition, LEED ND and LEED for New Construction and Major Renovation are well-known certification programs designed to encourage Smart Growth. Elements of these programs provide reliable standards for the assessment of sustainable development.

Under the realm of Growth Policy an exemption from an APFO finding (for transportation) should be based on design elements that improve transportation efficiency. Staff believes these elements should include the following prerequisites that lead to reduced auto travel:

- *Connectivity* Projects located in areas with the highest transit service or near several, other basic services
- *Diversity* Projects that provide a mix of residential and commercial uses as well as a mix of housing types

• *Design* – Projects built with compact design, taking advantage of the maximum zoning density

To achieve a better balance between capacity and more sustainable development, smart growth criteria are proposed to incentivize this goal. The proposed Smart Growth approach is divided into two categories – transit and basic services proximity; and urban area boundaries.

Transit & Basic Services Proximity

The Growth Policy must evolve into more than just a capacity measure. It should promote sustainability through design and infrastructure. If a project is designed to encourage walking to jobs or transit, and if it produces less carbon, these factors should be considered concurrently with traffic and school capacity.

Studies have shown that people living within a half mile of transit are more likely to commute via transit than car. California has recently led the nation in mandating higher densities near transit, citing the positive benefits of more compact growth.

This growth policy includes recommendations for incentives to be provided for smart growth development. A revised Alternative Review Procedure is proposed that would allow for projects meeting certain criteria to benefit from either a 100 percent or 50 percent PAMR offset. The amount would depend upon proximity to either transit, or basic services such as grocery stores, dry cleaners, community facilities, restaurants, etc.

Below is the *Smart Growth Criteria* whereby projects meeting the criteria are eligible for an offset in PAMR mitigation. The framework is designed to encourage development in areas that are well-served by transit or areas that are well-served by other services. In addition, these projects must provide a mix of residential and commercial uses; they must contribute to diversity in housing affordability; and they must make efficient use of resources through compact design and increased energy efficiency or production.

Montgomery County - Smart Growth Criteria

All projects must meet the following criteria to be considered							
for an Alternative PAMR Review:							
• Project must be mixed-use with a minimum 50% residential use and							
 Project must seek to achieve the maximum dens allowed in the zone (including all applicable bong plan and 	Project must seek to achieve the maximum density of the site using 75% or more of the maximum density allowed in the zone (including all applicable bonuses) subject to the limits specified in the master/sector plan and						
 Building(s) exceeds energy efficiency standards building renovation. Or, building(s) has on-site energy cost is off-set by the renewable production 	by 17.5% for new buildings or by 10.5% for existing nergy production such that 2.5% of the annual building on system (LEED New Construction/Major Renovation)						
 And, the project must provide either one of the f approval: 	ollowing above and beyond that required for plan						
 1 workforce housing unit (whu) or 1 mo equals one half the number of trips require trip to the cost of providing one afforda 	derately-priced dwelling unit (mpdu) for <i>x</i> trips – where x uiring mitigation times the relative cost of mitigating one ble unit.						
Mixed-Use Transit Proximity	Mixed-Use Urban with Proximity to Basic Services						
Projects that meet the following criteria are eligible for 100% PAMR offset:	Projects that meet the following criteria are eligible for 50% PAMR offset:						
 Project must be located within ½ mile of an existing or planned major transit stop or high-quality transit corridor. A high-quality transit corridor means a corridor with fixed route bus service where service intervals are no longer than 15 minute during peak commute hours. A project shall be considered to be within one-half mile of a major transit stop if all parcels within the project have no more than 25% of their area farther than one-half mile from a transit stop or corridor and if not more than 10% of the residential units in the project are father than one-half mile from the stop or corridor. A planned transit stop or corridor is one that is funded for construction within the first four years of the Consolidated Transportation Program and/or the Capital Improvement Program 	 Project must be located within a Road Code Urban Area and be located within ½ mile of at least 10 Basic Services ; Basic Services include but are not limited to: bank, place of worship, convenience grocery, day care, cleaners, fire station, beauty, hardware, laundry, library, medical/dental, senior care facility, park, pharmacy, post office, restaurant, school, supermarket, theater, community center, fitness center or museum, (based on LEED for New Construction/Major Renovation) 						

In other words, projects that are mixed use with 50 percent residential uses, that propose to build to a minimum of 75 percent of the allowable density of the zone, that meet minimum specific energy efficiency standards, and that provide additional mpdus or workforce housing at rates based on trip mitigation requirements of the overall project would then be assessed under one of the two following scenarios.

Transit proximity:

Developments within ½ mile of an existing or planned major transit stop or high quality transit corridor, including Metro, MARC, or a major bus station, would be eligible for a 100 percent PAMR offset. A planned transit stop or corridor must be funded for construction in the first four years of the Consolidation Transportation Program or the Capital Improvement Program.

Proximity to basic services:

This category recognizes that not all development in the County will be near a major transit corridor. Many of the 106 strip malls in the County do not qualify. However, they should be redeveloped in a more sustainable manner.

A strip mall on Route 29 could offer amenities that would reduce vehicle trips through mixed uses and a minimum of stores that provide services and products that residents and workers use on a daily basis, or what LEED for New Construction and Major Renovation defines as "basic services".

Basic services include grocery stores, dry cleaners, fire stations, medical office, fitness center, etc. People who live near these services frequently walk to them, reducing car trips. For projects that qualify, the PAMR requirement would be offset by 50 percent.

At the end to this appendix is an example of a project that could qualify for the PAMR offset under each of the above scenarios.

