
APPENDIX B. PRO-RATA SHARE PROGRAM EVALUATION

B.1 Introduction

Across the United States, municipalities utilize mechanisms such as storm water utilities and pro rata share programs to fund activities required to comply with the U.S. Environmental Protection Agency (EPA)'s storm water program. To provide an effective storm water management program, the City of Chesapeake collects fees from residents through a storm water utility and collects fees from developers through a pro rata share system.

An increase in impervious area is associated with an increase in runoff. As properties are developed, runoff, and associated storm water management costs, increase. The City has developed a Master Drainage Plan (MDP) for each of its watersheds that designates storm water system improvements necessary to accommodate future growth in that watershed. The pro rata share program allocates a portion of the costs of the required improvements to the developments that necessitate those improvements. Potential improvements could include regional ponds, new culverts, and channel improvements.

The Milldam Creek watershed is largely developed, and additional development is planned. Accommodating additional development will require that existing infrastructure be improved and/or that new infrastructure be constructed. This document evaluates the use of pro rata charges to make necessary improvements in the Milldam Creek watershed to address current and future storm water management issues.

B.2 Pro Rata Share Calculation Options

Pro rata fees are often based on impervious area, since runoff quantities are related to impervious area. A number of methods exist for including runoff generated by a property in pro rata fee calculations. The City of Chesapeake currently includes impervious area in pro rata fees via the rational coefficient. Four common methods for determining pro rata charges, including the City's current method, are discussed in the following sections.

B.2.1 Pro Rata Share Calculations Based on a Billing Unit

This method utilizes an equivalent service unit, most commonly an equivalent residential unit (ERU). The ERU uses a uniform impervious area for all single-family residences. All single-family residential parcels are charged the same rate, while non-residential and possibly multi-family parcels are charged a rate based on the amount of impervious area (to the nearest ERU) for the property. For example, if the ERU is set at 2,000 square feet, all single-family residences are assessed at the flat rate of one ERU. The ERU for non-residential property is calculated by dividing the impervious area of the property by the impervious area of an ERU. For this example, a commercial property with 10,000 square feet of impervious area would be assessed as having five ERUs (10,000 sf/2,000 sf).

Using the ERU method eliminates the need to calculate impervious area for individual single-family residences. A development with 100 single-family homes would be charged 100 times the ERU rate. Calculations would be required for non-residential, and possibly multi-family, properties. The benefits of this method include ease of administration and fairness.

Impervious area based on a billing unit is an easily understood method and rate differences are justifiable. Charging the same rate for all single-family residences has typically been found to have a high degree of acceptability since these uses are normally considered to have similar contributions to runoff problems. In addition, charging higher fees to more intensely developed properties such as non-residential properties, in

approximate proportion to the increased amounts of runoff, has typically been found to be acceptable. The City currently uses the ERU method for its storm water utility, with one ERU set at 2,112 square feet.

B.2.2 Pro Rata Share Calculations Based on Actual Measurement of All Parcels

This method is similar to the impervious area based on a billing unit method, except developers would be required to provide the proposed impervious area for every development, including single-family residential developments. This approach provides a more equitable system than the billing unit method, but is more labor intensive, as calculations would be required for all proposed developments.

B.2.3 Pro Rata Share Calculations Using Rational Coefficients

The method, currently utilized by the City, involves utilizing rational coefficients based on land use to determine the pro rata coefficient. Table B-1 provides typical weighted coefficients used by the City, as provided in the City’s Public Facilities Manual (PFM), revised July 2001.

Land Use	Weighed Runoff Coefficient
Farmettes (3 acre)	0.30
Residential (1/2 acre or more)	0.35
Residential (10,000 sq. ft. or more)	0.40
Residential (less than 10,000 sq. ft.)	0.45
Apartments and Townhouses	0.70
Parks, Lawns, Etc.	0.20
Woodlands	0.10
Industrial and Commercial	0.75 (min)
Cultivated Land	0.25
Gravel Parking Lots	0.90 (post-devel.) 0.65 (pre-devel.)
Retention/Detention Easements	1.00

According to Chapter 5 of the PFM, the following equation is used to calculate the pro rata share coefficient:

$$PRC = CI / (C \times A)$$

- where:
- PRC = pro rata coefficient
 - CI = total cost of improvements required by the adopted Master Plan for the respective drainage sub-basin or area
 - C = ultimate composite rational coefficient anticipated under the approved future Land Use Plan
 - A = total area of the watershed (acres).

