Green Infrastructure Advisory Committee Report

Stormwater Management Fee Policy Options and Recommendations

Prepared for

City of Lancaster, PA

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CH2MHILL®

1717 Arch Street

Suite 4400

Philadelphia, PA 19103

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Acronyms and Abbreviations

AO	Administrative Order
AWWTF	advanced wastewater treatment facility
BMP	best management practice (stormwater control, sometimes used interchangeably with GI)
CIP	Capital Improvement Program
City	City of Lancaster
CSO	combined sewer overflow
CSS	combined sewer system
ERU	equivalent residential unit
GI	Green Infrastructure
GIAC	Green Infrastructure Advisory Committee
IA	impervious area
LOS	level of service
LTCP	Long-Term Control Plan for CSOs
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
PA DEP	Pennsylvania Department of Environmental Protection
sf	square feet
SFR	single-family residential
SWMF	stormwater management fee
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency
WIP	Watershed Implementation Plan

Executive Summary

Background

Numerous drivers requiring changes to the way the City of Lancaster (the City) manages urban stormwater runoff support the need for a dedicated cost recovery source, all of which are addressed in the City's Green Infrastructure (GI) Plan.

In early 2008, the U.S. Environmental Protection Agency (USEPA) requested information on the City's Long-Term Control Plan (LTCP) for combined sewer overflows (CSOs). In response, the City prepared an update to its LTCP. The City is continuing to discuss the adaptation of the CSO control program, which historically has relied on optimizing the "grey infrastructure" (underground combined sewers that divert a significant fraction of all sanitary wastes to the City's advanced wastewater treatment facility (AWWTF)). The City has completed upgrades and expansions of all pump stations and a biological nutrient reduction project at the AWWTF over the last 12 years in compliance with the "grey infrastructure portion of the LTCP, at a cost of over $32M for city rate payers.

More recently the City has moved away from additional storage originally projected to be constructed in the 1998 LTCP towards planning and implementation of GI throughout the city to reduce CSOs as well as to respond to the evolving requirements of the Chesapeake Bay Total Maximum Daily Load (TMDL) and associated Watershed Implementation Plan (WIP) being prepared by Pennsylvania Department of Environmental Protection (PA DEP). Compliance with the Chesapeake Bay TMDL is a requirement of the City's Municipal Separate Storm Sewer Systems (MS4)[1] permit, which sets requirements for stormwater management in areas not served by the City combined sewer system. By managing runoff quantity and quality, implementation of the GI Plan throughout the City helps with compliance with both CSO LTCP and the MS4 permit, and Bay TMDL. In addition, since 2003 the City's first flush ordinance has required that stormwater from new impervious area be managed on-site.

"**Lancaster is in violation** of the AO, and needs to address these deficiencies as soon as possible. Violation of the terms of the AO may result in **further USEPA enforcement** action for violation of the order and for the underlying violations including, but not limited to, imposition of **administrative penalties**, 33 U.S.C § 1319(g), and/or initiation of judicial proceedings that allow for **civil penalties of up to $37,500 per day**, 33 U.S.C § 1319 (b) and (d), for each day of violation."

The TMDL is a tool of the federal Clean Water Act and requires the City to reduce pollutant loads to the Chesapeake Bay. The TMDL sets binding limits on nutrient (nitrogen and phosphorus) and sediment pollution, and seeks to ensure that all practices to restore the health of the Bay are in place by 2025, with 60 percent of the actions taken by 2017.

These regulatory programs will all require the City, like all municipalities in the County, to invest in controls that reduce stormwater runoff, CSOs, and the pollutants they contain. The GI Plan completed by the City in 2010 seeks to address all of these new regulatory requirements in an integrated manner that focuses on fixing other necessary City infrastructure at the same time. The GI Plan will accomplish this objective by providing conceptual

[1] US EPA issues permits for stormwater discharges from MS4s, which it defines as a conveyance or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

plans that incorporate rain gardens, tree trenches, vegetated curb extensions, and other GI techniques throughout the City's urban environment. A second objective to the City's goal is to "enhance the quality of surface and groundwater resources." The City of Lancaster's GI Plan will achieve this objective by providing detailed guidance on demonstration projects that capture stormwater and infiltrate it into the local groundwater table as well as allow for increased evapotranspiration, rather than sending it through the combined sewer system (CSS). In layman's terms, manage rainwater where it falls using the natural ecosystem rather than rely on manmade infrastructure that is costly to construct and maintain.

Faced with significant increases in regulatory requirements and anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to complying with regulatory requirements while meeting City goals for economic development, and to evaluate the feasibility of developing an impervious area (IA) -based fee for stormwater management services (sometimes known as a stormwater utility). To attract broad stakeholder input to these studies, the City formed the Green Infrastructure Advisory Committee (GIAC) in 2010, which includes representatives from business owners, citizens, institutions, environmental groups, state government, and Lancaster city and county government.

Purpose

The purpose of this report is to document the policy options and recommendations of the GIAC for the elected officials of the City to consider with respect to implementing the Green Infrastructure (GI) Plan, maintaining new and existing storm water management systems, complying with increasing federal and state regulatory requirements and avoiding costly litigation that comes along with consent orders and potential fines that many other cities across the country have faced from the USEPA.. Faced with anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to address the capital and ongoing maintenance costs while also meeting City goals for economic development, and to evaluate the feasibility of developing an IA-based fee for stormwater management services (sometimes known as a stormwater utility). Each property contributes to the need for stormwater management based on the volume of runoff generated by their property. That volume of runoff is a direct function of how much impervious surface is on their property, such as rooftops and paved surfaces, which prevent rainfall from infiltrating. So a stormwater management fee is typically assessed based on the amount of impervious surface on each property.

The GIAC was initially convened to help in the development of the GI Plan, and was reconvened to evaluate cost recovery options, including implementation of a stormwater management fee (SWMF) based on IA. The GIAC carefully reviewed policy options as described below.

- What does the City need to do and how much does it cost? Program elements, level of service (LOS), and cost to provide regulatory compliance and improved customer service.
- What are the options to pay for these costs? What dedicated cost recovery options should be implemented? Continuation of current City reliance on sewer user fees, or implementation of a dedicated property tax based on assessed value, or implementation of a stormwater management fee (SWMF) based on impervious area?
- What rate structure options for the SWMF is right for our city?
- Should we use a pay-as-you-go financing program for a 10-year planning horizon or should we use debt-financing for the stormwater Capital Improvement Program (CIP)?
- How can the City incentivize action? Incentive options include rebates or grants and/or credits.
- How will the City administer billing?
- How will the City manage appeals?

Benefits of a Dedicated Cost Recovery Source for Stormwater Management

A dedicated cost recovery source, such as an SWMF, provides the City with the benefits listed below:

- For citizens:
  - Improved public health and safety,
  - Improved customer service and a reduced backlog of customer complaints,
  - Reduced long-term capital costs through proactive maintenance,
  - Local drainage improvements that help to reduce localized flooding, and
  - Other triple bottom line benefits such as potential increased property value (but not property assessments), and improved aesthetic and environmental quality.
- For businesses:
  - Improved City services,
  - Cleaner streets, which help improve the business climate, and
  - Support of economic development initiatives and public-private partnerships
- For environmental quality:
  - Meeting local and regional regulations on water quality, reducing the possibility of USEPA fines for compliance with permit requirements,
  - Creating cleaner rivers, creeks and streams, and
  - Providing cleaner waterfront and park areas.

There are significant issues related to stormwater management, which are the focus of recent regulatory requirements such as the MS4 permit and consent orders (a legal document signed by a judge that spells out actions required, schedule, and fines should action not be completed) related to combined sewer overflows (CSOs). As described above, the City is facing increased scrutiny from both USEPA and the PA DEP and has been fined, along with numerous other cities, for violations related to interpretations of the Clean Streams Law. Projects and programs related to stormwater are dispersed throughout the City's Department of Public Works, and implementation of a dedicated cost recovery source can help streamline and provide program efficiencies in both projects and programs. One of the main benefits is movement away from a reactive, customer-complaint-driven model for stormwater management to a proactive, strategic, and customer-service-driven approach.

Key Findings and Recommendations

What does the City need to do and how much does it cost? Program Elements, Level of Service, and Costs

The GIAC first considered the requirements to meet the City's regulatory obligations, maintain its existing infrastructure and further reduce combined storm water overflows. These program elements, taken together, represent an LOS. Three LOS alternatives were considered and consisted of the following:

Low — Assumes current level of expenditures and MS4 permit implementation (considered to be status quo or no changes to our current program which has been deemed inadequate due to regulations promulgated by USEPA);

Medium — Assumes GI Plan implementation (public properties only), MS4 permit implementation, increased maintenance and customer service; or

High — Assumes GI Plan implementation (public and private properties), MS4 permit implementation, high level of maintenance and customer service.

Table ES-1 summarizes the LOS cost estimates for program elements for the proposed SWMF. The GIAC recommended that dedicated cost recovery options be investigated to provide at least the medium LOS, with a goal of moving towards the higher LOS. It was agreed that the current low LOS would not be adequate to meet regulatory requirements.

TABLE ES-1
Level of Service Cost Estimate Summary

	Estimated Annual Costs		
	Low	**Medium**	**High**
Operating and Maintenance			
Green Infrastructure	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
Green Infrastructure	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

What are the options to pay for these costs? Rate Structure and Preliminary Rates for Pay-Go and Debt Financing

The GIAC reviewed three options for dedicated cost recovery of the GI Plan and permit requirements, including:

- Continuation of current City reliance on sewer user fees,
- Implementation of a dedicated property tax based on assessed value, or
- Implementation of a stormwater management fee (SWMF) based on impervious area.

Comparisons of the effects of these three options were done across all the major property classes in the City, including single-family residential, multi-family residential, commercial, industrial, institutional, faith organizations and non-profits. In addition, a review was conducted of what other jurisdictions are doing to meet these cost recovery challenges. Based on that assessment, the GIAC is recommending proceeding with the SWMF because it is more equitable, that is properties pay based on their contributions to stormwater runoff as measured by impervious area, and everyone who contributes to the issue will pay including parking lots who do not currently have water/sewer bills, and tax-exempt properties who do not currently pay property taxes.

In addition to the equity of assessing a fee based on impervious area, it is important to note that by investing in GI for the City's overall stormwater and CSO management strategy, all properties avoid paying an additional sewer charge of $0.23-$0.26 per gallon estimated for grey storage.

For the SWMF, a number of rate structure options were considered, as discussed below.

Rate Structure Options - Tiering

There are various approaches to determine rate structure. Properties could be assessed a fee based on whether they are residential, business, multi-unit, institutional or other. However, this approach does not take into consideration the various sized properties and amount of IA on each. As such, it is recommended that the City utilize a tiered approach that is based on the amount of IA.

The tiers were derived based on aerial photography. Table ES-2 shows the IA range for the recommended four-tier rate structure. This method groups properties within a range of IA, which are then assessed based on the

average. For larger parcels over 3,000 square feet, an actual calculation will be made of IA and applicable fee applied.

Three rate structure options were evaluated using impervious estimates based on aerial photography and digitization of IAs included in the City's geographic information system. For the three rate scenarios, the tiering method rate structure, which is applied to all properties, was used. The tiering method groups all properties within a range of IA, which are then assessed a fee based on a representative IA for that range. Based on feedback from the GIAC, using a rate structure based on four tiers was preferred over using actual IA, or lumping all single IA properties by type because it represents the most reasonable and equitable method.

TABLE ES-2
Proposed Four-Tier Rate Structure based on Medium LOS[a]

		Preliminary Stormwater Charge (Year 1)[b]	
Tier	**Impervious Area Range**	**Annual**	**Quarterly**
1	<=1,000 sf	$15.48	$3.87
2	>1,000 sf and <=2,000 sf	$46.44	$11.61
3	>2,000 sf and <=3,000 sf	$77.40	$19.35
4	>3,000	Charge based on total impervious area $30.96/1,000 sf	$7.74/1,000 sf

a Applies to all properties.

b Assumes medium LOS, a $4,800,000 stormwater program and pay-go financing. This represents estimated cost recovery requirement, gross before subtracting grants / PennVest loans. After grants and PennVest loan, the estimated Year 1 net cost recovery requirement is $2,600,000.

sf = square feet

What is the impact of pay-as-you-go vs. debt financing? Rate Impacts for Different Levels of Service, with Pay-Go Financing

Pay-as-you-go implies that you spend only the revenues you have on hand, generated by the stormwater management fee.

Figure ES-1 below illustrates the program costs based on the three LOS scenarios evaluated as part of this study. The program costs required to be recovered by the fee in the first 3 years are low compared to years 4 and 5 because the use of grants and loans help reduce the costs that would be recovered by the SWMF.

The capital requirements represent the largest expense item and is used to recover costs for projects contemplated in the GI Plan such as green streets, green parks, downspout disconnections (cisterns or rain barrels), etc. The use of grants and loans in early years offset the CIP cost and help to keep the SWMF low. These grants and loans that have been awarded to the City because the GI Plan is innovative and the USEPA's goal is for all municipalities to implement GI projects. Therefore, the City does not expect these sources of cost recovery to be available in the future. However, in years 4 and 5 the capital requirements increase significantly because currently available grants/loans are exhausted, which affects the SWMF. To fund capital requirements in years 4 and 5 without further increases in the SWMF, additional grants/loans would need to be secured or the use of debt financing needs to be considered.

Figure ES-2 illustrates the SWMF ($ per 1,000 sf) to recover the program costs identified in Figure ES-1 and to cover the program costs for each rate scenario assuming pay-as-you-go CIP cost recovery. The significant increase in years 4 and 5 are attributable to the increase in capital requirements after currently available grants/loans are used to fund other capital projects. The recommended scenario is Rate Scenario 2 – Medium Level of Service, which represents the estimated program needs to satisfy MS4 permit and other regulatory requirements that have been established by USEPA and PA DEP with timelines already established for compliance

Rate Impacts for Different Levels of Service, with Debt Financing

Figure ES-3 illustrates, for Rate Scenario 2 – Medium Level of Service, the sensitivity of using pay-as-you-go versus debt financing for the capital requirements starting in Year 4. The use of debt financing helps keep rates low and spreads the costs over time to current and future rate payers. Additionally, as is the City's current practice for all capital expenditures, future rate payers are sharing the cost of the investment made today for assets that last for many decades into the future.

Rate Structure Recommendations

The GIAC recommends Rate Scenario 2 – Medium Level of Service, which represents the estimated program needs to satisfy MS4 permit and other regulatory requirements, and to avoid further enforcement action including consent orders and fines. The following financing options are recommended:

- Use tiering of all properties, with four tiers based on the IA area ranges shown in Table ES-2; and
- Use the SWMF to leverage bonds, so that debt financing can be used to keep rates lower over the long term and spread costs over time to current and future rate payers.