Urban area boundaries

Currently, an Alternative Review Procedure for PAMR is offered to projects in Metro Station Policy Areas. This Growth Policy proposes expanding the Alternative Review Procedures into all urban areas.

These changes are intended to encourage mixed use development in areas that are well-served by transit or by basic services. Moving capacity from commercial to residential development contributes to housing affordability, and energy efficiency. The smart growth approach to growth policy combines several positive elements of important initiatives that are surfacing across the country.

- transit proximity
- green building technology
- retail and service diversity
- compact development

Encouraging mixed-use projects close to transit and basic services will help reduce vehicle trips and promotes County's Climate Protection Plan goals. This is a first step to further work and research into how this approach can evolve with the next growth policy two years from now.

2009-2011 Growth Policy Case Study Examples of Smart Growth Criteria Effects

Case Study #1. Metro Station Policy Area (Such as Twinbrook) With 35% PAMR Mitigation Requirement

	_		Alte	ernative Review	Ali	ternative Review	Co	mparison:
	Samp	ole Proposal	Pro	pposal #1 -	Pr	oposal #2 -	Inc	reased FAR
	Grow	th Criteria	Dro	ked Use Transit	Pr Sc	oximity to Basic		thout
	GIUW	un chitena	I IC	DAIITIILY	50		IXC.	Sidemiai
Transportation Impact Tax Office								
GSF		82500		75000		75000		165000
Rate	\$	4.85	\$	4.85	\$	4.85	\$	4.85
Extension	\$	400,125	\$	363,750	\$	363,750	\$	800,250
Transportation Impact Tax Retail								
GSF		67500		60000		60000		135000
Rate	\$	4.34	\$	4.34	\$	4.34	\$	4.34
Extension	\$	292,950	\$	260,400	\$	260,400	\$	585,900
Transportation Impact Tax - High Rise Residential								
DU (subject to impact taxes)		0		129		136		0
Rate	\$	2,420.00	\$	2,420.00	\$	2,420.00	\$	2,420.00
Extension	\$	-	\$	312,180	\$	329,120	\$	-
School Impact Tax - High Rise Residential								
DU (subject to impact taxes)		0		129		136		0
Rate	\$	4,127.00	\$	4,127.00	\$	4,127.00	\$	4,127.00
Extension	\$	-	\$	532,383	\$	561,272	\$	-
	¢	602.075	¢	1 469 712	¢	1 514 540	¢	1 296 150
	φ	093,075	ę	1,400,713	9	1,514,542	φ	1,300,130
PAMR COSTS								
Applied toward MPDUs	\$	-	\$	731,500	\$	376,750	\$	-
Applied toward transportation projects	\$	1,342,000	\$	-	\$	753,500	\$	2,662,000
TOTAL PAMR COST	\$	1,342,000	\$	731,500	\$	1,130,250	\$	2,662,000
TOTAL PAMR COST PLUS IMPACT TAX	\$	2.035.075	\$	2.200.213	\$	2.644.792	\$	4.048.150
Total Development GSF	Ť	150000	Ť	300000	Ű	300000	Ť	300000
TOTAL PAMR COST PLUS IMPACT TAX / GSF	\$	13.57	\$	7.33	\$	8.82	\$	13.49

Case Study #2.	Suburban Area (Such as	Germantown East) With	100% PAMR Mitigation R	lequirement
----------------	------------------------	-----------------------	------------------------	-------------

	Samp Witho Grow	ble Proposal but Smart th Criteria	Alt Pro Miz Pro	ernative Review oposal #1 - xed Use Transit oximity	Alt Pr Pr Se	ternative Review oposal #2 - oximity to Basic ervices	Co Inc Wit Re	mparison: rreased FAR thout sidential
IMPACT TAX COSTS								
Transportation Impact Tax Office GSF Rate Extension	\$	45000 9.69 436,050	\$ \$	38250 9.69 370,643	\$\$	38250 9.69 370,643	\$\$	76500 9.69 741,285
Transportation Impact Tax Retail GSF Rate Extension	\$	5000 8.67 43,350	\$	4250 8.67 36,848	\$	4250 8.67 36,848	\$	8500 8.67 73,695
Transportation Impact Tax - Multifamily (Garden) DU (subject to impact taxes) Rate Extension	\$	0 6,776.00 -	\$ \$	22 6,776.00 149,072	\$ \$	27 6,776.00 182,952	\$	0 6,776.00 -
School Impact Tax - Multifamily (Non High Rise) DU (subject to impact taxes) Rate Extension	\$	0 9,734.00 -	\$ \$	22 9,734.00 214,148	\$ \$	27 9,734.00 262,818	\$ \$	0 9,734.00 -
TOTAL IMPACT TAX	\$	479,400	\$	770,710	\$	853,260	\$	814,980
PAMR COSTS								
Applied toward MPDUs Applied toward transportation projects TOTAL PAMR COST	\$ \$ \$	- 440,000 440,000	\$ \$ \$	258,500 - 258,500	\$ \$ \$	129,250 258,500 387,750	\$\$\$	- 605,000 605,000
TOTAL PAMR COST PLUS IMPACT TAX Total Development GSF TOTAL PAMR COST PLUS IMPACT TAX / GSF	\$ \$	919,400 50000 18.39	\$ \$	1,029,210 85000 12.11	\$ \$	1,241,010 85000 14.60	\$ \$	1,419,980 85000 16.71

How would the Smart Growth Criteria work in practice? Consider a hypothetical project in an area with partial PAMR mitigation (such as the Twinbrook Sector Plan area) with a 35% requirement (for FY 10). The affordable housing and PAMR requirements would be assessed as follows. First, the application must meet the following criteria:

- Within ½ mile of the Metrorail station (or other transit route with 15 minute frequency transit service during peak periods)
- Using at least 75% of the allowable density

- Minimum 50% residential use
- Meet specified energy efficiency requirements

Suppose the application had the following parameters:

- A 100,000 square foot site with a 3.0 FAR resulting in 300,000 square feet of building footprint,
- A 55% residential component, resulting in 165,000 square feet of residential space,
- A commercial component split between office (25% of the total building space) and retail (20% of the total building space)
- An average gross DU size of 1,000 square feet, resulting in 165 residential dwelling units, of which 12.5% (20 units) must be affordable and 10% (16 units) must be workforce.