The PRC is then used to calculate the developer’s pro rata share using the following equation:

$$\text{Pro rata share} = PRC \times C \times A \times RF$$

- Where:
- PRC = pro rata coefficient
 - C = ultimate composite rational coefficient for the development
 - A = total acreage of the development
 - RF = reduction factor for detention specified in MDP (based on the reduction in the C factor and the percent reduction in discharge for the design storm event).

This method is less objective than the impervious area based on a billing unit or the measured impervious area methods since the assumption of a rational coefficient reduces objectivity. However, the method is more easily implemented, as exact calculations of impervious area are not necessary.

B.2.4 Pro Rata Share Based on a Flat Rate

The flat rate method charges the same amount for all property owners within a particular land use classification. For example, each commercial parcel could be assessed \$5,000, while each single-family residential parcel could be assessed \$100. The flat rate is the easiest fee structure to implement, but has poor fairness and equity since the fee is unrelated to the individual property's actual contribution to the storm water problem. Consequently, this alternative is not recommended for use by the City and is not considered in additional detail in this document.

B.2.5 Summary of Calculation Methods

It is important that the method selected to compute pro rata fees be both fair and implementable. At times, these two requirements conflict with one another, as methods that are easiest to implement, such as charging a flat rate, are often less fair; and the most fair methods, such as charging a fee based on an actual measurement of impervious area on a parcel, are more labor intensive and difficult to implement. Of the options discussed for calculating pro rata shares, only the first three options, calculations based on a billing unit, calculations based on measurement of impervious area, and calculations using rational coefficients, are considered to be viable alternatives.

B.3 Credits

The City's current method for calculating pro rata shares offers credits to developers who construct elements or portions of elements that are recommended in the MDP. Credits could also be offered for storm water management facilities that are not included in the MDP. Credits offered for the implementation of storm water best management practices (BMPs) would reduce revenue; however, the BMPs could also reduce actions required by the City, thereby reducing revenue requirements. The City of Chesapeake's storm water utility provides credits for specified BMPs.

Benefits of a credit system include an increased use of BMPs that provides additional storm water benefits to the City, a reward to developers who implement BMPs, and increased equity of the fee structure. It also can be beneficial for community relations since developers are given options for lowering their pro rata fee. However, a credit system would require an additional administrative burden for the City, and would likely reduce the revenue generated by the pro rata share system. It could also undermine regional plans for storm water management, as developers received credits to implement smaller, localized facilities, reducing funding for planned regional facilities.

At this time, it is recommended that the City continue to provide credits for facilities specified in the MDP, but not for additional storm water facilities that are not part of the MDP.

B.4 Recommended Improvements in the Milldam Creek Watershed

The purpose of the pro rata share is to fund recommended improvements in the watershed. Therefore, the amount of the fee depends upon the cost of the improvements needed in the watershed. The 2004 Milldam Creek MDP recommends four improvements to decrease the likelihood of flooding and to accommodate growth in the watershed. Table B-2 summarizes the drainage improvements recommended in the Milldam Creek watershed.

Table B-2. Recommended Drainage Improvements In The Milldam Creek Watershed	
Improvement	Estimated Cost to City (2004 Dollars)
32-Foot Bridge at Campostella Road	\$683,289
Widening Channel to 40 Feet Between Campostella Rd. and Military Hwy.	\$293,551
Second 6x6 culvert under Military Hwy.	\$253,750
Two New Stormwater Management Basins East of Battlefield Blvd.	\$0 (assumes City will require developer to construct basins) ¹
TOTAL	\$1,230,590
¹ These basins will be required for development of the associated parcels and are not considered to be a regional improvement eligible for credit under the Milldam Creek Master Drainage Plan.	

B.5 Pro Rata Fee Determination

In this section, the pro rata fee is calculated using the billing unit, measurement of impervious area, and the rational coefficient methods. The basis for the fee is \$1,230,590 in improvements, described in the preceding section. Approximately 71 acres in the Milldam Creek watershed are currently proposed for development. An additional 190 acres of potentially developable large parcels were identified in the watershed. Based on the SWMM model developed for the watershed, the future conditions impervious area was estimated to be 168 acres.

B.5.1 Pro Rata Fee Based on a Billing Unit

For the purposes of this analysis, it was assumed that a billing unit was based on an ERU, defined as 2,112 square feet by the City’s stormwater utility. The total impervious area of future development was estimated to be 168 acres, or 3,463 ERUs (168 acres x 43,560 square feet per acre/2,112 sq. ft.). Based on these assumptions, the pro rata fee for a developer would be \$356 per impervious ERU (\$1,230,590/3,463 ERUs).