FIGURE ES-1
Comparison of Program Costs Covered by the SWMF by Rate Scenario (Pay-Go Financing)

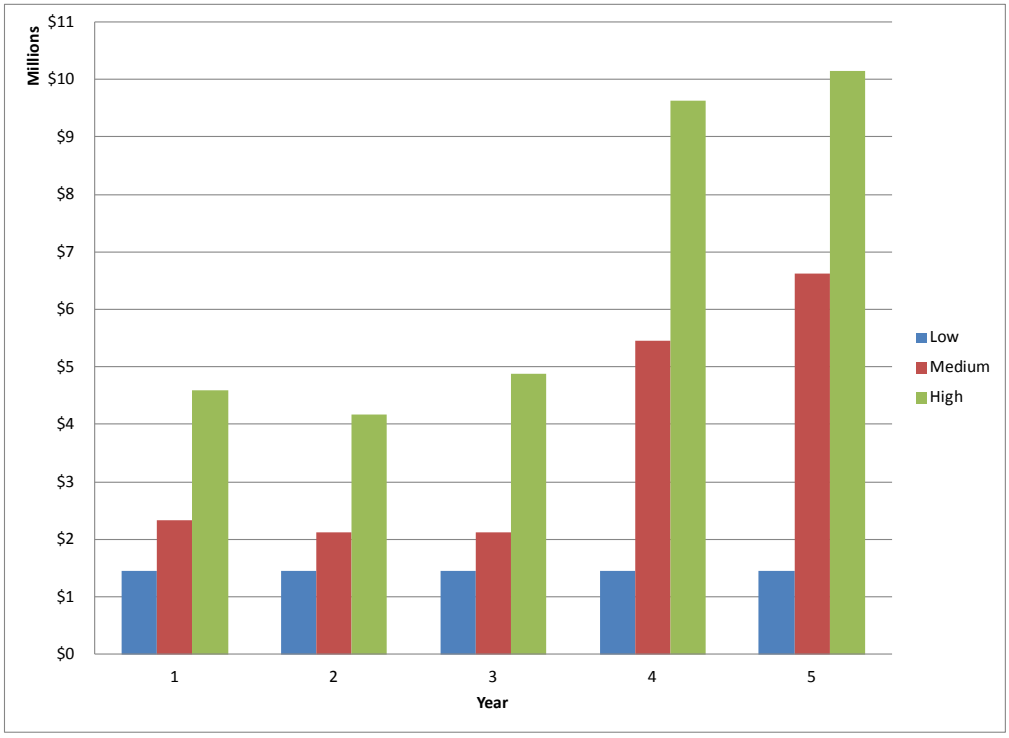


FIGURE ES-2
Comparison of SWMF by Rate Scenario (Pay-Go Financing)

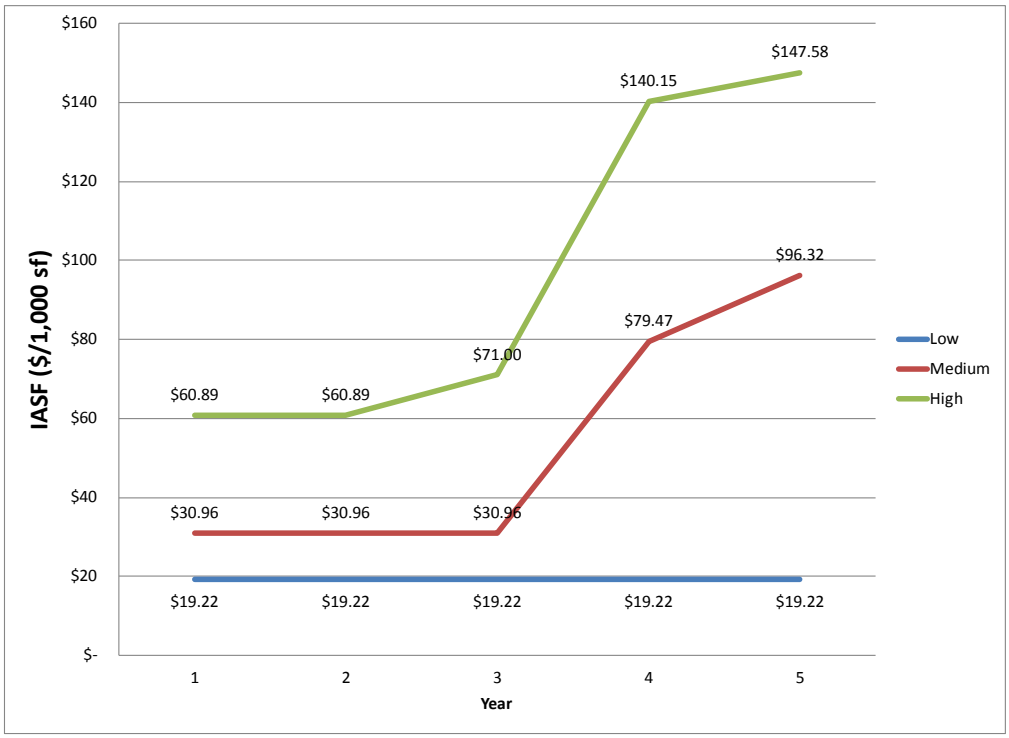
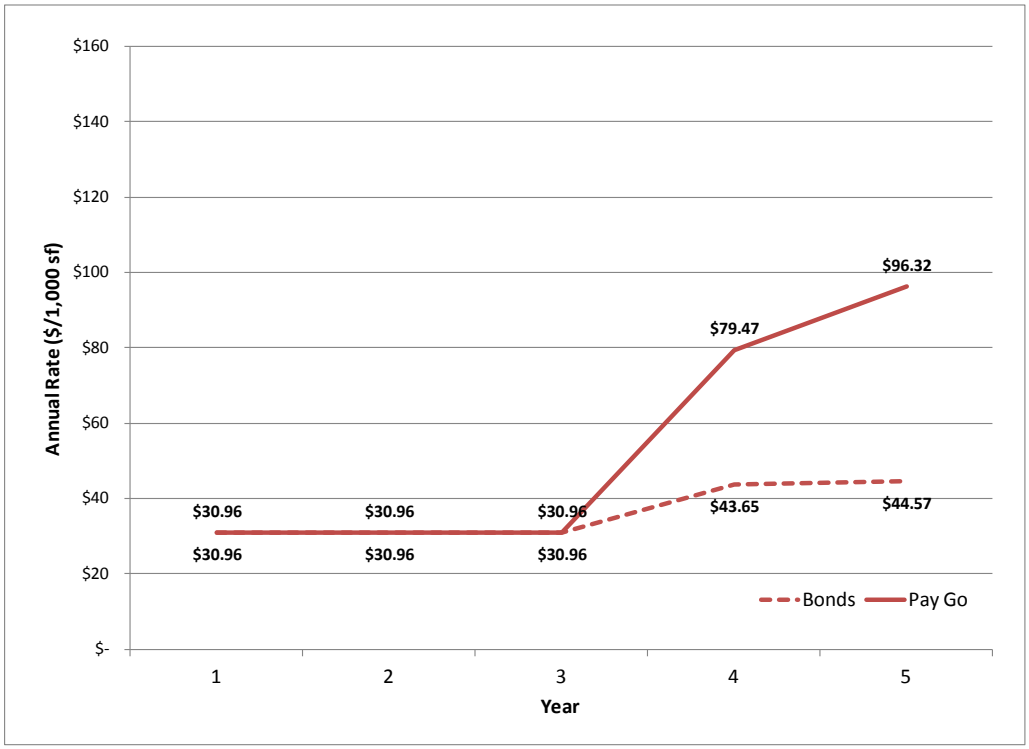


FIGURE ES-3
Comparison of SWMF Rates with Pay-Go Financing to Debt Financing (Bonds) for Medium Level of Service



How can the City incentivize action? Rebates/Grants and Credits

Many stormwater utilities that assess fees based on IA provide incentives to properties with onsite stormwater facilities to treat stormwater runoff. As discussed in the GI Plan, there is not enough public property to manage enough stormwater to significantly reduce or eliminate CSOs and therefore the City needs private property

owners to do their fair share in helping to reduce overflows. There are two types of incentive programs typically are considered:

- Rebates or grants, and
- Credits.

The purpose of grants or rebates is to provide a one-time subsidy to reduce construction costs associated with installing stormwater facilities on private property. This sort of program is fairly uncommon, but is growing in popularity among jurisdictions with CSO and MS4 permit mandates.

The purpose of credits is to help property owners reduce their annual stormwater fee, thus providing an incentive for implementing stormwater management facilities. Historically, credits have been offered only to commercial properties, but recent trends show that single-family properties are now eligible for certain types of credits. The credit amount that a property can receive varies among stormwater utilities. Most utilities provide only a partial credit, while others provide a full credit. The rationale for not providing a 100-percent credit, even if all stormwater is managed onsite, is that property owners should contribute to services provided by the City that are beyond their property lines, such as citywide permit compliance, road drainage maintenance, and GI improvements on public lands. Also, the City must have stormwater management facilities available to deal with extraordinary storms that create run-off from properties that usually do not create run-off. The criteria for determining the credit level typically is based on the type of facility and percent of IA treated (usually just the onsite IA).

Incentive Program Recommendations

Because the GI Plan requires a significant proportion of new capital facilities to be built on private property, the GIAC recommends providing an incentive program cost recovered by the SWMF. This would include some combination of rebates for facility construction, as well as credits to encourage maintenance of those facilities. Credits have the added benefit of giving property owners some mechanism of reducing the financial impact of the SWMF. A property owner using grants to help pay for GI improvements will also be eligible to receive credits, provided they apply separately for credits. Application for credits typically entails agreeing to maintain the facility and allowing the City to perform inspections. Overtime, cost of the improvements borne by the property owner could be recouped through the reduction in the quarterly fee from the credits.

An allowance was included for the cost a credit program in the estimated SWMF scenarios.

How will the City administer billing? Billing System Options

Three billing methods are commonly used to collect stormwater utility charges around the country: real estate tax bills, water/sewer utility bills, or separate billing systems. Selection of a billing system is unique to the locality establishing a stormwater utility. For example, the water/sewer bill may only cover part of the stormwater utility service area, while the property tax database provides complete coverage. The selection of the billing method should be cost-effective, timely, and capture all affected properties.

Billing Recommendations

The City administration is currently recommending adding a new line item for the SWMF to the water and sewer bill that is issued quarterly or monthly based on the rate class for the property. Properties that currently do not get a water/sewer bill will be added to the list getting bills for the SWMF, with their water/sewer line item showing a $0 charge.

How will the City administer appeals?

All stormwater utility charges typically provide a mechanism for rate payers to appeal their bills and allow them the ability to correct erroneous information. However, what can be appealed, when, and the process for submitting and reviewing appeals need to be clearly defined to make the fee defensible and manageable.

What can be appealed typically is limited to the following:

- IA calculation and tier assignment,

- Determination of exemption status (for example, if the enabling ordinance exempts local and state governments), and
- Credit calculation, assuming a property owner applied for a credit.

Appeals are typically submitted only once per year, well in advance of the billing cycle.

Appeals Recommendations

The City administration would prefer that appeals be allowed only once per year, to minimize administrative costs and are recommending that a deadline for appeals be set 6 months before the first bills go out in a given fiscal year.

Summary of Recommendations

The GIAC made the following recommendations for the City of Lancaster to address its stormwater management regulatory obligations and further reduce combined storm water overflows:

- Recover costs of the stormwater management program at the medium level of service, which assumes GI Plan implementation (public properties only), MS4 permit implementation, increased maintenance and customer service, and rehabilitation of existing stormwater infrastructure. The gross program costs for the medium level of service are estimated to be $4.8 million annually.
- Recover costs of the program with a stormwater management fee based on impervious area, as the most equitable approach compared to other options such as raising property taxes or sewer fees.
- Implement the stormwater management fee (SWMF) with a rate structure based on four tiers of impervious area; Tier 1: up to 1000 square feet, Tier 2: from 1000 to 2000 sf, Tier 3: from 2000 to 3000 sf, and Tier 4: over 3000 sf. Initial rates are estimated at $30.96/1000 sf/year.
- Leverage the SWMF by issuing bonds to keep rates low and spread capital costs over time.
- Include an incentive program to encourage implementation and maintenance of green infrastructure projects on private property. The incentives could include rebate or grant program to defray one-time upfront capital costs, as well as a credit program to reduce fees and promote facility maintenance.
- Bill the SWMF as a new line item on the existing sewer bill, which is issued monthly or quarterly depending on the account.
- Provide an appeals mechanism for property owners to seek corrections to their bills based on impervious area, tier category, or credit calculation. The appeals process would be tied an annual deadline, with the initial appeal cycle starting after assessment notices are issued for the estimated SWMF.

SECTION 1

Introduction

1.1 Purpose

The purpose of this report is to document the policy options and recommendations of the Green Infrastructure Advisory Committee (GIAC) for the elected officials of the City of Lancaster (the City) to consider with respect to implementing the Green Infrastructure (GI) Plan, maintaining new and existing storm water management systems, complying with increasing federal and state regulatory requirements, and avoiding costly litigation that comes along with consent orders and potential fines that many other cities across the country have faced from the U.S. Environmental Protection Agency (USEPA). Faced with anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to address recovery of the capital and ongoing maintenance costs while also meeting City goals for economic development, and to evaluate the feasibility of developing an impervious area (IA) -based fee for stormwater management services (sometimes known as a stormwater utility). Each property contributes to the need for stormwater management based on the volume of runoff generated by their property. That volume of runoff is a direct function of how much impervious surface is on their property, such as rooftops and paved surfaces, which prevent rainfall from infiltrating[2]. So a stormwater management fee is typically assessed based on the amount of impervious surface on each property.

The GIAC carefully reviewed policy options as described below:

- What does the City need to do and how much does it cost? Program elements, level of service (LOS), and cost to provide regulatory compliance and improved customer service.
- What are the options to recover these costs? What dedicated options should be implemented? Continuation of current City reliance on sewer user fees, or implementation of a dedicated property tax based on assessed value, or implementation of a stormwater management fee (SWMF) based on IA?
- What rate structure options for the SWMF is right for our city?
- Should we use a pay-as-you-go financing program for a 10-year planning horizon, or should we use debt-financing for the stormwater Capital Improvement Program (CIP)?
- How can the City incentivize action? Incentive options include rebates or grants and/or credits.
- How will the City administer billing?
- How will the City manage appeals?

1.2 Drivers for Dedicated Source of Cost Recovery for Stormwater Management

Numerous drivers requiring changes to the way the City manages urban stormwater runoff support the need for a dedicated cost recovery source, all of which are addressed in the City's GI Plan.

In early 2008, the USEPA requested information on the City's Long-Term Control Plan (LTCP) for combined sewer overflows (CSOs). In response, the City prepared an update to its LTCP. The City is continuing to discuss the adaptation of the CSO control program, which historically has relied on optimizing the "grey infrastructure" (underground combined sewers that divert a significant fraction of all sanitary wastes to the City's advanced

[2] Impervious surfaces will need to be clearly defined within the ordinance establishing the stormwater management fee. The following is a typical definition provided in a stormwater management fee ordinance from Montgomery County, MD: "Any surface that prevents or significantly impedes the infiltration of water into the underlying soil, including any structure, building, patio, deck sidewalk, compacted gravel, pavement, asphalt, concrete, stone, brick, tile, swimming pool, or artificial turf. Impervious surface also includes any area used by or for motor vehicles or heavy commercial equipment, regardless of surface type or material, including any road, road shoulder driveway, or parking area." The City would need to decide whether or not to include compacted soil and grass, as has been done in the example above. Some jurisdictions count that as impervious, others say that counts as half. Lancaster County's model ordinance says that gravel is considered impervious.

wastewater treatment facility (AWWTF)). The City has completed upgrades and expansions of all pump stations and a biological nutrient reduction project at the AWWTF over the last 12 years in compliance with the "grey infrastructure portion of the LTCP, at a cost of over $32M for city rate payers.

More recently, the City has moved away from additional storage originally projected to be constructed in the 1998 LTCP towards planning and implementation of GI throughout the city to reduce CSOs as well as to respond to the evolving requirements of the Chesapeake Bay Total Maximum Daily Load (TMDL) and associated Watershed Implementation Plan (WIP) being prepared by Pennsylvania Department of Environmental Protection (PA DEP). Compliance with the Chesapeake Bay TMDL is a requirement of the City's Municipal Separate Storm Sewer Systems (MS4)[3] permit, which sets requirements for stormwater management in areas not served by the City combined sewer system. By managing runoff quantity and quality, implementation of the GI Plan throughout the City helps with compliance with both CSO LTCP and the MS4 permit, and Bay TMDL. In addition, since 2003 the City's first flush ordinance has required that stormwater from new impervious area be managed on-site.

The TMDL is a tool of the federal Clean Water Act and requires the City to reduce pollutant loads to the Chesapeake Bay. The TMDL sets binding limits on nutrient (nitrogen and phosphorus) and sediment pollution, and seeks to ensure that all practices to restore the health of the Bay are in place by 2025, with 60 percent of the actions taken by 2017.

These regulatory programs will all require the City, like all municipalities in the County, to incur costs for controls that reduce stormwater runoff, CSOs, and the pollutants they contain. The GI Plan completed by the City in 2010 seeks to address all of these new regulatory requirements in an integrated manner that focuses on fixing other necessary City infrastructure at the same time. The GI Plan will accomplish this objective by providing conceptual plans that incorporate rain gardens, tree trenches, vegetated curb extensions, and other GI techniques throughout the City's urban environment. A second objective to the City's goal is to "enhance the quality of surface and groundwater resources." The City of Lancaster's GI Plan will achieve this objective by providing detailed guidance on demonstration projects that capture stormwater and infiltrate it into the local groundwater table as well as allow for increased evapotranspiration, rather than sending it through the combined sewer system (CSS). In layman's terms, this means managing rainwater where it falls using the natural ecosystem rather than relying on manmade infrastructure that is costly to construct and maintain.

1.3 Project History

Faced with significant increases in regulatory requirements and anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to address the capital and ongoing maintenance costs while also meeting City goals for economic development, and to evaluate the feasibility of developing an IA - based fee for stormwater management services (sometimes known as a stormwater utility). Each property contributes to the need for stormwater management based on the volume of runoff generated by the property. That volume of runoff is a direct function of how much impervious surface is on the property, such as rooftops and paved surfaces, which prevent rainfall from infiltrating. So a stormwater management fee is typically assessed based on the amount of impervious surface on each property.