This application:

- Would generate 379 peak hour trips,
- With 35% mitigation, 133 peak hour trips would require PAMR mitigation,
- At \$11,000 a trip, the PAMR mitigation would have an expected value of \$1,463,000

Under the Smart Growth Criteria, the applicant could be relieved of PAMR mitigation requirements if 50% of the PAMR savings, or \$731,500, were applied toward providing additional affordable housing.

If the applicant could be expected to take a \$50,000 loss on each affordable housing unit (the difference between the cost to build and the sales cost). The \$731,500 would cover approximately 15 units at \$50,000 each. Therefore, to meet the smart growth criteria, the number of affordable units would need to be increased from 21 units to 36 units (while retaining the 165-unit total).

The combination of PAMR and development impact taxes provides a financial incentive when considered on a per-square foot basis. This application would pay:

- \$937,000 in transportation impact taxes and
- \$532,000 in school impact taxes, for a total of
- \$1,469,000 in development impact taxes, plus
- \$731,500 in PAMR requirements redirected toward affordable housing, resulting in a total of
- \$2,220,500 in tax/PAMR payments, or about \$7.30 per square foot.

Without the Smart Growth Criteria, a similarly sized development of 300,000 GSF without a residential component:

- Would generate 690 peak hour vehicle trips
- With 35% mitigation, 242 peak hour trips would require PAMR mitigation,
- At \$11,000 a trip, the PAMR mitigation would have an expected value of \$2,662,000

The application without Smart Growth Criteria would pay:

- \$1,386,000 in transportation impact taxes and
- \$0 in school impact taxes, for a total of
- \$1,386,000 in development impact taxes, plus
- \$2,662,000 in PAMR requirements, resulting in a total of
- \$4,048,000 in tax/PAMR payments, or about \$13.49 per square foot.

Growth Policy Study:	Appendix O – Carbon Trading/Offsets at the Local Level
Lead Staff:	Mark Pfefferle

Summary:

The appendix demonstrates that further evaluations are necessary to identify a means to encourage reductions in future carbon emissions that are generated by growth.

In January 2009, Planning Department staff began working with a group of George Washington University Master of Public Policy studies to explore different methods of reducing greenhouse gases. Specifically, staff directed the students to research and explore various approaches to reduce greenhouse gases applicable to new development and redevelopment plans. The students found programs that address greenhouse gas emissions at the state and local levels to be in their infancy. Since the programs are new, there is little data available indicating the success of the programs in reducing greenhouse gas emissions.

The students identified three approaches to reduce greenhouse gas emission generated by development and redevelopment: direct regulation, offset the existing AFPO fees, or initiate new impact fees. The direct regulation approach would mandate developers implement greenhouse gas reduction actions during the development process. The approach to either offset the existing AFPO fee or new impact fees would provide incentives to induce developers to reduce greenhouse gas emissions by reducing existing or pre-requisites for fees so that the greater the greenhouse gas emissions the greater the fee reduction.

Staff is recommending a continued analysis of the various techniques to reduce greenhouse gases generated by new development. In particular, further analysis is needed to determine which of the approaches mentioned above are most appropriate for Montgomery County. All of the approaches would require developers employ and implement technologies that are not used elsewhere in the Washington Metropolitan area. Care would need to be taken to ensure that an approach does not become a disincentive for development and yield little of few results. Any program, such as the new fee program, must be used for the intended purpose, that is to reduce greenhouse gas emissions and not as an attempt to slow growth or raise revenue for the County. Furthermore, the students recommend and staff concurs that a full cost-benefit analysis be undertaken to determine the greenhouse gas reduction impact, cost savings to businesses, changes in desirability of developing in Montgomery County, historic

development rates, and transaction costs before implementing a greenhouse gas emissions program.

A copy of the Capstone report: "Strategies for Reducing Greenhouse Gas Emissions During Development and Redevelopment in Montgomery County, Maryland" and the accompanying appendices to that report can be found on the GrowingSmarterMontgomery webpage:

http://www.montgomeryplanning.org/research/growth_policy/growth_policy09/agp_growing_smarter.shtm

Growth Policy Study:	Appendix P – Literature Review: Costs of Growth
Lead Staff:	Krishna Akundi

Summary: Sprawl is a consequence of the market's failure to efficiently allocate resources. This market inefficiency manifests itself as a scattered or discontinuous or low-density development pattern. Low-density development patterns increase costs for all (businesses, residents, and governments) in the region. Thus, it is in everyone's interests to correct for those inefficiencies— for the costs of growth.

Local governments across the country have considered a range of remedies. These solutions include the application of an adequate public facilities ordinance, charging development impact fees, preserving open space and rural lands, creating transit-oriented developments and mixed-use centers. Guiding growth towards a compact form of development is a continuing effort and requires experimentation with new and innovative tools such as eminent domain, congestion pricing, land banking, and infrastructure funds; tradable development rights, mechanisms to offset developer's upfront costs, and varying exactions by distance from an urban core.