As an example, the pro rata fee was calculated for the proposed property identified as Space Cadets Storage, located north of Military Highway and east of Campostella Road. Preliminary plans for the property specify a total area of 5.4 acres and a future imperviousness of 50 percent, or 2.7 acres. This corresponds to 56 impervious ERUs (2.7 acres x 43,560 square feet per acre/2,112 sq. ft.). When calculating the fee based on an ERU, this property would pay a pro rata fee of \$19,936 (\$356 per ERU x 56 ERUs).

B.5.2 Pro Rata Fee Based on Measurement of Impervious Area

This method is similar to the billing unit method, except fees are based on actual impervious area rather than a billing unit. The pro rata fee would be based on the future impervious area in the watershed, estimated to be 168 acres. Therefore, the fee for a developer would be \$7,325 per impervious acre (\$1,230,590/168 impervious acres).

The pro rata fee using measurement of impervious area was calculated, again using the proposed Space Cadets Storage property as an example. The pro rata fee for this property, with a proposed impervious area of 2.7 acres and a fee of \$7,325 per impervious acre, would be \$19,778.

B.5.3 Pro Rata Fee Based on Rational Coefficient

As specified previously, the City defines the pro rata coefficient as:

$$PRC = CI / (C \times A)$$

where: PRC = pro rata coefficient
 CI = total cost of improvements required by the adopted Master Plan for the respective drainage sub-basin or area
 C = ultimate composite rational coefficient anticipated under the approved future Land Use Plan
 A = total area of the watershed (acres).

The total area of the Milldam Creek watershed is 2,275 acres, with an estimated future rational coefficient of 0.65. Assuming a total cost of \$1,230,590 for improvements in the Milldam Creek watershed, the PRC is calculated to be \$833 per acre.

The potential pro rata fee for the proposed Space Cadets parcel was calculated using the rational coefficient method. The area of the parcel is 5.7 acres, and the rational coefficient is assumed to be 0.75, the minimum for a commercial/industrial property. For this example, the developer does not construct any storm water structures specified in the MDP, so there is no reduction in the fee. Therefore, the pro rata share for this parcel is calculated to be \$3,561 (\$833 x 0.75 x 5.7 acres).

B.5.4 Pro Rata Fee Determination Summary

As shown in the above examples, the City's current equation utilizing the rational coefficient results in pro rata charges that are significantly smaller than charges calculated using the billing unit or measurement of impervious area methods. This occurs because the City's equation for calculating the pro rata coefficient averages the cost of improvements over the impervious area in the entire watershed, while the billing unit and impervious measurement methods average the cost over the additional future impervious area only. In a developed watershed, such as the Milldam Creek watershed, it would be difficult to realize the full cost of recommended improvements using the City's current equations.

B.6 Conclusions

The pro rata fee is a necessary program to fund storm water improvements in the Milldam Creek watershed. A number of methods are available to calculate the fee; three potential methods are discussed in detail in this document. The rational coefficient method will likely fail to generate sufficient funds to implement the projects identified in the Master Drainage Plan for Milldam Creek, and therefore is not recommended. Of the remaining two potential methods, the billing unit method is more easily implementable and the measured impervious area method is more equitable.

The billing unit method and the measured impervious area method will generate roughly the same income. For non-residential properties, the fees calculated using the two methods should not differ significantly. The main difference in fees generated using the two methods would occur in the cases of very large or very small single family homes, with very large homes paying more when impervious area is measured and very small homes paying more when the billing unit method is utilized.

Developers often submit plans for single-family developments before individual house plans have been selected. Therefore, the impervious area of the development, and the corresponding impact on storm water management, is not known at the time of plan submittal. Utilizing the billing unit method would facilitate the calculation of pro rata fees for this situation.

In order to generate sufficient funds to implement the storm water improvement projects recommended in the Milldam Creek MDP while treating developers fairly and remaining implementable, the City should consider utilizing the billing unit method for calculating pro rata fees in the Milldam Creek watershed. An ERU should be defined as 2,112 square feet to be consistent with the City's storm water utility. Based on the information and assumptions provided in this report, the pro rata charge should be \$356 per ERU (2004 dollars) for the Milldam Creek watershed. The City should revise the pro rata charge per ERU as necessary to account for inflation, revised land use information, changes in the definition of an ERU, and revisions to the MDP.