Based on the GIAC's recommendations, the City retained CH2M HILL in March 2012 to assist in moving towards implementing an IA-based fee. Studies and activities completed before the current implementation efforts include the following:

- Stormwater Utility Feasibility Analysis Status Briefing (CDM, November 2010),

[3] US EPA issues permits for stormwater discharges from MS4s, which it defines as a conveyance or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

- *Urban Tree Canopy: A Report on the City of Lancaster's Existing and Possible Tree Canopy* (Pennsylvania Department of Conservation and Recreation and University of Vermont, February 2011),
- Stormwater Fee Structure Evaluation (CDM, March 2011),
- Green Infrastructure Master Plan for the City of Lancaster (CH2M HILL, April 2011),
- Lancaster City Tree Inventory and Summary Report (Draft, Penn State, October 2011),
- Keith Campbell Grant: Stormwater Utility Credits and Incentives for Green Infrastructure – A Case Study Assessment (CH2M HILL, November 2011),
- Stormwater Management: Program Needs, Levels of Service, and Cost (Draft Technical Memorandum, CH2M HILL, August 2012),
- Stormwater Management: Program Needs, Levels of Service, and Cost (Draft Technical Memorandum No.1, CH2M HILL, August 2012), and
- *Preliminary Stormwater Management Fee (SWMF) Analysis* (Draft Technical Memorandum No.2, CH2M HILL, September 2012).

1.4 Benefits of a Dedicated Cost Recovery Source for Stormwater Management

A dedicated cost recovery source, such as an SWMF, provides the City with the benefits listed below:

- For citizens
  - Improved public health and safety,
  - Improved customer service and a reduced backlog of customer complaints,
  - Reduced long-term capital costs through proactive maintenance,
  - Local drainage improvements that help reduce localized flooding, and
  - Other triple bottom line benefits such as potential increased property value (but not property assessments), and improved aesthetic and environmental quality.
- For businesses
  - Improved City services,
  - Cleaner streets, which help improve the business climate, and
  - Support of economic development initiatives and public-private partnerships.
- For environmental quality
  - Meeting local and regional regulations on water quality, reducing the possibility of USEPA fines for compliance with permit requirements,
  - Creating cleaner rivers, creeks and streams, and
  - Providing cleaner waterfront and park areas.

There are significant issues related to stormwater management, which are the focus of recent regulatory requirements such as the Municipal Separate Storm Sewer Systems (MS4) [4] permit and consent orders (a legal document signed by a judge that spells out actions required, schedule, and fines should action not be completed)

[4] US EPA issues permits for stormwater discharges from MS4s, which it defines as a conveyance or system of conveyances that is:

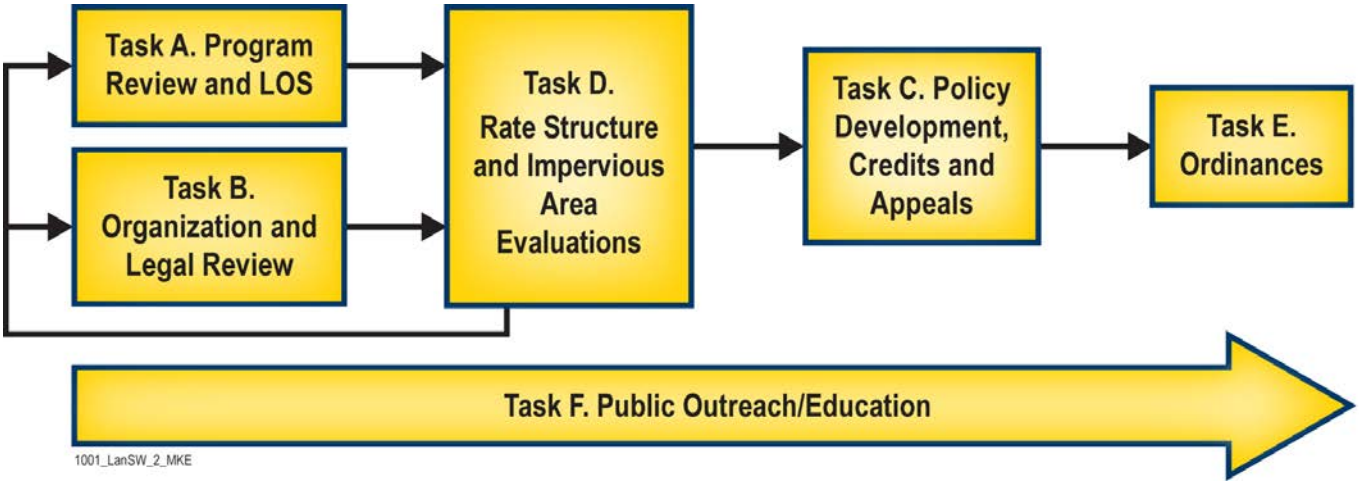
- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

related to CSOs. As described above, the City is facing increased scrutiny from both USEPA and the PA DEP and has been fined, along with numerous other cities, for violations related to interpretations of the Clean Streams Law. Projects and programs related to stormwater are dispersed throughout the City's Department of Public Works, and implementation of a dedicated cost recovery source can help streamline and provide program efficiencies in both projects and programs. One of the main benefits is movement away from a reactive, customer-complaint-driven model for stormwater management to a proactive, strategic, and customer-service-driven approach.

1.5 Impervious Area-based Stormwater User Fee Implementation Steps

Figure 1-1 shows the overall sequence of tasks that are being followed to move towards implementing an IA-based stormwater user fee. The review of program requirements and level of service (LOS) options were developed in Task A. Those program costs are being used to evaluate staffing needs in Task B, and cost recovery options and policy implications in Tasks D and C, with review and input by the GIAC. The GIAC's input constitutes the first step of a concerted public outreach program in Task F that will continue with a series of public outreach activities targeting a cross-section of stakeholder groups. Materials for public outreach are currently being developed, including powerpoint presentations, fact sheets, and a frequently asked questions (FAQ) document.

FIGURE 1-1
Impervious Area Fee Feasibility Study and Implementation Road Map



1.6 Green Infrastructure Advisory Committee Composition and Process

To attract broad stakeholder input to these studies, the City formed the GIAC in 2010, which includes representatives from the business and faith communities, city residents, non-profit institutions, environmental groups, state government, and Lancaster city and county government. Following its work on development of the GI Plan, the GIAC was reconvened to support the SWMF evaluation through a series of meetings to evaluate policy options. These options, deliberations, and recommendations are documented in this report.

For the SWMF evaluation, the GIAC participated in a total of six meetings between May and September 2012. The meetings were structured to educate the GIAC on policy options, solicit feedback on additional analyses needed, and obtain recommendations. One or two policy issues were discussed in each meeting, with each successive meeting allowing for a recap of discussion and preliminary recommendations, before being finalized. A series of policy papers were prepared, with a new policy paper being distributed ahead of each meeting. Policy papers were also used to capture discussion and decisions by the GIAC, with updated policy papers distributed after each

meeting to reflect the discussion and recommendations. Appendix A provides a list of GIAC members, City staff members, and consultants who supported this effort.

SECTION 2

Policy Options and Recommendations

2.1 Program Elements, Level of Service, and Costs

Appendix A contains the policy paper that was prepared and reviewed by the GIAC on program elements, LOS, and costs. Appendix B contains the Technical Memorandum that was prepared to document the analysis of program costs and level of service. Key issues and recommendations are summarized below.

2.1.1 Program Elements and Regulatory Requirements – What does the City need to do and how much does it cost?

An analysis was performed to document the various activities of the bureaus within the City's Department of Public Works that contribute to stormwater management and watershed protection and to document the baseline and potential program enhancements and cost recovery requirements that will provide for regulatory compliance and improved customer service. A stormwater management program assessment was developed for the following program elements and their respective costs:

- Program administration,
- Inspection and maintenance of stormwater best management practices (BMPs) and GI,
- National Pollutant Discharge Elimination System (NPDES) Phase II permit implementation for MS4,
- Compliance with TMDL and WIP,
- Flood control and floodplain management programs,
- Wet-weather-related wastewater treatment, and
- Wet weather CIP, including GI.

For each of these program elements, the project team analyzed and summarized internal and external program costs for a 5-year period for three different LOS alternatives and compared these to the current program. Although no two stormwater utilities (IA-based user fee programs) are exactly alike, the program costs recovered by the fee are generally similar. In order to identify the program costs for the proposed fee, individual program elements were evaluated and estimates were developed based on a combination of previous studies, staff salaries, estimated time spent on stormwater-related functions/services, and other expenditures.

2.1.2 Level-of-Service Alternatives

The GIAC first considered the requirements to meet the City's regulatory obligations and further reduce combined storm water overflows. These program elements, taken together, represent an LOS. Three LOS alternatives were considered and consisted of the following:

Low — Assumes current level of expenditures and MS4 permit implementation (considered to be status quo or no changes to our current program, which has been deemed inadequate due to regulations promulgated by USEPA);

Medium — Assumes GI Plan implementation (public properties only), MS4 permit implementation, increased maintenance and customer service; or

High — Assumes GI Plan implementation (public and private properties), MS4 permit implementation, high level of maintenance and customer service.

Table 2-1 summarizes the LOS cost estimates for program elements for the proposed SWMF. Figure 2-1 shows how costs are assumed to be distributed over the first 5 years of the program for the medium and high LOS alternatives.

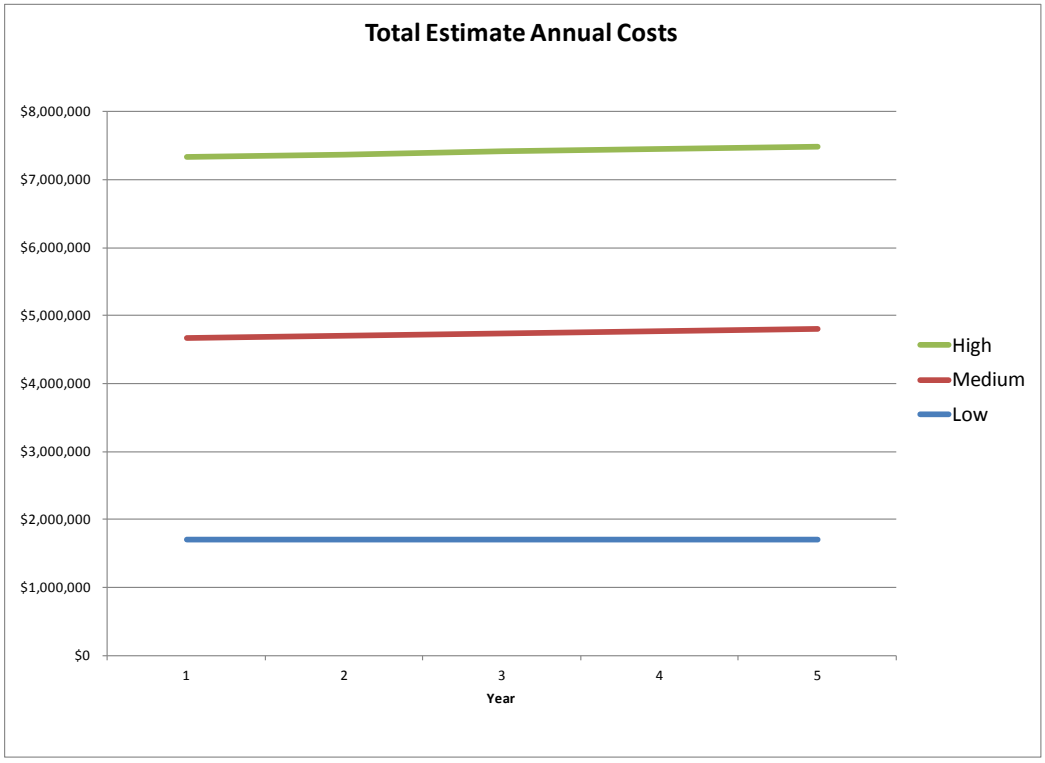
TABLE 2-1
Level of Service Cost Estimate Summary

	Estimated Annual Costs		
	Low	**Medium**	**High**
Operating and Maintenance			
Green Infrastructure*	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
Green Infrastructure	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

2.1.3 Level-of-Service Recommendations

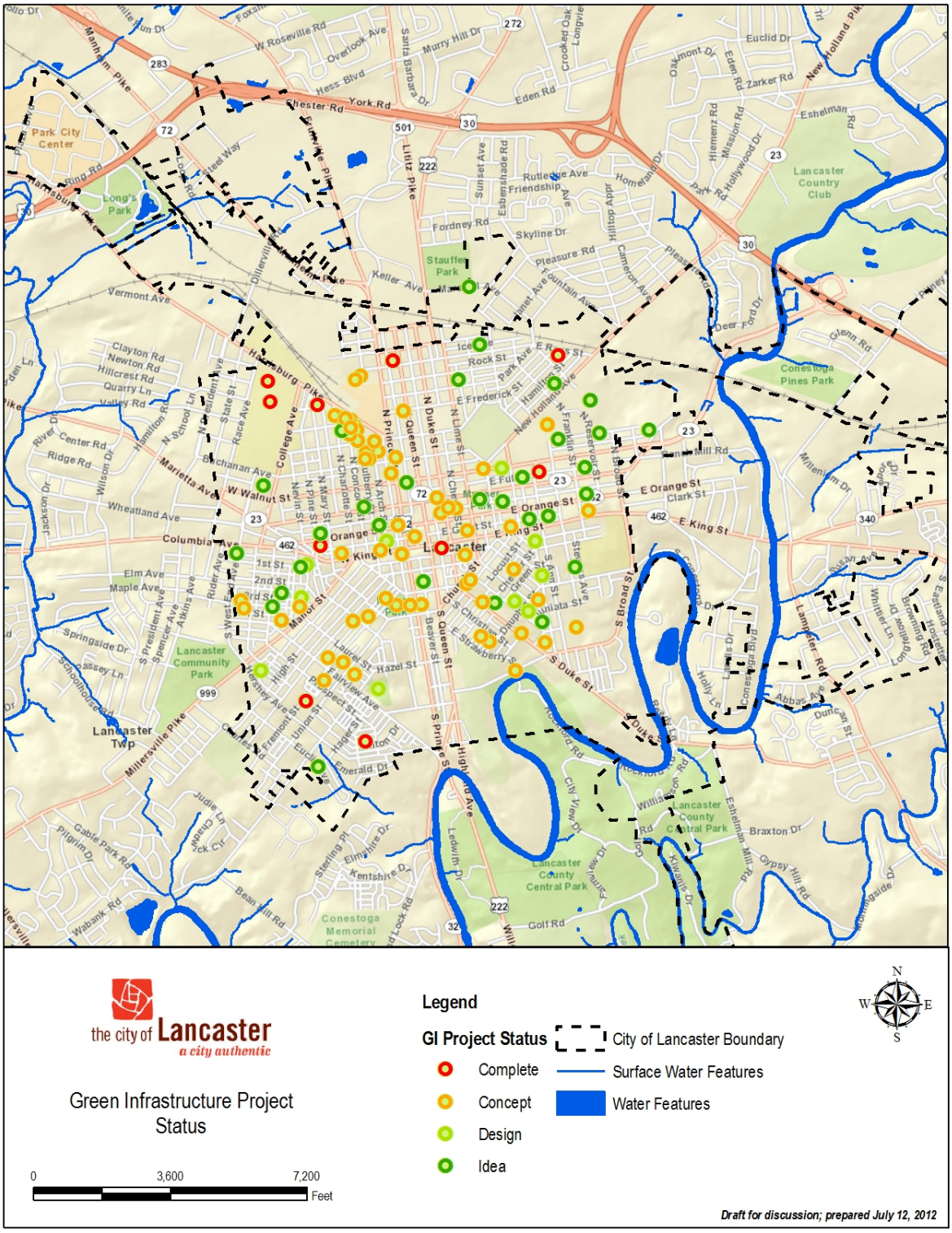
The GIAC recommended that dedicated cost recovery options be investigated to provide at least the medium LOS, with a goal of moving towards the higher LOS. It was agreed that the current low LOS would not be adequate to meet regulatory requirements.

FIGURE 2-1
Level of Service Program Needs for the Next 5 Years



As part of the City's GI program, the SWMF would cover costs associated with ongoing planning, engineering, and construction of projects shown in Figure 2-2.

FIGURE 2-2
Green Infrastructure Project Status Map



2.2 What are the options to pay for these costs? Rate Structure and Preliminary Rates for Pay-Go and Debt Financing

The GIAC reviewed three options for dedicated cost recovery of the GI Plan and permit requirements, including:

- Continuation of current City reliance on sewer user fees,
- Implementation of a dedicated property tax based on assessed value, or
- Implementation of a stormwater management fee (SWMF) based on IA.

Comparisons of the effects of these three options were done across all the major property classes in the city, including single-family residential, multi-family residential, commercial, industrial, institutional, faith organizations and non-profits. In addition, a review was conducted of what other jurisdictions are doing to meet these cost recovery challenges. Based on that assessment, the GIAC is recommending proceeding with the SWMF because it is more equitable, that is properties pay based on their contributions to stormwater runoff as measured by impervious area, and everyone who contributes to the issue will pay including parking lots who do not currently have water/sewer bills, and tax-exempt properties who do not currently pay property taxes.