In this review staff surveys some of the academic research on the costs of low-density development— especially from journey-to-work travel patterns and public health; the provision of public services and infrastructure; land prices and housing affordability.

In this essay staff surveys some of the current research and analysis. The essay is organized into five sections: growth and density; sprawl as market failure; the physical, fiscal, and socio-economic costs; summary of potential remedies; and bibliography. Much of the work on the costs of growth/costs of sprawl is anecdotal, case-specific, contested, or lacks a causal link. More robust analytical studies are required. Only two of the articles we came across show a significant relationship between increasing density and lower per capita costs.

1. Growth and Density

A cornucopia of journal articles, literature reviews, working papers, and books have defined, described, or characterized sprawl (Wagner, et.al 2005; Khe and Grammy 2002). Common to all this established research: the density of development. Research shows that in a multi-nucleated region or polycentric city, the density gradient falls with distance from the central business district and from inner ring suburbs to developments (i.e. sub-centers) further out because of the large tracts of undeveloped land between them. Miezkowski and Smith (1991) find that as sub-centers relocate to the edge of established settlements they promote scattered development patterns resulting in heavy economic and social costs— the unintended consequences of growth.

1.1 Unintended consequences of rapid growth:

Robert Freilich in his 1999 text, From Sprawl to Smart Growth, discusses the battle that local governments are waging against unbridled growth, against low-density development. He describes these costs of sprawl in terms of its socio-economic impacts, i.e., on the community, housing, and jobs; its fiscal impacts, i.e., the costs to local governments of expanding road service, installing sewer and water lines to developments beyond the urbanized area, locating police stations and fire stations, and building new schools; and its physical costs as experienced by residents through traffic congestion, slow decline in environmental quality, and chronic illnesses.

Loudoun County, in this region, illustrates the unintended consequences of rapid growth. County supervisor Jim Burton in a series of presentations across Virginia reported that due to an unprecedented burst of population growth—a 50 percent increase between 2000 and 2007, and an additional 14 percent expected increase between 2007 and 2010— Loudoun County faced the following:

- A sharp but sudden increase in debt.
- Sixty-six percent increase in school enrollments: from 30,000 in 2000 to 50,000 in 2007.
- Unprecedented school construction activity. The County spent \$839 million on nearly 40 schools between 1993 and 2007. The County has budgeted \$1.38 billion in school construction for the 2007-2010 cycle: 27 new schools.
- An increase in property taxes: 200 percent increase between 1994 and 2007.
- Traffic congestion.
- Decline in air and water quality.
- Demand for higher levels of service.

Sprawl is not only a function of rapid population growth. Data show a number of urban areas, especially in the Northeast and Midwest, where population declined but land consumption increased: undeveloped and/or agricultural lands were converted to urban uses (Kolankiewicz and Beck 2001). This outcome is explained, in part, by push factors; factors such as crime, poor quality schools, and unresponsive public services that push residents from the urban core and inner suburbs to the periphery. There are also cases where population has increased but the amount of land consumed per capita has declined. This outcome may be explained by economic conditions, physical and political barriers to expansion, or land use controls.

Although the rate of per capita land conversion may have slowed or even reversed in some jurisdictions, in absolute terms open space, wetlands, and agricultural lands are still being lost to urban uses. Consequences include (Heimlich 2001; Sierra Club 1998):

- Between 1982 and 1992, according to the USDA's National Resources Inventory, 89,000 wetlands were lost. Wetlands serve as "natural sponges that soak up and store rain and run-off." With fewer wetlands, floods, flood deaths, and property damages caused by flooding would increase. Floods caused \$4.3 billion in damage each year from 1988 to 1997.
- In the state of Maine, unfettered development activity has harmed 200 of the state's 2700 lakes and placed another 300 at risk.
- Low-density development patterns impact water quality. Groundwater recharge diminishes because of paved surfaces. Underground water supplies decline because of increased demand. McAllen Texas, for example, experienced a 40 percent increase in population between 1990 and 1996, thus exerting pressure on its already scarce water resources.
- Water quality in rural areas suffers from the development of residential subdivisions. In many cases, public sewer service is not available in rural areas, prompting private developers to provide septic systems which soon become inadequate to meet demands. Development activity—that is neither managed nor controlled— could generate bacteria, suspended solids, nitrogen and phosphorous run-off, and sediment in nearby lakes, rivers, streams, or aquifers.
- An even more tangible consequence for local governments is the impact on the tax base. The cost to government from expanding roads, laying water and sewer lines, building schools, and providing police and fire protection and emergency medical services for people who live far way from existing infrastructure is far greater than the taxes, fees, and surcharges it collects. New developments at the urban periphery do not pay for themselves.

How do jurisdictions manage land conversions and their resulting consequences? Jim Burton, the Loudoun County supervisor, explains that in their case, state courts and the Virginia legislature rejected nearly all of the planning department's proposals to control unbridled growth: No to a building moratorium, an adequate public facilities ordinance, developer impact fees, and to using an affordability index. The Board of Supervisors was directed to apply tools already available in the zoning toolbox.