In addition to the equity of assessing a fee based on impervious area, it is important to note that by investing in GI for the City's overall stormwater and CSO management strategy, all properties avoid paying an additional sewer charge of $0.23-$0.26 per gallon estimated for grey storage.

For the SWMF, a number of rate structure options were considered, as discussed below.

Appendix A contains the policy papers that were prepared and reviewed by the GIAC on rate structure alternatives and preliminary rates for the option to pay all costs annually (Pay-Go), or issue bonds to finance the capital improvement program. Appendix C contains the Technical Memorandum that was prepared to document the analysis of financing options, fees and rate structure options. Key issues and recommendations are summarized below.

The City of Lancaster Department of Public Works currently provides stormwater management functions and services, which fall under several bureaus. The stormwater program is cost recovered through the Sewer Fund and General Fund. As part of this study, a rate model was prepared to evaluate an SWMF to fund the City's stormwater management program. A separate effort will look at how to organize the overall stormwater management functions to provide the higher level of service recommended by the GIAC. It is anticipated that stormwater management functions will be moved from various bureaus into a single stormwater management bureau, which will improve efficiency by being directed by one program manager, and will alleviate the burden on the general fund (i.e. street sweeping), and ensures compliance with current and future regulations.

2.2.1 Rate Structure Options - Tiering

There are various approaches to determine rate structure. Properties could be assessed a fee based on whether they are residential, business, multi-unit, institutional or other. However, this approach does not take into consideration the various sized properties and amount of IA on each. As such, it is recommended that the city utilize a tiered approach that is based on the amount of IA.

Three rate structure options were evaluated using impervious estimates based on aerial photography and digitization of IAs included the City's geographic information system. For the three rate scenarios, the tiering method (4 tiers) rate structure, which is applied to all properties, was used. Table 2-2 shows the IA range for the recommended four-tier rate structure. The tiering method groups all properties within a range of IA, which are then assessed a fee based on a representative IA for that range. For larger parcels over 3,000 square feet, an actual calculation will be made of IA and applicable fee applied. Based on feedback from the GIAC, the tiering method was preferred over using actual IA or lumping all single IA properties by type because it represents the most reasonable and equitable method.

TABLE 2-2
Proposed Four-Tier Rate Structure based on Medium LOS[a]

Tier	Impervious Area Range	Preliminary Stormwater Charge (Year 1)[b]	
		Annual	Quarterly
1	<=1,000 sf	$15.48	$3.87
2	>1,000 sf and <=2,000 sf	$46.44	$11.61
3	>2,000 sf and <=3,000 sf	$77.40	$19.35
4	>3,000	Charge based on total impervious area $30.96/1,000 sf	$7.74/1,000 sf

a Applies to all properties.

b Assumes medium LOS, a $4,800,000 stormwater program and pay-go financing. This represents estimated program costs covered by the SWMF, gross before subtracting grants / PennVest loans. After grants and PennVest loan, the estimated Year 1 net program cost coverage requirement is $2,600,000.

sf = square feet

2.2.2 What is the impact of pay-as-you-go vs. debt financing? Rate Impacts for Different Levels of Service, with Pay-Go Financing

Pay-as-you-go implies that you spend only the money on hand, generated by the stormwater management fee.

The SWMF rate model evaluated the program costs based on three LOS alternatives identified in Policy Paper No.1.[5] The recommended rate scenario is Rate Scenario 2 – Medium Level of Service, which represents the estimated program needs to satisfy MS4 permit and other regulatory requirements.

The capital requirements represent the largest expense item and are used to pay for projects contemplated in the GI Plan such as green streets, green parks, downspout disconnections (cisterns or rain barrels), etc. The use of grants and loans in early years offset the CIP cost and help to keep the SWMF low. These grants and loans that have been awarded to the City because the GI Plan is innovative and the USEPA's goal is for all municipalities to implement GI projects. Therefore, the City does not expect these sources of cost recovery to be available in the future. However, in years 4 and 5 the capital requirements increase significantly because currently available grants/loans are exhausted, which affects the SWMF. To fund capital requirements in years 4 and 5 without further increases in the SWMF, additional grants/loans would need to be secured or the use of debt financing needs to be considered.

Figure 2-3 illustrates the program costs based on the three LOS scenarios evaluated as part of this study. The program costs required to be recovered by the fee in the first 3 years are low compared to years 4 and 5 because the use of grants and loans help reduce the costs that would be covered by the SWMF.

Figure 2-4 illustrates the SWMF ($ per 1,000 sf) to cover the program costs identified in Figure 2-3 and to cover the program costs for each rate scenario, assuming pay-go CIP cost recovery. The significant increase in years 4 and 5 are attributable to the increase in capital requirements after currently available grants/loans are used to fund other capital projects.

Table 2-3 provides the financial summary for Rate Scenario 2 – Medium Level of Service. Table 2-3 summarizes the SWMF rate and annual SWMF per property by tier for Rate Scenario 2 – Medium Level of Service.

2.2.3 Rate Impacts for Different Levels of Service, with Debt Financing

Figure 2-5 illustrates, for Rate Scenario 2 – Medium Level of Service, the sensitivity of using pay-go versus debt financing for the capital requirements starting in Year 4. The use of debt financing helps keep rates low and spreads the costs over time to current and future rate payers. Additionally, as is the City's current practice for all

[5] Details of program costs are documented in Technical Memorandum No. 1 (CH2M HILL, August 2012). Details of the rate model assumptions are documented in Technical Memorandum No. 2 (Ch2M HILL, September 2012).

capital expenditures, future rate payers are sharing the cost of the investment made today for assets that last for many decades into the future.

2.2.4 Rate Structure Recommendations

The GIAC recommends Rate Scenario 2 – Medium Level of Service, which represents the estimated program needs to satisfy MS4 permit and other regulatory requirements, and to avoid further enforcement action including consent orders and fines. The following financing options are recommended:

- Use tiering of all properties, with four tiers based on the IA ranges shown in Table 2-3 and Table 2-4; and
- Use the SWMF to leverage bonds, so that debt financing can be used to keep rates lower over the long term and spread costs over time to current and future rate payers.

FIGURE 2-3
Comparison of Program Costs Covered by the SWMF by Rate Scenario (Pay-Go Financing)

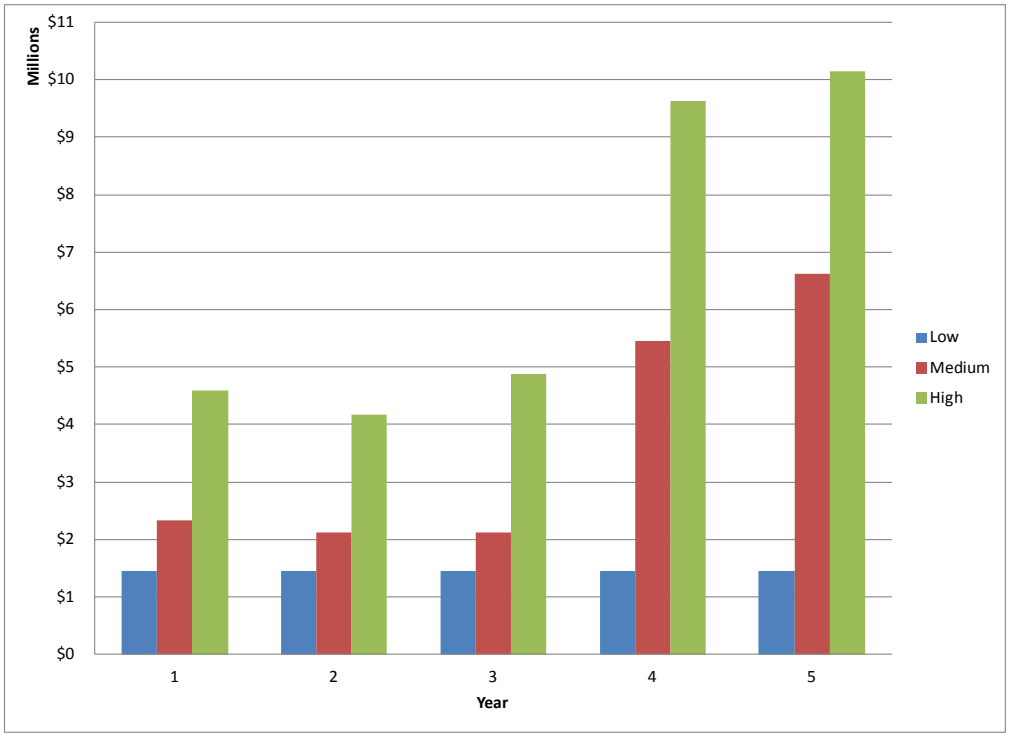


FIGURE 2-4
Comparison of SWMF by Rate Scenario (Pay-Go Financing)

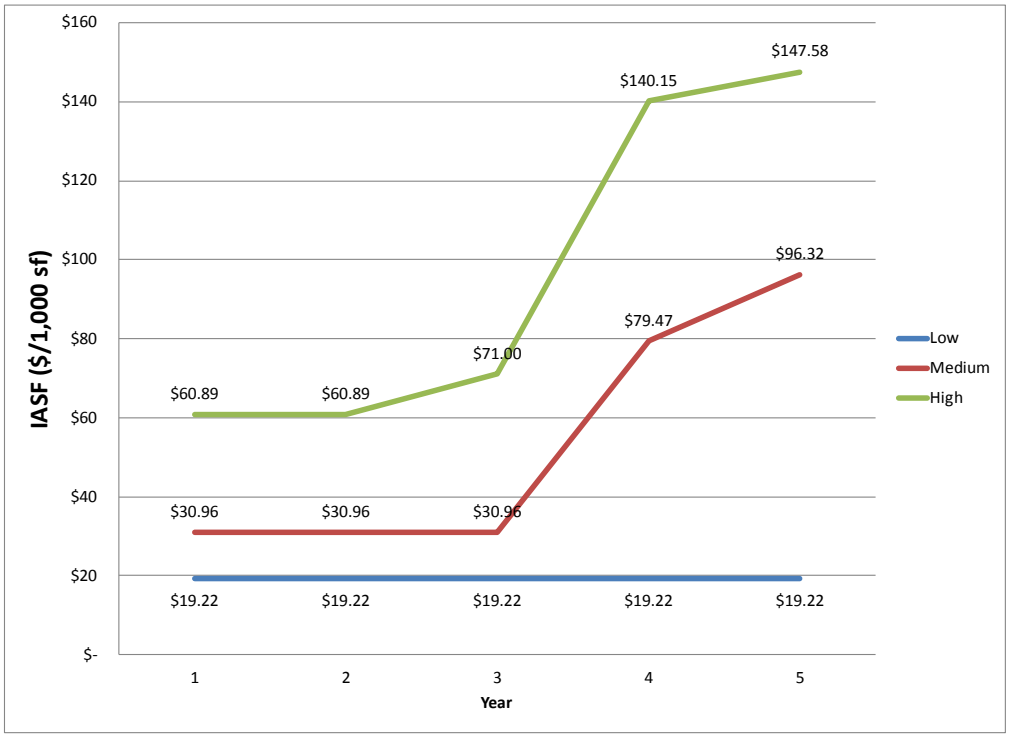


FIGURE 2-5
Comparison of SWMF Rates with Pay-Go Financing to Debt Financing (Bonds) for Medium Level of Service

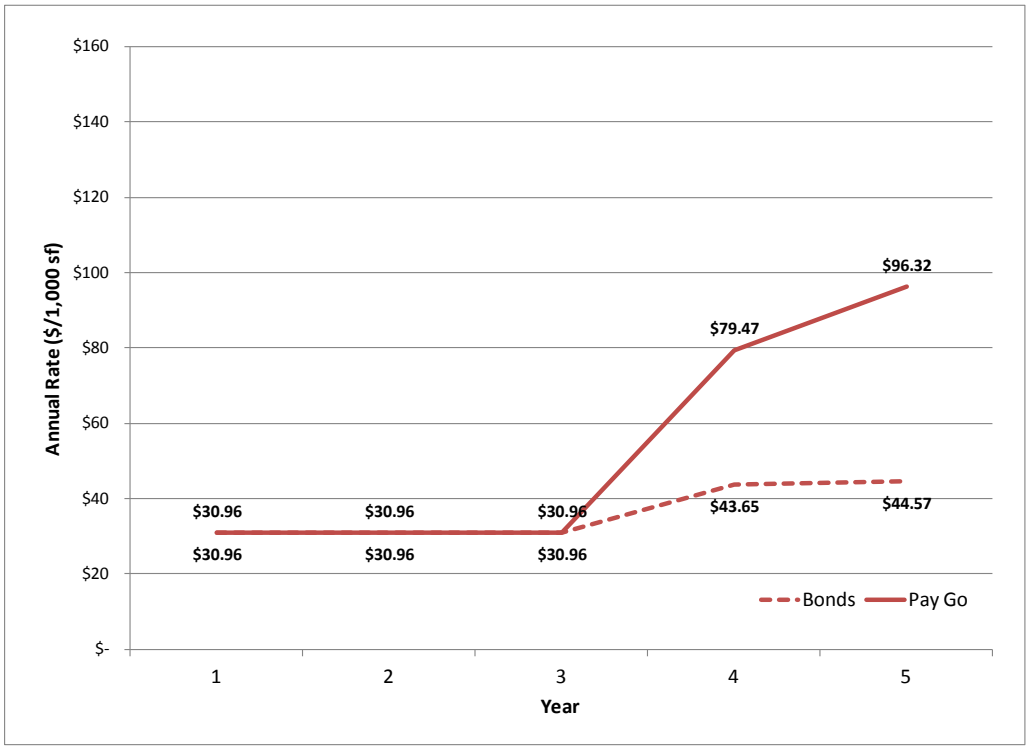


TABLE 2-3
Financial Summary for the Medium Level of Service Rate Scenario (Rate Scenario 2)

	Year 1	Year 2	Year 3	Year 4	Year 5
Stormwater Utility Fee ($/1,000 sf)	$ 30.96	$30.96	$30.96	$79.47	$96.32
Equivalent Residential Units (=1,000 sf)	83,745	83,787	83,829	83,870	83,912
Operating Revenues					
SWMF	$2,592,738	$2,594,030	$2,595,330	$6,665,180	$8,082,440
less Allowance for Uncollectable Accounts	($259,274)	($259,403)	($259,533)	($666,518)	($808,244)
less Credits/Incentives	$0	($210,859)	($210,964)	($541,786)	($656,989)
Interest Income	$600	$1,900	$2,700	$2,200	$1,400
Total Revenues	**$2,334,064**	**$2,125,668**	**$2,127,533**	**$5,459,076**	**$6,618,607**
Program Costs					
Operation And Maintenance	$1,289,512	$1,328,197	$1,368,043	$1,409,085	$1,451,357
Non-operating	-	-	-	-	-
Debt Service	$104,700	$104,700	$255,000	$405,200	$405,200
Stormwater CIP (Pay-Go)	$295,000	$118,000	$240,000	$4,423,000	$4,739,000
Total Expenditures	**$1,689,212**	**$1,550,897**	**$1,863,043**	**$6,237,285**	**$6,595,557**
Beginning Balance	**$0**	**$644,852**	**$1,219,623**	**$1,484,113**	**$705,904**
Ending Balance	**$644,852**	**$1,219,623**	**$1,484,113**	**$705,904**	**$728,954**

TABLE 2-4
Stormwater Utility Rate and Annual SWMF per Property by Tier Medium Level of Service (Rate Scenario 2)

Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$30.96	$30.96	$30.96	$79.47	$96.32
Percent Increase		0.0%	0.0%	156.7%	21.2%
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$15.48	$15.48	$15.48	$39.74	$48.16
Tier 2 (>1,000 sf and <=2,000 sf)	$46.44	$46.44	$46.44	$119.21	$144.48
Tier 3 (>2,000 sf and <=3,000 sf)	$77.40	$77.40	$77.40	$198.68	$240.80
Tier 4 (>3,000)	*Properties pay based on total impervious area / SWMF.*				

2.3 How can the City incentivize action? Rebates/Grants and Credits

Many stormwater utilities that assess fees based on IA provide incentives to properties with onsite stormwater facilities to treat stormwater runoff. As discussed in the GI Plan, there is not enough public property to manage enough stormwater to significantly reduce or eliminate CSOs, and therefore the City needs private property

owners to do their fair share in helping to reduce overflows. Two types of incentive programs typically are considered:

- Rebates or grants, and
- Credits

Appendix A contains the policy paper that was prepared and reviewed by the GIAC on incentive program options. Key issues and recommendations are summarized below.