Ewing, Pendall and Chen (2005) in their article for Smart Growth America, and the Sierra Club (1998) in *Sprawl: the Dark Side of the American Dream* call for an array of measures including:

- Agricultural Zoning
- Conservation Easements
- Clustering
- Tax-base sharing
- Transit-Oriented Development
- Infill Redevelopment
- Rehabilitate abandoned or obsolete properties
- Create Mixed-Use Activity Centers

The difference between the options Loudoun initially considered and those recommended by the Sierra Club and Smart Growth America is the difference between growth control and growth management. Vicki Been (2005), in her review of the literature on impact fees and housing affordability, describes the difference:

Growth control refers to efforts to stop or limit growth through traditional regulatory tools such as growth caps or indefinite moratoria not tied to a particular goal, such as completing a comprehensive plan. Growth management means efforts to channel (but not stop or limit) growth into particular areas. Growth management may also take the form of concurrency requirements that seek to direct growth to areas in which infrastructure is already made available or planned, rather than allowing it to occur without regard to the availability of infrastructure (page 154).

The distinction between control and management is important because it influences how business, the development community, government, and residents perceive sprawl: "low-density, automobile-dependent development beyond the edge of service and employment areas [sprawl] is ubiquitous and its effects are impacting the quality of life in every region of America, in our large cities and small towns" (Sierra Club 1998).

1.2 Sprawl: for it or against it?

Among the first set of studies to make a case against low density development was a 1974 report by the Chicago-based Real Estate Research Corporation (RERC). Their report was commissioned by the U.S. Department of Housing and Urban Development and the Environmental Protection Agency. The authors of the study considered the typical costs involved in developing a 1,000 unit residential subdivision. The RERC team measured the costs of development, operation and maintenance under three scenarios (traditional low-density subdivision, combination, and dense development). Each scenario is based on a mix of housing unit types—single family, townhomes, and multi-family (walk-up or high-rise apartments). They defined costs as land and capital, streets and roads, utilities (sewer, stormwater, gas, electric, telephone), public services (police, fire, sanitation), public facilities (library, health care, churches, government), environmental effects (air pollution, water pollution), and personal costs (travel time, traffic accidents, and crime). The RERC study concludes that costs are 44 percent lower at higher densities. Under all three scenarios, land costs are constant and there is no significant change in the cost of building public facilities and schools. However, construction costs and infrastructure costs are highest for the traditional development pattern and lowest under the high-density pattern.

The RERC study has been criticized on three issues: first, it is a conceptual model and thus one cannot generalize from it and apply the findings to real world conditions; second, the assumptions about construction standards are wrong; and lastly it makes statements on socioeconomic status that are unfounded (Najafi and Mohamed 2006). What is important about the RERC study, however, is that thirty years later researchers continue to measure the association between low-density development and costs using almost the same set of variables.

There are an increasing number of case studies—Khe's analysis of Bakersfield (2002) and Coyne's of the Denver-Boulder region (2003)— that show the cost savings from implementing growth management measures or conversely cost burdens from maintaining conventional growth patterns. Using larger data sets to make cross-sectional comparisons allow researchers to make broad statements about sprawling metros and compact metros (Burchell 1998; Snyder and Bird 1998; McCann and Ewing 2003). Far too few analyses demonstrate an explanatory relationship between urban form and the cost of public services (Carruthers and Ulfarrson 2003).

The Transportation Research Board commissioned a study group to revisit the costs of sprawl. Burchell (1998) and his team measured the per-unit costs of conventional (sprawl) versus managed development patterns on (1) the conversion of land to residential and non-residential uses, (2) providing infrastructure, (3) providing public services and facilities (police, fire, emergency medical services, and schools), and (4) the journey-to-work. The *Costs of Sprawl, Revisited* differs from all other works in its scale: 742 counties across all four regions of the nation. Data indicate that these 742 would experience significant sprawl in the next 25 years; so what costs would accrue under a managed growth scenario and what costs would accrue under the conventional (sprawl) scenario. Some findings from the study group are listed below:

• Building a non-residential project in managed or compact setting results in a one percent cost-saving. (This finding applied in all four regions except the Northeast where it was 2 percent).

- Building residential where growth is managed could result in a savings of \$13,000 per unit.
- Adopting managed growth policies could save the nation nearly \$110 billion in road expansion and ten percent in road –lane miles over the next 25 years.
- Managed growth scenario could bring \$12.6 billion in infrastructure (water and sewer) savings. Regionally, the West would experience the largest savings-- \$5.5 billion; the Northeast only \$1.3 billion.
- Assuming local governments adopt a managed growth scenario, after 2025, municipal budgets could see a ten percent increase in annual savings (Burchell and Mukheriji 2003).

The numbers are quite large. Critics of the study claim that these large savings, which come after a 25-year period, are reported for impact. If the savings were reported on an annual basis, critics claim, the savings would be negligible. Cox and Utt (2004) hold that the assumptions and remedies laid out in *Costs of Sprawl* are wrong with respect to higher densities: higher densities do not result in lower per capita service costs.

Myers and Kitsuse (2001) writing for the Lincoln Land Policy Institute, review two sets of arguments: Ewing's support of compact development against Gordon and Richardson's implicit support of scattered development, and the views of the Bank of America against Wells Fargo. Their review of the competing bank reports is notable because the development community, in general, has stood against most land use and regulatory controls.

The reviewers find that the Bank of America report, *Beyond Sprawl: New Patterns of Growth to Fit the New California*, reviews development patterns in California. The document acknowledges the loss of wetlands and the impact of pollution on California's farms and agriculture. The report, however, is bereft of any analysis or specific prescriptions. Although, Bank of America should be credited for recognizing the impact "low-density single-use development that is removed from the central city and inner suburbs" has on economic growth and quality of life. As a rebuttal to the Bank of America document, Wells Fargo prepared the report, *Preserving the American Dream*. In its report, the Wells Fargo team contends that mass transit is inefficient and that leapfrog development will eventually lead to higher infill densities. Wells Fargo views development is dense. It is unclear what that study's standard is for dense development. It is clear that The Wells Fargo study falls on the side against compact development. Myers and Kitsuse fault the Wells Fargo study for not taking into account all the negative externalities of sprawl—specifically, its social and environmental costs.

2. Sprawl as Market Failure

Dense development— represented by a multinucleated or polycentric urban form— is more the rule than the exception in an efficient market economy. This is so because developers are more likely to economize on the use of land at expensive locations. They do so by substituting townhomes and multi-family units for single-family homes, and by constructing office buildings with higher floor area ratios (Bertaud and Malpezzi 2009). Market-oriented approaches to growth, however, are not always optimal. Sub-optimal choices include 'satisficing' by developers and hold-outs by land owners (Miceli and Sirmans 2004; Mohamed 2009).

2.1 Inefficient Allocation of Resources

Poor and inefficient allocation of resources occur, for example, when (1) residents do not account for all the costs associated with the journey-to-work choosing to drive and at peak times although other cost-saving commuter options are available; (2) local government must bear the costs for the public services and infrastructure required by new developments located far from established centers, and (3) the intangible benefits of open spaces are lost (Ewing 1995; Brueckner 2000; Ciscel 2001; Hernandez-Murillo 2001).

Bertaud and Malpezzi (2009) measured the relationship between urban form and population density for 48 large cities in twenty countries— eight are American cities. These researchers found that in market-oriented economies, density gradients flatten with income, population, and falling transportation costs. In other words, as people gain the ability to move away from the urban core they do so thus creating a low-density development pattern. However, low-density development patterns, "from an economic point of view, [are] deficient." Bertaud and Malpezzi would argue, based on a review of the literature, that the density gradient and price gradient follow one another up to a point. After that critical value, the price gradient begins climbing. A deficient spatial structure fragments labor and consumer markets; as the distance between people and places increases, the length of city infrastructure must increase which in turn increases capital and operating costs.

Even if we accept that the 'market' makes sub-optimal choices in urban development, Staley (2001) cautions against a top-down approach. An approach where local government does not take into account consumer preferences could lead to a situation where a jurisdiction's tools to manage sprawl inadvertently cause consumers to "vote with their feet" and exacerbate the very problem they were trying to solve. This is an example of regulatory failure— the public equivalent of market failure. Bertaud and Malpezzi find that regulatory failure is the reason for sprawl in centrally-planned economies. Some of these sub-optimal market choices include satisficing by real estate developers and hold-outs by land-owners for more money. Mohamed (2009) in a narrowly crafted analysis addresses the question: Why do residential developers prefer large exurban lots? Because of poor market information and the desire to reduce costs and increase profits, small-scale developers will satisfice. This behavior, Mohamed contends, results in metro area's having low-density and leap-frog development patterns. While land use and zoning reduce the risk of uncertainty, they do nothing to reduce the upfront costs that a developer would have to spend when building in dense areas. Mohamed (2009) suggests that municipalities bear the burden of upfront costs "for certain on-site infrastructures and be reimbursed by developers for these capital and interest costs when the lots are sold."

Miceli and Sirmans (2004) contend that, because of the hold-out problem, largescale projects such as housing developments and shopping centers will be underproduced in the urban core and inner suburbs. In the urbanized parts of metro areas, especially, land assembly requires negotiations with owners of multiple parcels. If any one of those small landowners should hold-out, the entire deal may fail. In contrast, developments at the urban fringe, more often than not, require negotiating with one large landowner. Miceli and Sirmans list a number of remedies—all of them well-known and used— to solve the hold-out problem but the most interesting of these is their call for the government to use its power of eminent domain to facilitate efficient development through urban renewal.

Despite evidence showing sprawl as a failure of the market and the positive effect that land use and zoning have in curbing negative externalities, there remains a chorus who defend low-density development: sprawl is a symptom of consumer preference and any attempt to manage or control "sprawl" would result in a decline in American's standard of living (O'Toole 2007; Gordon & Richardson 2000; Brueckner 2000).

Gordon and Richardson (2000) dismiss the premise—sprawl as market failure entirely. These authors review each of the arguments for smart growth and offer a counter-argument. They conclude: "smart-growth prescriptions weaken property rights and limit the power of markets to deliver growth." Yet, perhaps, it is the advocates of sprawl who miss the mark. Growth for the sake of growth is not a good thing. If bad decisions result in a landscape of isolated and abandoned structures and those structures remain empty for years, then is it not a burden on the tax base and on adjacent owners whose property values decline?

Cox and Utt (2004) analyzed the statistical relationship between expenditures and growth across 700 municipalities. Expenditures were restricted to total municipal spending, water and wastewater utility charges. Growth was measured in terms of 12

variables including population density. Model results showed that 71 percent of the variation in total municipal expenditures could not be explained by growth.

3. Physical, Fiscal, and Socio-Economic Costs

3.1 Traffic Congestion

Ewing, Pendall, and Chen (2005) compared travel times between most sprawling metros and least sprawling metros. Residential density strongly influences the amount of driving per person. For example, workers in Atlanta, which has a high sprawl index, travel 34 miles daily per capita compared to New Orleans which has a low sprawl index and workers travel 15 miles daily per capita. Reid and others also found that in the most sprawling metros

- People drive more and own more cars
- Fewer people get to work by taking public transit and walking
- Increased incidence of accidents and fatal crashes

The Surface Transportation Policy project analyzed congestion in 70 metropolitan areas over a fifteen year period. They concluded that areas investing heavily in road capacity fared no better than those that did not in easing congestion (Cervero 2001). Cervero in a 2001 study had two objectives:

- To dissuade environmentalists and other critics of road investments from making the dubious claim that there is some cause effect rationale between highways and sprawl: congestion is a negative externality from the use of roads not from the road itself.
- Call for more research on road expansion, urban growth and induced travel using a path model.