2.3.1 Rebates or Grants

The purpose of grants or rebates is to provide a one-time subsidy to reduce construction costs associated with installing stormwater facilities on private property. This sort of program is fairly uncommon, but is growing in popularity among jurisdictions with CSO and MS4 permit mandates. Examples include Philadelphia's Stormwater Management Incentives Program - Business Improvement District Grant; Montgomery County, Maryland's RainScapes program; and Washington, DC's RiverSmart Homes. For example, RainScapes provides grants of up to $1,200 for residential property and up to $5,000 for commercial, multi-family, or institutional property, depending on project type. Eligible practices include but are not limited to rain gardens, tree canopy, permeable pavers, green roofs, and rain barrels. RainScapes is cost recovered by the County's stormwater utility. Similarly, DC's RiverSmart Homes program funds up to $1,200 for similar project types, but is restricted to private residences.

2.3.2 Credits

The purpose of credits is to help property owners reduce their annual stormwater fee, thus providing an incentive for implementing stormwater management facilities. Historically, credits have been offered only to commercial properties, but recent trends show that single-family properties are now eligible for certain types of credits. The credit amount that a property can receive varies among stormwater utilities. Most utilities provide only a partial credit, while others provide a full credit. The rationale for not providing a 100-percent credit, even if all stormwater is managed onsite, is that property owners should contribute to services provided by the City that are beyond their property lines, such as citywide permit compliance, road drainage maintenance, and GI improvements on public lands. The criteria for determining the credit level typically are based on the type of facility and percent of IA treated (usually just the onsite IA). Some utilities provide credits to property owners who do not have qualifying facilities but agree to participate in public education or outreach programs.

Table 2-5 provides a summary of credit programs around the United States.

Table 2-6 provides a list of potential credit amounts by stormwater project type being considered by Montgomery County, Maryland.

2.3.3 Incentive Program Recommendations

Because the GI Plan requires a significant proportion of new capital facilities to be built on private property, the GIAC recommends providing an incentive program cost recovered by the SWMF. This would include some combination of rebates for facility construction, as well as credits to encourage maintenance of those facilities. Credits have the added benefit of giving property owners some mechanism for reducing the financial impact of the SWMF. A property owner using grants to help pay for GI improvements will also be eligible to receive credits, provided they apply separately for credits. Application for credits typically entails agreeing to maintain the facility and allowing the City to perform inspections. Overtime, cost of the improvements borne by the property owner could be recouped through the reduction in the quarterly fee from the credits.

An allowance was included for the cost a credit program in the estimated SWMF scenarios.

TABLE 2-5
Example Credit Programs

Municipality	Single Family Residential?	Non-residential and Multi-family residential?	Types of Credits	Maximum Credit Allowed
Chesapeake, VA	No	Yes	Application of onsite BMPs that provide water quality or water quantity benefits..	Water quality (20%) Water quantity (20%) Maximum of 40%
Prince William County, VA	No	Yes	Control stormwater onsite; non-structural program participation	50% for structural control 30% for non-structural controls compiled as follows: 30% for nutrient mgmt. plan 30% for public education program 10% for attending workshop 10% site cleanup
Virginia Beach, VA	No	Yes	Manage stormwater quality onsite	30% for management to pre-developed condition 20% for management to Chesapeake Bay standards
Portland, OR	Yes	Yes	Low-impact development (ecoroof, rainbarrel, rain garden) Tree canopy Downspout disconnect Stormwater quality Stormwater quantity Stormwater planters	35% of total stormwater charges Credit for tree canopy based on number of trees greater than 15 feet.
Philadelphia, PA	No	Yes, must have >500 sf impervious area	IA Gross area NPDES credit Application and renewal fee apply	Except monthly minimum charge. Up to 100% of stormwater charge for IA and gross area credit 7% for NPDES credit
NEORSD, Cleveland, OH	Yes	Yes	Stormwater quality credit (25%) Stormwater quantity credit (50%) Education credit (25%)	Up to 75% Up to 100% for public/private schools

TABLE 2-6
Example of Stormwater Facility Classifications for Credits (Montgomery County, MD)

Pretreatment 10% credit	Water Quality (WQ) 25% credit	Water Quantity (QN) 25% credit	Both (B) 50% credit	Green Infrastructure (low-impact development, ESD, etc.) 25% credit	Programmatic 15% credit (regardless of IA treated)
AQSW – aquaswirl	AQFIL – aquafilter	PDQN – Dry Pond	DS – dry swale	RG – rain garden	Adopt-a-Stream
BAYSAV – baysaver	BF – Bayfilter	PDQNED – Dry Pond with extended detention	BR – bioretention	PP – permeable pavement	Adopt-a-Road
BSFS – baysaver flow splitter	INF – Infiltration Trench	UG – underground storage facility	BRQN – bioretention	Rain barrel	Integrated Pest Management
SEP – oil/grit separator	INFIL – Infiltrator	UGINF – underground storage facility with infiltration	BS – bioswale	Cistern	*Other DEP-approved program participation
SNOUT	INFU – Infiltration Trench, buried by design		INFQN – infiltration with quality and quantity control	Micro – bioretention	Industrial Permit
STC – stormceptor	PDIB – Infiltration basin		INFUQN – underground infiltration with quality and quantity control	Submerged gravel wetlands	
V2B1	PSF – Peat sand filter		PDQNSF – dry pond with sand filter base	Landscape Infiltration	
VORTEC - vortechnics	SC – stormchamber		PDIBQN – infiltration basin with quantity control	Infiltration Berm	
	SEPSF – separator sand filter		PDWD – constructed wetland	Swales	
	SF – surface sand filter		PDWDED – constructed wetland with extended detention	Green Roofs	
	SFU – underground sand filter		PDWT – Wet pond	Reinforced Turf	
	STFIL – storm filter		PDWTED – wet pond with extended detention	Disconnection	
			SFQN – surface sand filter with quantity control	Sheet Flow	
			TB – tree box	Dry well	

2.4 How will the City administer billing? Billing System Options

Three billing methods are commonly used to collect stormwater utility charges around the country: real estate tax bills, water/sewer utility bills, or separate billing systems. Selection of a billing system is unique to the locality establishing a stormwater utility. For example, the water/sewer bill may only cover part of the stormwater utility service area, while the property tax database provides complete coverage. Water/sewer bills are not normally sent to parking lots and vacant properties with no water/sewer connection. Similarly, property tax bills are not usually sent to owners of tax-exempt properties. It may be the case that the stormwater utility service area is not covered by either database system. The selection of the billing method should be cost-effective, timely, and capture all affected properties.

Appendix A presents the policy paper that was developed and reviewed with the GIAC on billing options.

The City administration is currently recommending adding a new line item for the SWMF to the water and sewer bill that is issued quarterly or monthly based on the rate class for the property. Properties that currently do not get a water/sewer bill will be added to the list getting bills for the SWMF, with their water/sewer line item showing a $0 charge.

2.5 How will the City administer appeals?

All stormwater utility charges typically provide a mechanism for rate payers to appeal their bills and allow them the ability to correct erroneous information. However, what can be appealed, when, and the process for submitting and reviewing appeals need to be clearly defined to make the fee defensible and manageable. Appendix A presents the policy paper that was developed and reviewed with the GIAC on appeals options.

What can be appealed typically is limited to the following:

- IA calculation and tier assignment,
- Determination of exemption status (for example, if the enabling ordinance exempts local and state governments), and
- Credit calculation, assuming a property owner applied for a credit.

Appeals are typically submitted only once per year, well in advance of the billing cycle (60-90 days), but with a quarterly billing cycle this could be done more frequently. The City administration would prefer that appeals be allowed only once per year to minimize administrative costs.

The City administration is recommending that a deadline for appeals be set 6 months before the first bills go out in a given fiscal year. Assuming the first bills go out July 1, for example, then appeals would be due no later than January 1 of each calendar year.

Appendix A
GIAC Participants and Policy Papers

Green Infrastructure Advisory Committee Participants

Green Infrastructure Advisory Committee
Member List

Peter Barber
Two Dudes Painting Company

Cathy Blantz
School District of Lancaster

Janine Boyle
PA Department of Environmental Protection

Jay Braund
PA Department of Environmental Protection

Beth Detz
Lancaster City Housing Authority

Michael Domin
Lancaster County Planning Commission

Matt Earhart
Chesapeake Bay Foundation

Lamonte Garber
Chesapeake Bay Foundation

Mary Gattis
Lancaster County Planning Commission

Tom Hassler
City Resident

Paula Jackson
City of Lancaster

Charlotte Katzenmoyer
City of Lancaster

Craig Lenhard
City of Lancaster

Brian Marengo
CH2M HILL

Randy Patterson
City of Lancaster

Frank Polan
General Growth Properties, Inc.

Lydia Pease
City Resident

Chris Peiffer
PA Department of Conservation and Natural Resources

Keith Orris
Lancaster General Hospital

Marshall Snively
James Street Improvement District

Jake Romig
Alliance for the Chesapeake Bay

Tim Roschel
City Councilman

Robert Ruth
City of Lancaster

Robert Schellhamer
Lancaster City Housing Authority

Fritz Schroeder
LIVE Green/Lancaster County Conservancy

Danene Sorace
LIVE Green/Lancaster County Conservancy

Laurens van der Tak
CH2M HILL

Bill Worley
First Reformed Church

Lori Yeich
PA Department of Conservation and Natural Resources

Stormwater Utility Program Needs Policy Paper

Stormwater Utility Program Needs
Policy Development Summary
Lancaster, PA

Policy Paper No. 1

Date Prepared: April 25, 2012
Date Revised: May 9, 2012
Date Final: September 13, 2012

Policy Issue: What is funded by the proposed Stormwater Utility?

Overview

There are several types of funding sources, which may include one or a combination of *ad valorem* taxes, grants, loans, and/or user charges. A stormwater utility is a funding mechanism that is dedicated for a variety of stormwater program elements, which may include conveyance, maintenance, and capital improvements. Currently, the City's General Fund and Sewer Fund are the source of funding for stormwater programs. In order to consider funding source, it is important to define the costs and level of service (LOS) for stormwater programs. The purpose of this policy paper is to define which program elements (Operations and Maintenance [O&M] and Capital Improvement Program [CIP]) should be funded by the proposed stormwater utility fee pursuant to Pennsylvania law.

A stormwater utility can fund O&M and/or capital projects. O&M can include administrative costs, inspection/maintenance costs, billing/collection costs, and other stormwater-related functions. Capital project costs can include rehabilitation and replacement of stormwater facilities. Program elements that could be funded by the stormwater utility fee include the following:

- Capital Improvement Projects
  - Green Infrastructure (GI) Program (Tables 5.9 and 5.10 from GI plan)
  - Combined sewer overflow (CSO) / wet-weather-related projects from wastewater CIP (funding source = Sewer Fund)
  - Catch Basin Rehabilitation and Replacement
  - Storm Drain Rehabilitation and Replacement
  - Stormwater / Drainage Master Plan CIP, for flood relief (not funded)
- Program Administration
  - Billing and Collection
  - Incentive/Credit Program (costs of administering program)
- Inspections and Maintenance
  - GI
  - Dry and Wet Ponds (inspection only, privately owned so not currently maintained by the City)
  - Street Sweeping
  - Catch Basin
  - Drainage Ditch
  - CSO / wet-weather facilities (funded by Sewer Fund)
    - Diversion Chambers
    - Junction Chambers
    - Manholes
    - Outfalls
    - Pressure Junction
    - Pump Station
    - Force Main Sewer
    - Gravity Main Sewer
    - Flow Monitoring
- National Pollutant Discharge Elimination System (NPDES) Phase II Implementation (Municipal Separate Storm Sewer System [MS4] Permit)
  - Public Education
  - Public Participation / Involvement
  - Illicit Discharge Detection / Elimination
  - Construction Site Runoff Control
  - Post-Construction Stormwater Management
  - Pollution Prevention
- Water Quality Monitoring (Total Maximum Daily Load compliance)
- Floodplain Management (not funded)
- Wastewater Treatment (funding source = Sewer Fund)

Exhibits 1a- e provide summary tables of the LOS assumptions. Exhibit 2 shows the estimated maintenance costs by LOS. Exhibits 3a-c summarize the estimated capital costs for the low, medium, and high LOS options. Exhibits 4a-b summarize the estimated capital costs for the high LOS option. Exhibits 5a-b summarize overall capital and maintenance costs for three levels of service options.

Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*: September 13, 2012

Policy Issue: What is funded by the proposed Stormwater Utility?

Policy Options

- LOS Alternative 1 – Current LOS and MS4 Permit Implementation
- LOS Alternative 2 – GI Plan Implementation (public only), MS4 Permit Implementation, Increased Maintenance and Customer Service
- LOS Alternative 3 – GI Plan Implementation, MS4 Permit Implementation, High Level of Maintenance and Customer Service

Issues, Concerns, Benefits

- LOS Alternative 3 would provide funding for a comprehensive program that includes preventive and corrective maintenance, inspection of facilities, additional CIP projects, and drainage master planning. However, the rate per equivalent residential unit may not be politically acceptable.
- LOS Alternative 1 provides only the bare-bones program with very little advancement above the current program. The fee is nominal, but the services are not comprehensive.
- LOS Alternative 2 provides advancement above the current program, including implementation of GI Plan elements on public property.
- Related policy issues include debt financing of CIP and payment of existing debt service for current CIP.
- A separate policy decision will be needed on whether existing program elements funded by the Sewer Fund will be funded by an impervious area fee, or whether new program costs due to regulatory drivers would be paid by the fee.

Advisory Committee Comments

What is funded by the Program?

- The City clarified that currently the potable water consumption is used to apportion costs for all sewer-related City services, including stormwater management.
- Question: is the user fee going to just reapportion existing costs, or will it also pay for the increase in program costs due to new elements and LOS increases? Response: it was clarified that this is a key decision that needs to be made. But the purpose of considering low, medium, and high program costs in developing fees is to bracket likely choices in terms of what programs could be funded by the fee.
- It was indicated that there is an inequity in using the current water/sewer fee system (based on water usage) to pay for stormwater/CSO issues, that are based on volume of runoff from each property.
- It was recommended to add flood relief to clarify the result of a stormwater/drainage master plan on the CIP list
- The City indicated that the CSO and treatment facility cost would remain in Sewer Fund
- Illicit discharge detection and elimination and cross-connections were discussed as a cost due to the need to inspect the system to locate cross-connected laterals, illegal connections, and sources of wet-weather flow into the sanitary sewer system, including sump pumps.
- It was suggested that we consider including a provision for expenses that we may not be thinking of (such as nutrient trading). The City clarified the role of the budget for nutrient credit purchase/sale in the sewer fund that provides the City with a cost benefit for its treatment of nutrients at the advanced wastewater treatment plant beyond the level required in its current allocation.

Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*: September 13, 2012

Policy Issue: What is funded by the proposed Stormwater Utility?

What LOS scenarios should be included in rate structure analysis?

- It was questioned whether the LOS would result in U.S. Environmental Protection Agency (EPA) acceptance of programs. Response: EPA rarely goes on record approving programs, so there's no certainty in what LOS is acceptable to meet EPA goals.
- The regulatory drivers for the program were discussed, including the uncertainties imposed by the EPA administrative order, the Total Maximum Daily Load, and future changes that are likely to occur in the City's MS4 permit.
- It was suggested to have an LOS between 2 and 3 to provide more granularity in options for LOS and to help clarify the understanding of the potential acceptability of the various Program components.
- It was suggested that LOS1 might be worth taking off the table. However, others pointed out that LOS1 illustrates the concept of the equity principle and is important to keep.
- The City indicated that the permit requirement is to clean once a year.
- Action - Fix LOS for street sweeping (CH2M HILL).
- Need to clarify the pollutant removal benefits of street sweeping (City has provided estimates for the Watershed Implementation Plan)
- It was noted that outreach could help reduce investments in ongoing street sweeping and inlet cleaning.
- Action - Need to include more intuitive metrics (CH2M HILL).

Consultant Recommendation

- The consultant recommended LOS2 or greater.

Decision/Action

The GIAC recommended that dedicated funding options be investigated to provide at least the medium level of service, with a goal of moving towards the higher level of service. It was generally agreed that the current low level of service would not be adequate to meet regulatory requirements.