Cervero's long-term path model acknowledges that the benefits of supplying a road lane are an increase in roadway speed and development activity. These benefits create a demand-- more vehicle miles travelled (VMT). His study found that, at least in California, it takes between 2 and 3 years for development activity to respond to road expansion and another three years for VMT to respond to development activity. Growth

in VMT, of course, feeds back into freeway investment several years later. His model explains 55 percent of the relationship between road expansion and VMT.

While a road building program is unlikely to erase traffic congestion, Cervero discovered that Houston has come closer to that goal than other jurisdictions – fifteen years and billions of dollars later. Cervero concedes that investment in roads will invariably create land use shifts and increased VMT, so the question is how to minimize negative externalities from land use decisions and maximize scarce transportation resources. He suggests that we should consider building more bus rapid transit systems, applying 'value-pricing' on current carpool lanes, and account for the social costs and benefits of the transportation-land use nexus.

William Coyne (2003), in his case study of Colorado and the Denver metro area, finds that building local roads costs 25 percent less in compact cities than in low-density communities. Following a smart growth strategy could save the metro area \$4.0 billion in road and highway construction over 25 years.

3.2 Public Health Impacts of Urban Sprawl

Staff at the USDA's Economic Research Service, writing on *Development at the Urban Fringe and Beyond*, cites that one impact of traffic congestion is air pollution. Air pollution in turn increases smog and other pollutants which translate into respiratory problems such as asthma for some. Frumpkin (2002) argues that there is a relationship between sprawl and public health. Low residential density, low employment density, low connectivity, is associated with less walking and bicycling and with more automobile travel. Twenty-five percent of all trips in the U.S. are shorter than one mile; however 75 percent of us make that trip by car. A sedentary lifestyle is responsible for obesity and other vascular problems.

McCann and Ewing summarize the findings from a 2003 national study of 83 metro areas and their counties. Based on their review of the literature on the health effects of sprawl, McCann and Ewing conclude that community design influences how people travel and how physically active they are in the course of a day. In the 2003 national study, researchers measure urban form in terms of residential density and street connectivity. Physical activity is measured in terms of hypertension rates, obesity, and body-mass-index. To increase physical activity, McCann and Ewing recommend that jurisdictions narrow streets at intersections, create raised crosswalks, install traffic circles, and lay bicycle and pedestrian infrastructure. Some of the findings:

- Hypertension rates are 3.3 points lower in compact counties than in sprawling counties.
- 71 percent of the parents of school age children walked or biked to school when they were young but only 18 percent of their children walk or bike to school
- 19 percent of adults in a sample of compact counties were obese compared to 22 percent of adults in sprawling counties
- A state-by-state analysis, conducted in 2001, showed that Colorado has fewer obese adults: 10-14 percent. In nearly a fifth of the states (including Maryland and Virginia) 15-19 percent of the adult population is obese. In the vast majority of states, 20-24 percent obese. Mississippi's adult obesity rate is over 24 percent.
- In the state of Maryland, Montgomery County, Prince George's County, and Baltimore City are compact.
- In a sample of 83 metro areas, 2 percent of the population in sprawling metro areas chose to commute by transit compared to 7 percent in compact metro areas.

3.3 Infrastructure Costs and Public Services Provision

It is the fiscal argument that perhaps provides the best support for growth management measures. Cox and Utt (2004) tried but, according to Litman (2004), fail to prove that developments at the fringe of urban settlements do not have a negative impact on local budgets. Litman focused in on their claim that the savings from smart growth are trivial. Cox and Utt only looked at water and wastewater charges when they should have examined the full range of public services: including the costs of providing electricity, sanitation, schools, and roads. In the second place, their unit of analysis was not properly specified. Cox and Utt measured municipal expenditures. Most "sprawl" occurs outside of existing municipal boundaries.

Coyne (2003), in his case study of the Denver metro area, examined the potential net cost savings, over a five year period (2000-2005), from providing services to new subdivisions under four development patterns.

Development Pattern	Cost Savings
Sprawl	\$0
Rural Clusters	\$22,000,000
Land Protection	\$17,000,000
Urban Growth	\$81,000,000

Heimlich and Anderson (2001) reviewed five case studies of managed growth in New Jersey, Michigan, South Carolina, Kentucky and Delaware. In all instances, low-density development generally resulted in greater public capital and operating costs for infrastructure:

- 25 percent higher for local roads than in planned developments
- 20 percent higher for utilities than in planned communities
- 5 percent higher for schools than in planned communities

Synder and Baird (1998) in their report to the U.S. Department of Energy contend that sprawl is subsidized. There are hidden charges that are not taken into account when evaluating the costs of development. They call for using a fair-share costing method. Usually when comparing costs under a high-density scenario and a low-density development scenario, only the hard and soft costs of construction are considered. High density development is more expensive. However, when VMT and driving subsidies are taken into account, the balance changes in favor of higher densities.