EXHIBIT 1A

Catch Basin (n = 1,910)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Inlet Cleaning	2,747	1x per year	2,747	1x per year	2,747	2x per year
Rehabilitation / Replacement	72	Per year	72	Per year	72	Per year

EXHIBIT 1B

Street Sweeping (~300 miles)	LOS 1	LOS 2 (current funding)	LOS 3
Activity	Frequency	Frequency	Frequency
Routes 1-8	2 per month	2 per month	3 per month
Development Route	2 per month	2 per month	3 per month
Alleys	2 per month	2 per month	3 per month
Park City Route	2 per month	2 per month	3 per month
5th Week Route	2 per month	2 per month	3 per month
Downtown District	5 per week	5 per week	5 per week

EXHIBIT 1C

Storm Sewer (79 mi MS4, 26 mi CSS)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Maintenance	Current Funding Level					
Rehabilitation	None	N/A	80%	100 yrs	80%	75 yrs
Replacement	None	N/A	20%	100 yrs	20%	75 yrs

CSS = combined sewer system
mi - miles

EXHIBIT 1D

GI Infrastructure (O&M)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Vegetated Roof						
Inspection						
Maintenance			30,300 sf	Per year	30,300 sf	Per year
Infiltration Trenches w/ Pretreatment Inlets						
Inspection						
Maintenance			115 ea	Per year	115 ea	Per year
Porous Pavement Systems						
Inspection						
Maintenance			142,900 sf	Per year	142,900 sf	Per year
Bioretention/Rain Gardens						
Inspection						
Maintenance			66,000 sf	Per year	66,000 sf	Per year
Tree Plantings/Trenches						
Inspection						
Maintenance			1,250 ea	Per year	1,250 ea	Per year
Cisterns						
Inspection						
Maintenance			5 ea	Per year	5 ea	Per year

EXHIBIT 1E

MS4 Implementation (6 minimum controls)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Public Education						
Public Participation / Involvement						
Illicit Discharge Detection / Elimination						
Construction Site Runoff Control						
Post-Construction Stormwater Management						
Pollution Prevention						

EXHIBIT 2

Maintenance	Estimated Annual Inspection/Maintenance Costs		
	Low	Medium*	High*
Green Infrastructure			
Green Streets		$29,000	$36,250
Park Improvements / Greening		$24,000	$30,000
Disconnection, Porous Pavement		$16,000	$20,000
Porous Pavement, Bioretention		$3,000	$3,750
Vegetated Roofs / Disconnection		$10,000	$12,500
Disconnection/Rain Gardens		---	---
Enhanced Tree Planting		$50,000	$62,500
Green Schools		$30,000	$37,500
Sub-total Green Infrastructure		$162,000	$202,500
Dry and Wet Ponds (inspection only)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation			
Public Education	$15,692	$92,000	$136,000
Public Participation / Involvement	$6,462	$15,000	$47,000
Illicit Discharge Detection / Elimination	$53,800	$53,800	$53,800
Construction Site Runoff Control [1]	$52,600	$52,600	$52,600
Post-Construction Stormwater Management	$17,800	$17,800	$17,800
Pollution Prevention	$305,212	$305,212	$305,212
Program Administration			
Billing and Collection	$90,000	$90,000	$90,000
Incentive/Credit Program	n/a	$77,000	$154,000
NPDES permit	$29,000	$29,000	$29,000
Plan Review	$23,000	$23,000	$23,000

*GI Plan annual maintenance costs are for the fifth year of GI implementation.

[1] This function is provided by the Lancaster County Conservation District at no cost to the City of Lancaster, and is paid for through plan review fees assessed by the Conservation District.

EXHIBIT 3A

Capital Costs (Low LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$132,600	$132,600	$132,600	$132,600	$132,600
Park Improvements / Greening	$50,000	$50,000	$50,000	$50,000	$50,000
Disconnection, Porous Pavement	$58,200	$58,200	$58,200	$58,200	$58,200
Porous Pavement, Bioretention	$70,200	$70,200	$70,200	$70,200	$70,200
Vegetated Roofs / Disconnection	$93,600	$93,600	$93,600	$93,600	$93,600
Disconnection/Rain Gardens	$131,000	$131,000	$131,000	$131,000	$131,000
Enhanced Tree Planting	$143,800	$143,800	$143,800	$143,800	$143,800
Green Schools	$51,200	$51,200	$51,200	$51,200	$51,200
Storm Drainage					
MS4					
Rehabilitation					
Replacement					
Information Management					
CSS					
Rehabilitation					
Replacement					
Information Management					
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$894,600**	**$894,600**	**$894,600**	**$894,600**	**$894,600**

EXHIBIT 3B

Capital Costs (Medium LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$530,000	$530,000	$530,000	$530,000	$530,000
Park Improvements / Greening	$199,800	$199,800	$199,800	$199,800	$199,800
Disconnection, Porous Pavement	$232,400	$232,400	$232,400	$232,400	$232,400
Porous Pavement, Bioretention	$28,100	$28,100	$28,100	$28,100	$28,100
Vegetated Roofs / Disconnection	$138,800	$138,800	$138,800	$138,800	$138,800
Disconnection/Rain Gardens	$0	$0	$0	$0	$0
Enhanced Tree Planting	$575,000	$575,000	$575,000	$575,000	$575,000
Green Schools	$205,000	$205,000	$205,000	$205,000	$205,000
Storm Drainage					
MS4					
Rehabilitation	$667,000	$667,000	$667,000	$667,000	$667,000
Replacement	$417,000	$417,000	$417,000	$417,000	$417,000
Information Management	$2,000	$2,000	$2,000	$2,000	$2,000
CSS					
Rehabilitation	$220,000	$220,000	$220,000	$220,000	$220,000
Replacement	$137,000	$137,000	$137,000	$137,000	$137,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$3,517,100**	**$3,517,100**	**$3,517,100**	**$3,517,100**	**$3,517,100**

EXHIBIT 3C

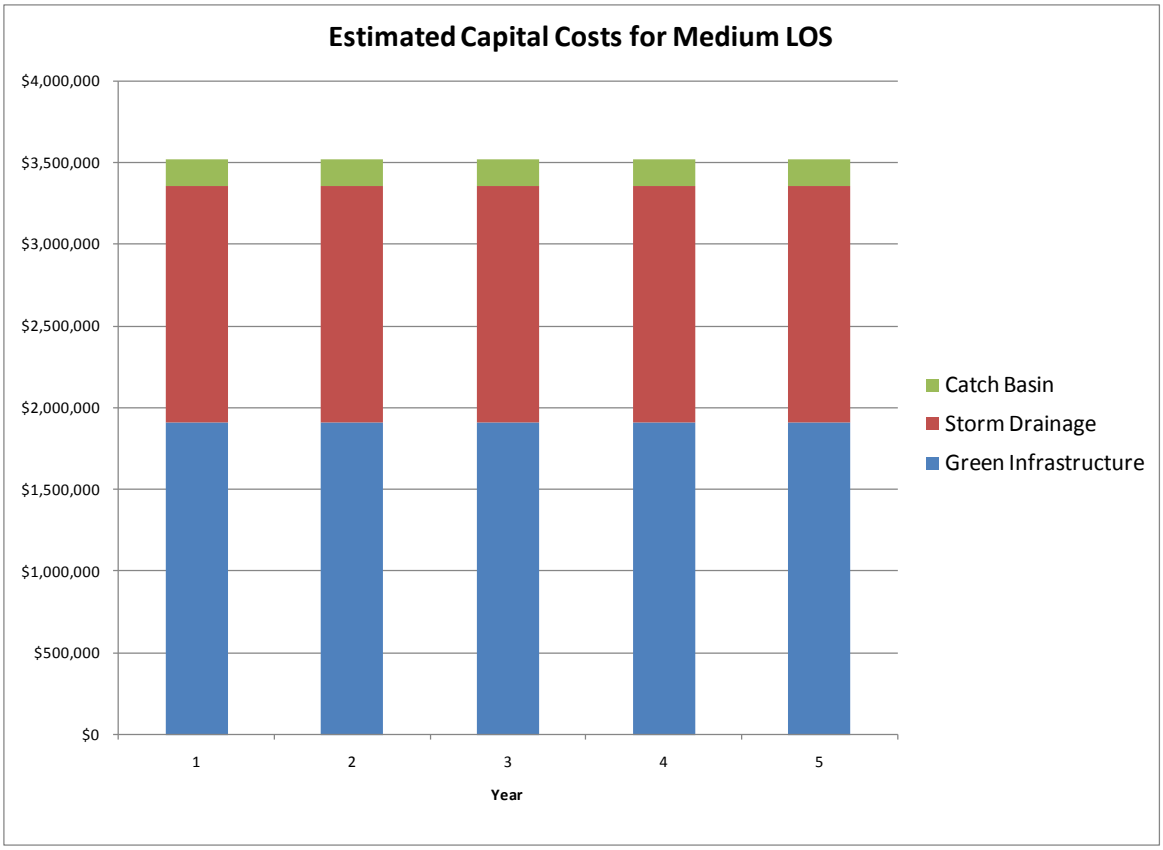

Estimated Capital Costs for Medium LOS
$4,000,000
$3,500,000
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
1
2
3
4
5
Year
Catch Basin
Storm Drainage
Green Infrastructure

EXHIBIT 4A

Capital Costs (High LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$662,600	$662,600	$662,600	$662,600	$662,600
Park Improvements / Greening	$249,800	$249,800	$249,800	$249,800	$249,800
Disconnection, Porous Pavement	$290,600	$290,600	$290,600	$290,600	$290,600
Porous Pavement, Bioretention	$351,200	$351,200	$351,200	$351,200	$351,200
Vegetated Roofs / Disconnection	$468,000	$468,000	$468,000	$468,000	$468,000
Disconnection/Rain Gardens	$655,200	$655,200	$655,200	$655,200	$655,200
Enhanced Tree Planting	$718,800	$718,800	$718,800	$718,800	$718,800
Green Schools	$256,200	$256,200	$256,200	$256,200	$256,200
Storm Drainage					
MS4					
Rehabilitation	$890,000	$890,000	$890,000	$890,000	$890,000
Replacement	$556,000	$556,000	$556,000	$556,000	$556,000
Information Management	$3,000	$3,000	$3,000	$3,000	$3,000
CSS					
Rehabilitation	$293,000	$293,000	$293,000	$293,000	$293,000
Replacement	$183,000	$183,000	$183,000	$183,000	$183,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$5,637,400**	**$5,637,400**	**$5,637,400**	**$5,637,400**	**$5,637,400**

EXHIBIT 4B

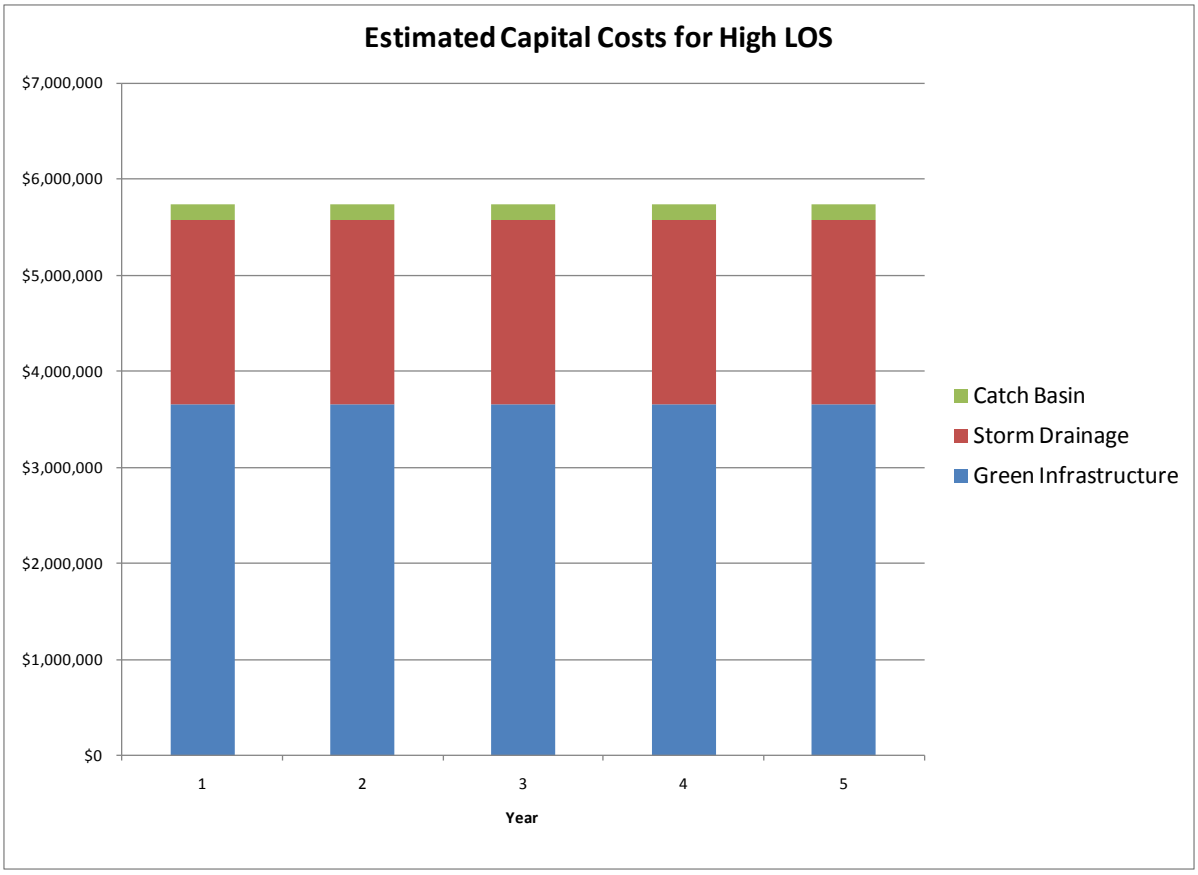
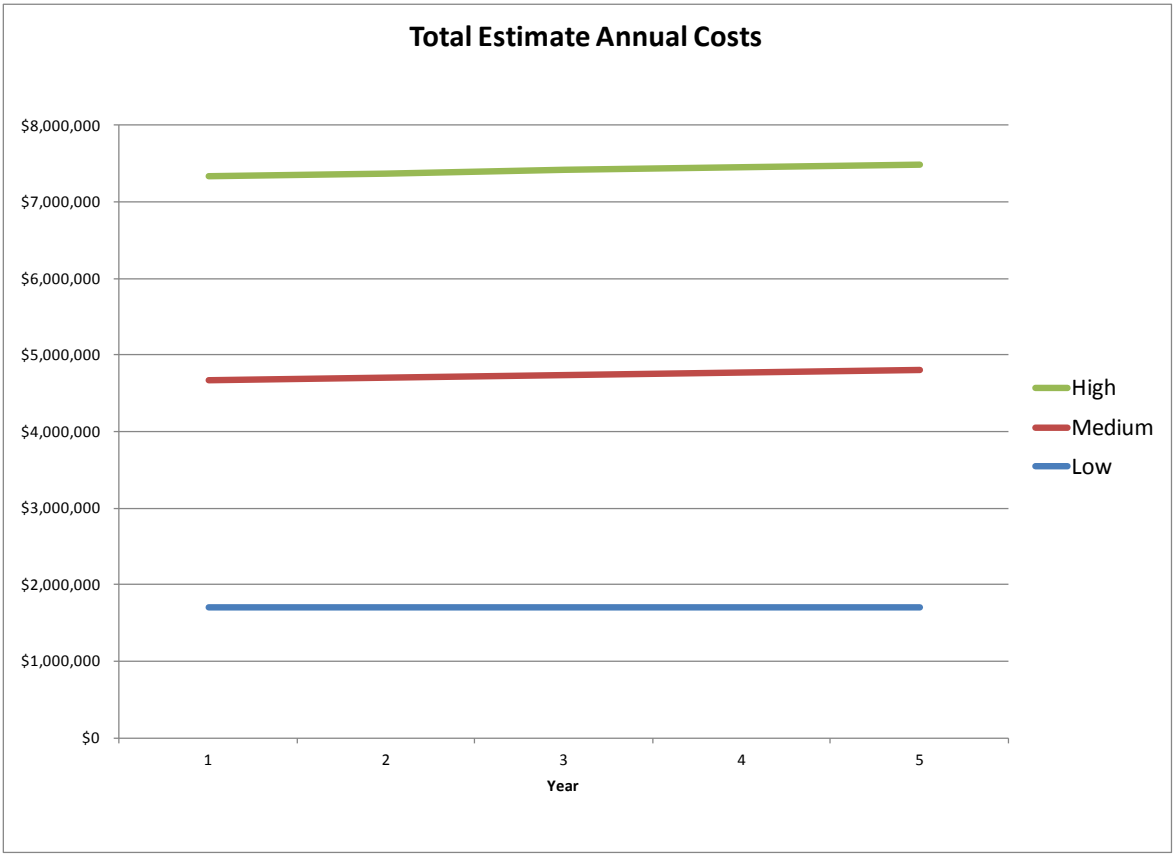


EXHIBIT 5A

	Estimated Annual Costs		
	Low	Medium	High
Operating and Maintenance			
Green Infrastructure*	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
Green Infrastructure	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

*GI Plan annual maintenance costs are for the fifth year of GI implementation.

EXHIBIT 5B


Total Estimate Annual Costs
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
1
2
3
4
5
Year
High
Medium
Low

Stormwater Utility Cost Recovery Structure and Policy Paper

Stormwater Utility Rate Structure and Rates
Policy Development Summary
Lancaster, PA

Policy Paper No. 2

Date Prepared: May 10, 2012
Date Revised: June 5, 2012
Date Final: September 13, 2012

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

The rate structure for most stormwater utilities is set up so that single-family residential (SFR) properties pay 1 ERU (Equivalent Residential Unit) and multi-family or non-residential properties pay based on actual IA. The ERU is calculated through statistical analysis of the imperviousness of single-family residential parcels. The number of ERUs (billing units) for multi-family or non-residential properties is based on total IA divided by the ERU or base unit.

In order to help with equity and fairness of the stormwater charge, municipalities are now starting to develop and implement tiered rate structures that break properties into tiers based on amount of IA. This could be applied for single-family properties or all properties. For example, there may be a statistical justification to break SFR properties into several categories (small, medium, large). Or, a tiered rate structure could be applied to all properties.

The total number of billing units, based on the rate structure, is then used to determine the rate. That is, the rate is set to recover total program costs, debt service, equity funded CIP, reserves (revenue requirements). The rate could be expressed as $/ERU or $/1,000 sf.

Policy Options

- Categories Based on Property Class —For this option, there would be multiple categories based on property class. For this option, SFR properties would be charged 1 ERU. All other property classes would be charged based on total IA. This method is perhaps the simplest and requires minimal analysis of the residential land use category. This method also has the lowest cost for billing system database implementation and maintenance. However, using 1 ERU for SFR properties is less equitable than ERU categories based size, or tiers.
- Categories Based on Size—For this option, there would be multiple categories, such as small, medium, and large properties. These categories could also be applied to all properties (commercial, institutional, industrial, faith and non-profit properties) if they fall within the IA tier ranges. Properties with IAs greater than the largest tier would pay based on actual IA. Two options were considered based on the size of all properties:
  - 4 tiers
  - 7 tiers

Issues, Concerns, Benefits

- A primary issue or concern involves equity. Does a smaller single family property (which contributes less stormwater) pay the same as a larger single family property (which contributes more stormwater), while each receive the same benefit(s) from the city-wide program? The benefits of breaking SFR properties into several categories or tiers (i.e., more precision) needs to be weighed against the implementation costs of developing and maintaining a tiered rate structure. This would require additional analysis for billing system implementation and maintenance of IA data. However, it more equitably links fees to IA size. The more tiers, the higher administrative cost and the greater likelihood of categorizing properties into the wrong tier, and therefore a possibly higher number of appeals.
- Another related consideration is whether gathering and maintaining data for more-detailed classification (more tiers) will result in noticeable differences in charges to customers.
- Based on existing geographic information system data and the property tax database, Figure 1 shows the distribution of IA for SFR properties based on available IA data[1]. The median value is 1,165 sf and the average is 1,368 sf, with a 95 percent confidence of 16 sf. For purpose of this analysis, the rate is expressed as $/1,000 sf.

[1] IAs were adjusted based on review of 199 properties from 2008 aerial photos and 2011 parcel boundaries to estimate missing or incorrectly digitized IA mapping, and a median deviation was applied to adjust the IA of each property, by class: residential, multi-family, commercial, industrial, institutional, government, or parking lot.

Stormwater Utility Rate Structure and Rates **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 2** *Date Prepared*: May 10, 2012 *Date Revised*: June 5, 2012 *Date Final*: September 13, 2012

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

Table 1 provides a tabular summary of number of properties, IA, and ERUs for three rate structures.

Figure 1 shows the frequency distribution of IA for SFR properties.

Figure 2 shows the frequency distribution of IA for all properties based on a rate structure with four tiers. Figure 3 shows the distribution for all properties based on a rate structure with 7 tiers.

Figure 4 compares number of properties and ERUs by property class. This helps illustrate the equity and fairness of basing the stormwater charge on a measure of imperviousness.

A tiered rate structure can help maintain equity for properties with IAs of less than 3,000 sf. Properties with IAs greater than 3,000 sf pay based on total IA.

For illustrative purposes, Tables 2 to 4 show the estimated stormwater charges for three rate structures, on both an annual or a quarterly basis. The rates assume a medium LOS program of $4,800,000.

Rates can increase over time depending on the operation and maintenance programs, CIP, availability of grants/loans, debt service, credits/incentives, and collection rate. Figure 5 illustrates how rates could increase over time assuming the use of grants/loans, pay-go CIP, and repayment of Penn Vest debt service (loan to fund CIP). The low LOS does not assume grants/loans or debt service because the CIP is minimal compared to the medium and high LOS.

Consultant Recommendation

- Based on the analyses presented, it is evident that justification for multiple tiers exists. However, although the equity issue could be used to justify a tiered rate structure, these considerations need to be balanced against considerations of simplicity and implementation/ database maintenance costs. More tiers are recommended for equity reasons, but only if the quality of the IA data is high enough to that properties can be categorized with confidence into more bins, i.e., smaller IA ranges. Current data probably do not justify that approach, but the City expects to get new IA data based on a 2012 aerial flyover. Assuming these data are captured at a high resolution, the seven-tier option is recommended, applied to all property types.

Stormwater Utility Rate Structure and Rates **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 2** *Date Prepared*: May 10, 2012 *Date Revised*: June 5, 2012 *Date Final*: September 13, 2012

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

Decision/Action

Reviewed Rate Structure Options and Preliminary Rates

- Property owners pay based on their contribution to stormwater runoff as determined by a measure of IA.
  - There is agreement that the assessed value of a property does not provide equity in computing the stormwater charge.
- To evaluate rate structure options, a statistical analysis of IA was conducted to obtain the median and average IA for SFR properties.
- The typical measure of IA is the ERU, and is based on the median or average IA of SFR properties.
- A recent trend among stormwater utilities is to implement a tiered rate structure based on IA. The tiers can be applied to SFR properties only or to all properties.
  - A proposed rate structure with four tiers was presented.
- The number of tiers included depends on characteristics of the municipality. For the City of Lancaster, development can be characterized as urban, with many mixed use buildings and attached row houses, and public/private alleys.
- Can a property owner have a stormwater charge of $0?
  - Some municipalities offer 100-percent credit for onsite stormwater facilities that a property owner owns and maintains.
  - Most municipalities offer partial credit because of offsite benefits received by property owners that the stormwater utility funds.
  - The City is considering a system of credits that will allow property owners to reduce their stormwater charge based on the amount of IA treated by eligible stormwater facilities. This is the subject of a separate Policy Paper.
- Based on feedback from the GIAC committee during the May 10 and 31, 2012 meetings:
  - There is agreement that a tiered rate structure will help achieve equity and fairness among all properties. This is true because of small non-residential / mixed-use buildings that would fall within the lower tiers. During the May 31 meeting, the contrast between four- and seven-tier options was presented in terms of rates and numbers of properties in each tier. Most participants preferred the four-tier option because it provided the right balance of equity/fairness based on property size and the increased data administration issues expected with more tiers. However, some participants preferred the greater number of tiers because it increases the connection of property size with rates and therefore adds further incentives for property owners to manage their IAs.
  - There is an agreement that a tiered rate structure that is applied to all properties makes the most sense.
  - Evaluating a tiered rate structure with more than four tiers is recommended.

Should Quality of Runoff be Reflected in Rates?

- Property owners pay based on contribution to stormwater runoff as determined by a measure of IA.
- Some properties are likely to be sources of pollutants that are picked up and washed away by stormwater runoff.
- The difficulty is making categorical limits based on property type because not all owners within a property type will be the source of pollutants.
- Some properties are required to have stormwater permits that identify stormwater facilities that treat stormwater runoff before being discharged into the system or waterway.
- As part of the City's MS4 permit, there are requirements to help control pollutants

Stormwater Utility Rate Structure and Rates **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 2** *Date Prepared*: May 10, 2012 *Date Revised*: June 5, 2012 *Date Final*: September 13, 2012

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

Need Public Outreach Plan to Prevent Politicizing New Fees

- There is concern about the proposed IAF becoming politicized because it may be viewed as something the sewer charge already pays for or that this is just another tax.
- The Public Education Plan can help identify ways to gain support for the fee, with a focus on communicating the value of the program. During the May 31, 2012, GIAC meeting, it was suggested that the outreach program should be specific about what specific enhancements to the program are being added, and what the program would fund that's currently already funded. It was pointed out that, in addition to several new and enhanced elements, the fee will be used to support a number of functions currently supported by the sewer fees and the General Fund, because an IA -based charge is a more equitable way to support the stormwater program.
- Business owners preferred a phased-in approach for the increases, and at a minimum would like to see advance assessments so that the fee can be budgeted for. It was pointed out that grants and loans in the early years do result in a lower initial projected charge compared with the example bills shown during the meeting, which are based on projected charges in Year 4 when grants and loans are not assumed. These lower initial fees act in a similar fashion to phasing-in fees.

TABLE 1
Number of Properties and ERUs by Stormwater Class

Stormwater Class	Estimated Impervious Area (sf)	Number of Properties	ERUs		
			No Tiers*	4 Tiers	7 Tiers
Single-Family	18,337,179	13,407	13,407	18,364	18,280
Multi-Family	9,909,174	1,976	9,909	9,904	9,894
Commercial	29,093,647	1,626	29,094	29,095	29,096
Industrial	15,205,021	111	15,205	15,205	15,205
Non-Profit	2,643,843	133	2,644	2,643	2,643
Institutional	4,824,416	44	4,824	4,825	4,825
Government	3,707,181	56	3,707	3,708	3,708
Total	83,720,461	17,353	78,790	83,745	83,651

*Assumes 1 ERU = 1,000 sf and SFR properties charge 1 ERU.