According to Snyder and Baird, developer impact fees are one form of fairshare costing. They also reviewed costing strategies applied in Lancaster California, Boulder Colorado. In Lancaster, the city instituted an Urban Structure Program (USP) where surcharges for the provision of infrastructure are levied by distance from the urban core. Since the USP went into effect, the city has experienced growth but all of it within the urban core not at the edges of the city. Boulder instituted a development excise tax to vary by residential development type.

Several case studies have shown that per unit costs of providing public services (particularly infrastructure) decreases with higher densities. However studies by Ladd and Yinger (1991) and Ladd (1994) turned that argument up-side down. They found that the relationship between density and cost may in fact be U-shaped. In other words, at some tipping point, higher densities lead to the diseconomies of scale—with infrastructure costs 43 percent higher in increasingly dense counties.

Carruthers and Ulfarrson (2003) were skeptical of those results. They developed an ordinary least squares regression model to examine the influence that alternative development patterns have on twelve measures of public expenditure: direct spending, capital facilities, roads, other transportation, sewerage, trash collection, housing and community development, police, fire, parks, schools and libraries, across 283 metropolitan counties. For many services, the cost per unit of development rises as densities decrease. In other words, low-density, spatially expansive development patterns lead to greater costs because of the large investments required to extend roads and other types of infrastructure that transmit water, sewage, electricity and other services long distances to reach relatively fewer numbers of people. The curve identified by Ladd and Yinger does occur but it appears to be restricted to those metro areas with a wide geographic spread and the relative strength of the property tax base.

3.4 Socio-Economic Costs of Low Density Development

Been (2005) reviewed the literature on the cost of smart growth-- specifically the influence of impact fees on housing affordability. It is her assessment, and one echoed by others, that impact fees have a negligible impact on housing affordability and that more importantly they are an effective growth management tool. Fees are predictable and more likely to be accepted by the development community. Perhaps for this reason, development fees have little effect on the rate of new construction.

Impact fees certainly increase the price of housing. Waddell and Blanco (2004) conducted a least-squares regression analysis measuring the influence of impact fees on the sales price of new single family homes in King County, Washington. They found that a \$1 increase in impact fees is correlated with a \$1.66 increase in house price. With respect to high quality housing, a \$1 increase in fees leads to a \$3.58 increase in house price.

Been also reviewed work by Ihlandfeldt and Shaughnessy (2004) showing that impact fees reduced the property tax rate after a 3-year lag. They analyzed the impact fee home sales relationship in Miami-Dade County Florida. Land prices also declined by eight percent due to the use of impact fees.

One critique of impact fees is that they are regressive. Been cites work showing that basing impact fees on housing type and unit size reduces the regressive character of the fee.

As a counterpoint to Been's 2005 piece, is a 1982 article by Dowall and Landis "Land-Use Controls and Housing Costs: An examination of San Francisco Bay Area Communities". Dowell and Landis find that land use controls particularly those that encourage higher densities have an inflationary effect on land values, and restrict new development. Dowall and Landis urge local governments that are committed to reducing housing costs to loosen density restrictions and/or other controls that inhibit the flow of new housing on the market. In their analysis they appear not to take into account the cost of infrastructure or the cost of providing other public services.

4. Remedies

How can jurisdictions minimize or reduce the costs of low-density development? Research presented in the published articles we reviewed offer solutions that are similar to those already pursued in Montgomery County: the application of an adequate public facilities ordinance, charging development impact fees, preserving open space and rural lands, creating transit-oriented developments and mixed-use centers. Tools that the County has not used include urban growth boundaries, varying fees by distance, and eminent domain, congestion pricing, land banking, infrastructure funds, and mechanisms to assume or offset a developer's upfront costs.

- The Urban Growth Boundary (UGB), first used in Portland Oregon, has emerged in other jurisdictions: Boulder Colorado, Minneapolis-St. Paul, Virginia Beach, Lexington Kentucky, San Jose California, and Miami-Dade Florida. Growth boundaries, however, have not proven effective in all settings. Knox County Tennessee instituted a UGB but a recent evaluation by researchers at the University of Minnesota found that Knox County's UGB was unable to effectively prevent sprawl. There are no examples of a UGB or USB (urban service boundary) t in the Washington DC region. It may not even be necessary for Montgomery County where its agricultural reserve serves as a boundary. Moreover, it has other tools directing growth and density to its CBD's and activity centers.
- Varying exactions by distance and development type. In Lancaster, California, the impact fee charged a developer varies based on distance from the urban core. So you could have a situation where the fee is low within a 2-mile radius of a CBD, but increases by some increment as distance increases. Boulder also has experimented with varying charges but based not on distance but development type. Developers building single-family pay a higher fee compared to those building townhomes or multi-family.
- Applying the power of eminent domain to direct development activity to already dense centers. Although the method is controversial, the courts have weighed in favor—see *Kelo v. City of New London, Housing Authority of Hawaii v. Midkiff, and Poletown Neighborhood Council v. City of Detroit.*
- Congestion Pricing. If roads are not being used efficiently then congestion pricing or congestion tolls could correct for this problem (Bogart 1998). The theory is that congestion pricing gives consumers the true cost of the journey-to-work and thus allows them to consider alternative modes of travel: bicycle, bus, rail, foot. The Montgomery County *Businesses Gazette* in a May 21, 2008 issue, noted that although its use was rejected in New York, other cities have

adopted this technique: London, Singapore, San Diego, Orange County California and Lee County Florida.

- Congestion tolls could be used on those roads with heavy traffic or during peak hours of the day. Bogart (1998) suggests that implementing congestion tolls is made easier by technology: GPS systems, satellites, traffic cameras, and automatic vehicle identification tags.
- Infrastructure Fund.
- Land Banks

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