FIGURE 1
Impervious Area Distribution of Residential Properties

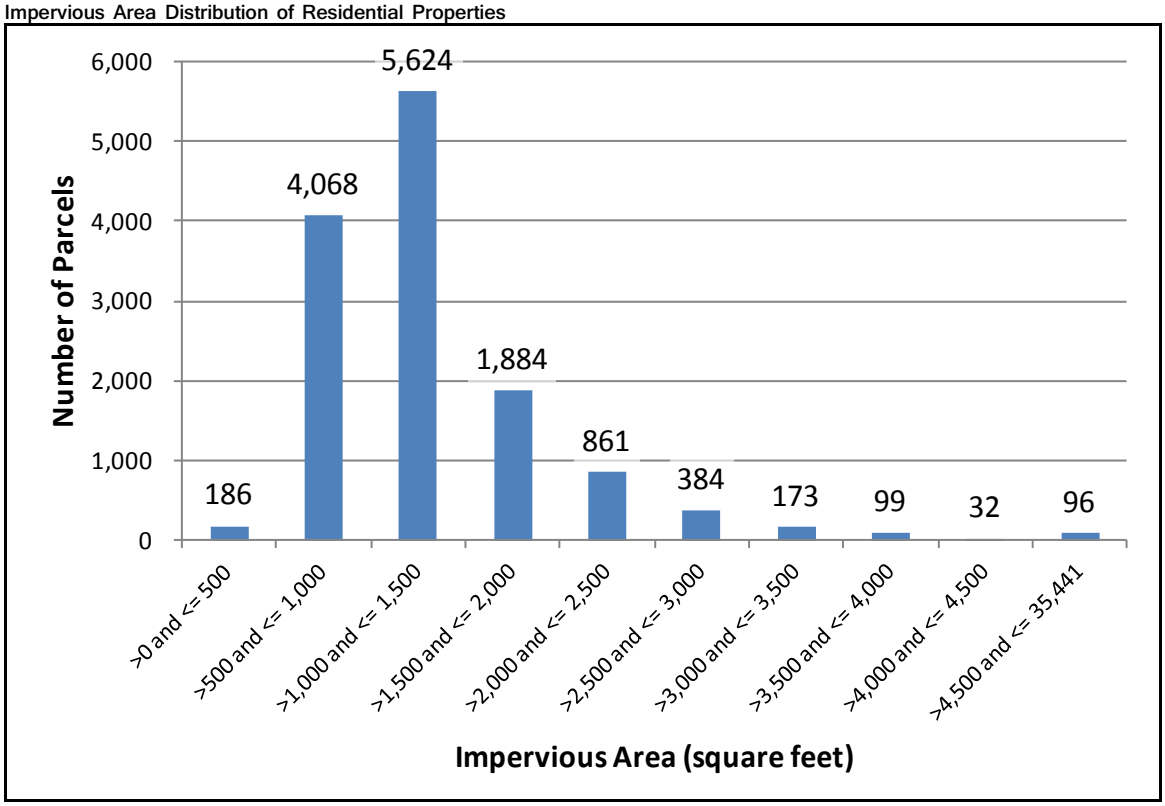


FIGURE 2

Impervious Area Distribution of All Properties and Four-Tier Rate Structure

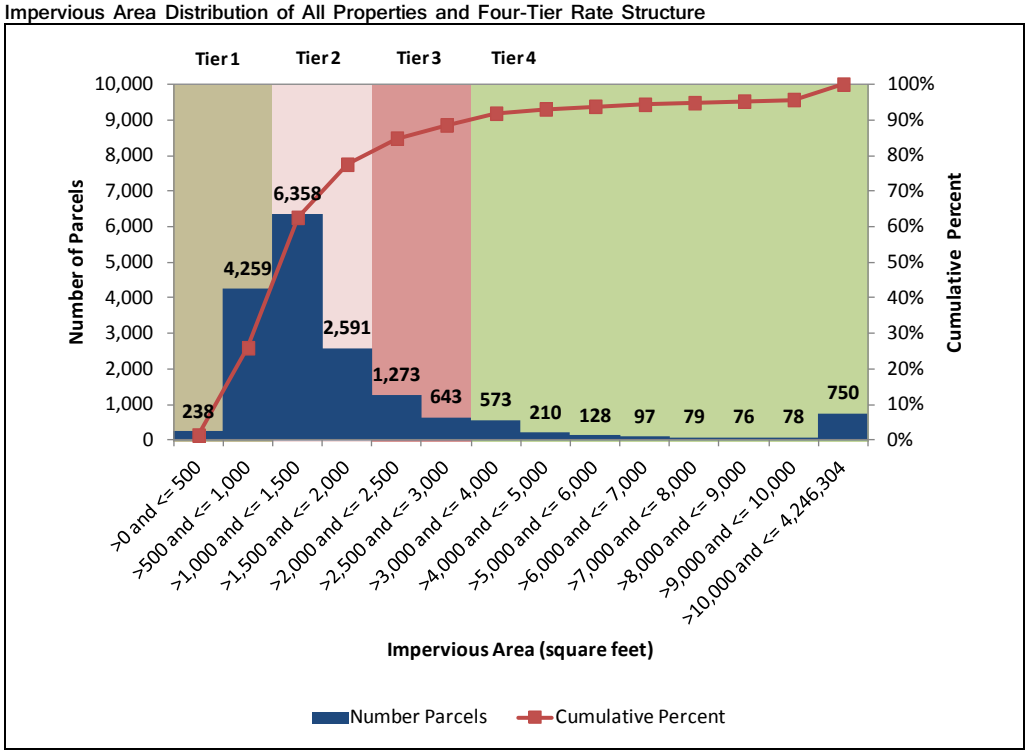


FIGURE 3

Impervious Area Distribution of All Properties and Four-Tier Rate Structure

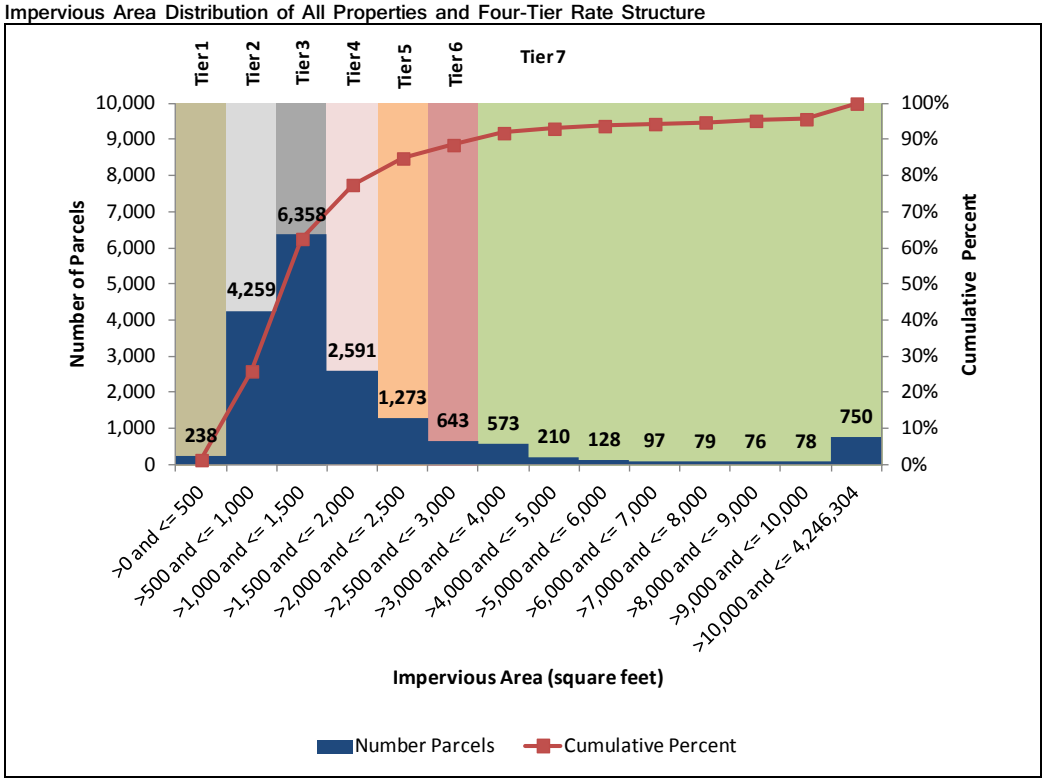


FIGURE 4
Number of properties and ERUs (No Tier Option) by Stormwater Class

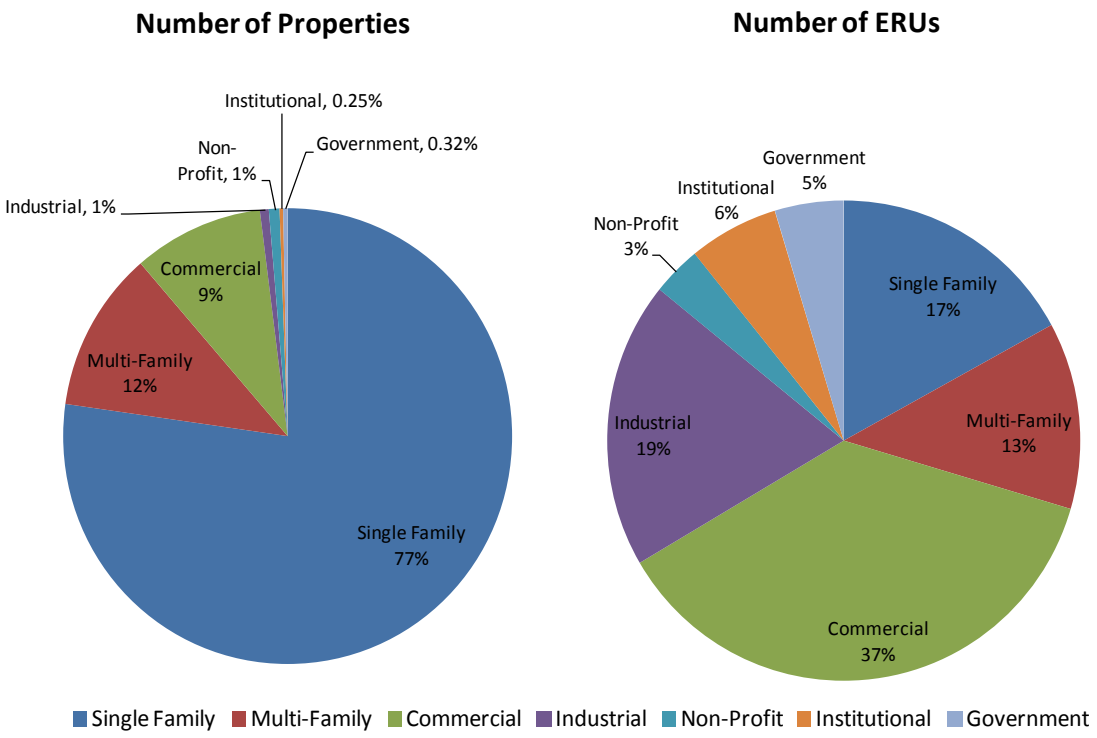


TABLE 2
Proposed No Tier Rate Structure

	Preliminary Stormwater Charge[a]	
	Annual	Quarterly
Single Family Residential	$61	$15.25
Non-Residential	Charge based on total impervious area $61/1,000 sf	$15.25/1,000 sf
Multi-Family	Charge based on total impervious area $61/1,000 sf	$15.25/1,000 sf

[a] Assumes medium LOS, a $4,800,000 stormwater program, and 78,790 ERUs.

TABLE 3
Proposed Four-Tier Rate Structure[a]

Tier	Impervious Area Range	Preliminary Stormwater Charge[b]	
		Annual	Quarterly
1	<=1,000 sf	$28.50	$7.13
2	>1,000 sf and <=2,000 sf	$85.50	$21.38
3	>2,000 sf and <=3,000 sf	$142.50	$35.63
4	>3,000	Charge based on total impervious area $57/1,000 sf	$14.25/1,000 sf

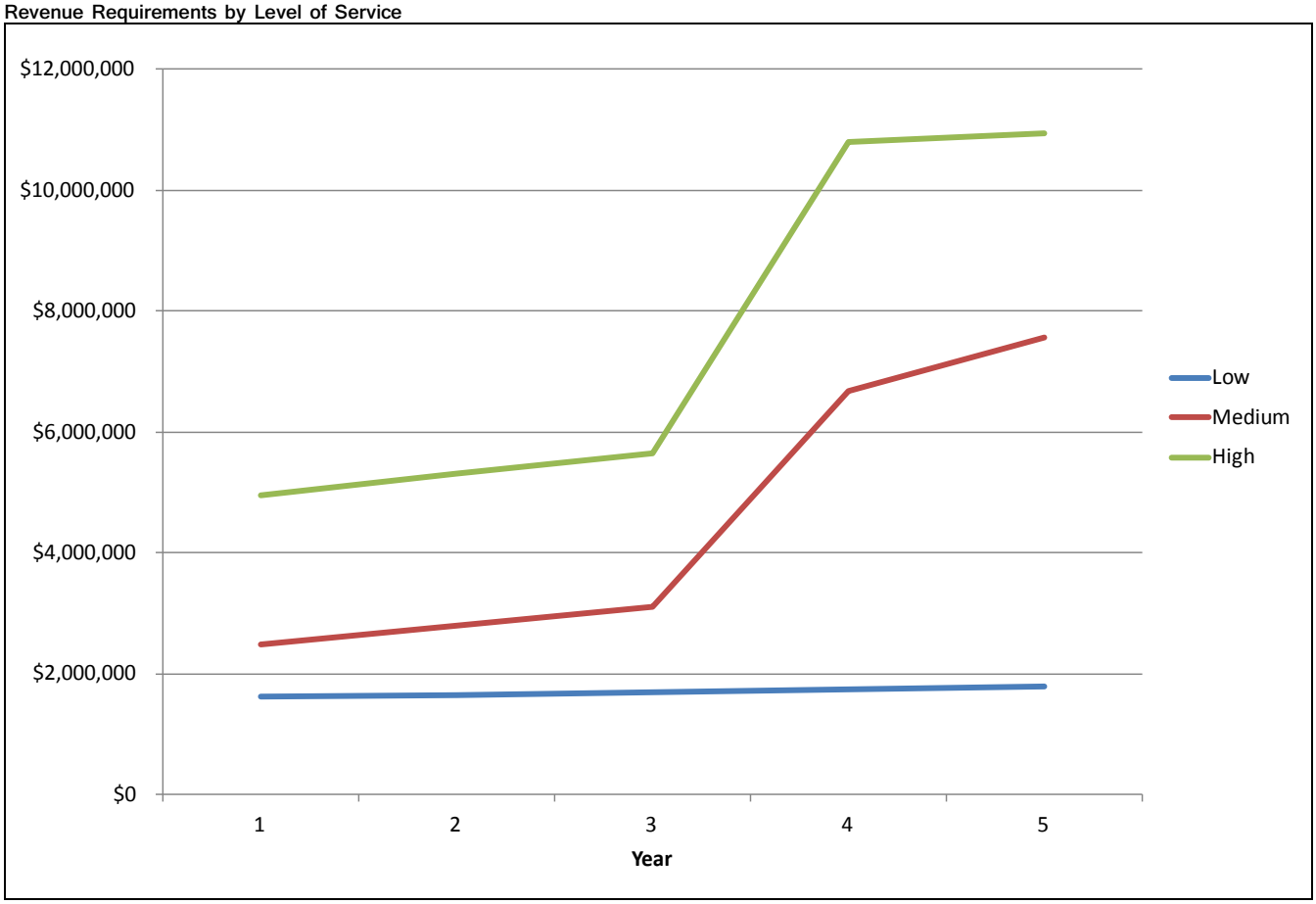
[a]Applies to all properties.
[b]Assumes medium LOS, a $4,800,000 stormwater program, and 83,745 ERUs.

TABLE 4
Proposed Seven-Tier Rate Structure[a]

Tier	Impervious Area Range	Preliminary Stormwater Charge[b]	
		Annual	Quarterly
1	<=500 sf	$14.25	$3.56
2	>500 sf and <=1,000 sf	$42.75	$10.69
3	>1,000 sf and <=1,500 sf	$71.25	$17.81
4	>1,500 sf and <=2,000 sf	$99.75	$24.94
5	>2,000 sf and <=2,500 sf	$128.25	$32.06
6	>2,500 sf and <=3,000 sf	$156.75	$39.19
7	>3,000	Charge based on total impervious area $57/1,000 sf	$14.25/1,000 sf

[a] Applies to all properties.
[b] Assumes medium LOS, a $4,800,000 stormwater program, and 83,651 ERUs.

FIGURE 5
Revenue Requirements by Level of Service



Assumes:
Penn Vest debt service, but no new debt service,
Use grants and Penn Vest loan to fund CIP.

Stormwater User Charge Rate Structure Policy Paper

Stormwater User Charge Rate Structure
Policy Development Summary
City of Lancaster, PA

Policy Paper No. 3

Date Prepared: May 31, 2012
Date Revised: June 5, 2012
Date Final: September 13, 2012

Policy Issue: For CIP projects with a useful life longer than 20 to 30 years, should the stormwater utility fund the CIP through rates (i.e., pay-as-you-go), or should long-term financing be used?

Overview

CIP projects are relatively major improvements that the City needs to maintain adequate stormwater management services. In addition, the CIP identifies projects related to the GI Plan. The activities involve development, design, scheduling, funding, permitting, and construction of the projects. These projects may include drainage improvements, storm sewer rehabilitation or replacement, catch basin rehabilitation and replacement, and/or drainage master planning studies.

Figure 1 shows the total CIP for the each LOS alternative considered. Figure 2 shows the net effect of using grants / loans to help reduce the capital costs funded by the stormwater utility. For the low LOS, the CIP is entirely funded by grants/loans and assumes no new debt service. For the high LOS, only a portion of the CIP is funded by grants/loans. The difference would need to be funded by the stormwater utility (i.e., pay-go or long-term financing).

Assuming grants/loans are used to fund the CIP and the difference is bond-funded starting in Year 4, Figure 3 shows the rate impacts for the medium LOS and compares pay-go versus bond financing. Figure 4 shows the rate impacts for the high LOS and compares pay-go versus bond financing. Bond financing is not assumed for the low LOS.

Based on feedback from City, the debt financing assumptions include:

- General Obligation Bonds (using full faith and credit of the City and pledge of stormwater utility revenues)
- Next likely bond issue in 2015-16
- 5.5% interest rate (subject to change based on market conditions)
- 20year term (subject to change based on average useful life of projects being financed)
- As a starting point, a target debt service coverage ratio of 1.5

Policy Options

- Option 1 – Do not fund CIP with IAF
- Option 2 – Pay-As-You-Go through IAF rates
- Option 3 – Long term financing and/or Pay-As-You-Go

Issues, Concerns, Benefits

Other municipalities have issued bonds to finance stormwater capital projects, including Griffin, GA; City of Miami Beach, FL; Clearwater, FL; and Charlotte, NC. Montgomery County, MD is in the process of issuing bonds to fund projects related to its MS4 permit. Based on experience from those locations and others, the following issues have been identified related to debt financing that Lancaster might need to consider:

- Issues may include overseeing the administration of the debt service payments. As a stormwater utility startup, revenue bonds would not likely be an option because underwriting agencies would require an established track record of stormwater utility fee revenues. Nonetheless, General Obligation bonds could be used, while using the full faith and credit of the City and/or the revenue from the utility fee.
- Concerns may include the City's fiscal policy regarding debt financing and any established caps on debt financing. The type of bond financing can help avoid affecting a cap on debt financing (i.e., using revenues generated by the IAF).
- Bond proceeds can be used to finance stormwater projects that meet average useful life requirements.
- Depending on the tax status of the bonds (tax-exempt vs. taxable), there could be restrictions on the types of projects financed with the bond proceeds (public vs. private facilities). In addition, if bond proceeds are used to finance projects, providing incentives/credits to the property owner could be limited. These issues are subject to review by the Bond Counsel during the bond issuance process.
- Debt-financing of significant CIP projects could be a benefit because the capital costs are spread out over time. In addition, long-term financing provides a form of fairness in the sense that existing residents do not pay for all of the costs up-front and new resident will share some of the costs.

Stormwater User Charge Rate Structure **Policy Development Summary** **City of Lancaster, PA**	**Policy Paper No. 3** *Date Prepared*: May 31, 2012 *Date Revised*: June 5, 20012 *Date Final*: September 13, 2012

Policy Issue: For CIP projects with a useful life longer than 20 to 30 years, should the stormwater utility fund the CIP through rates (i.e., pay-as-you-go), or should long-term financing be used?

Consultant Recommendation

- _____

Decision/Action

- Recommend going forward with debt financing .
- Further discussion and need for public understanding of risks / misconceptions of taking on debt and long-term implications. Need to overcome reluctance to debt.
- Additional discussion of this issue should be presented, including examples of other comparable communities that have used debt to support their stormwater capital programs.

FIGURE 1
Summary of Stormwater CIP by Levels of Service

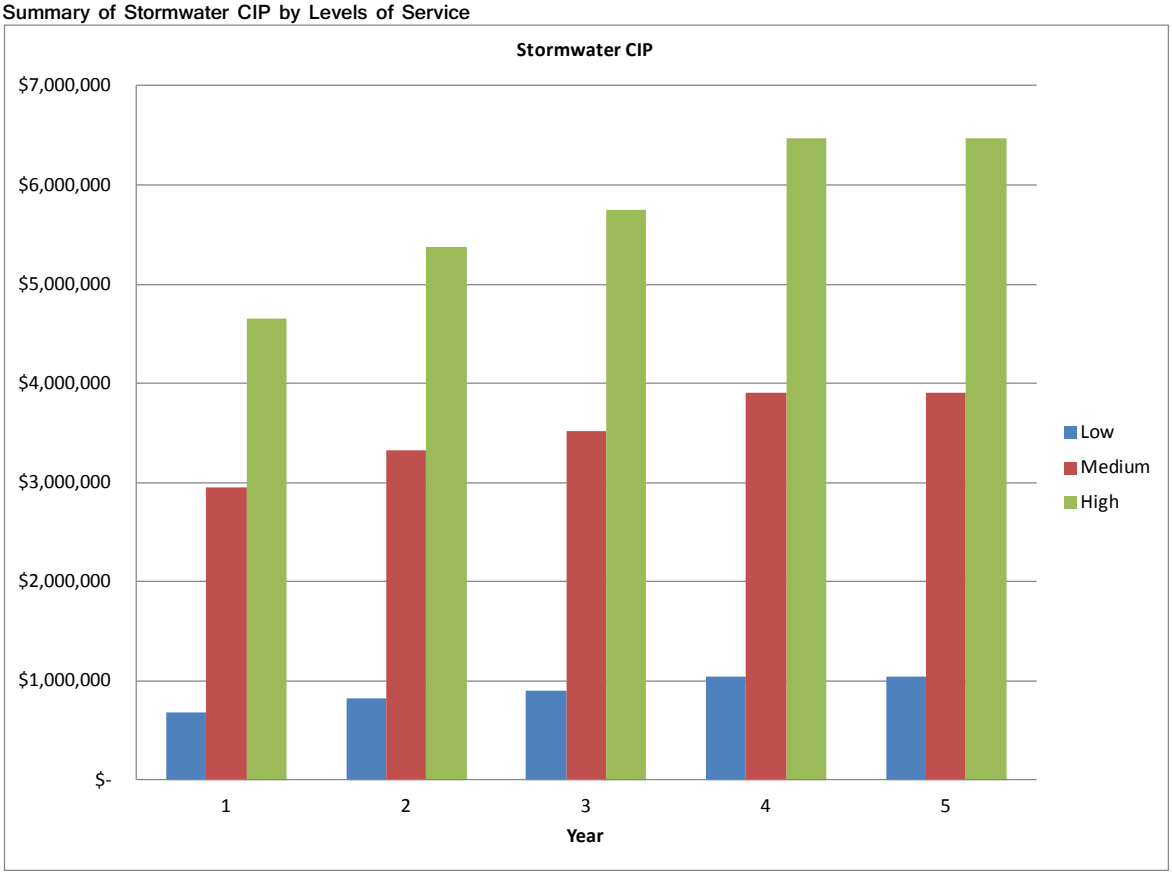


FIGURE 2
Summary of Medium Level of Service Stormwater CIP Net of Grants and Loans

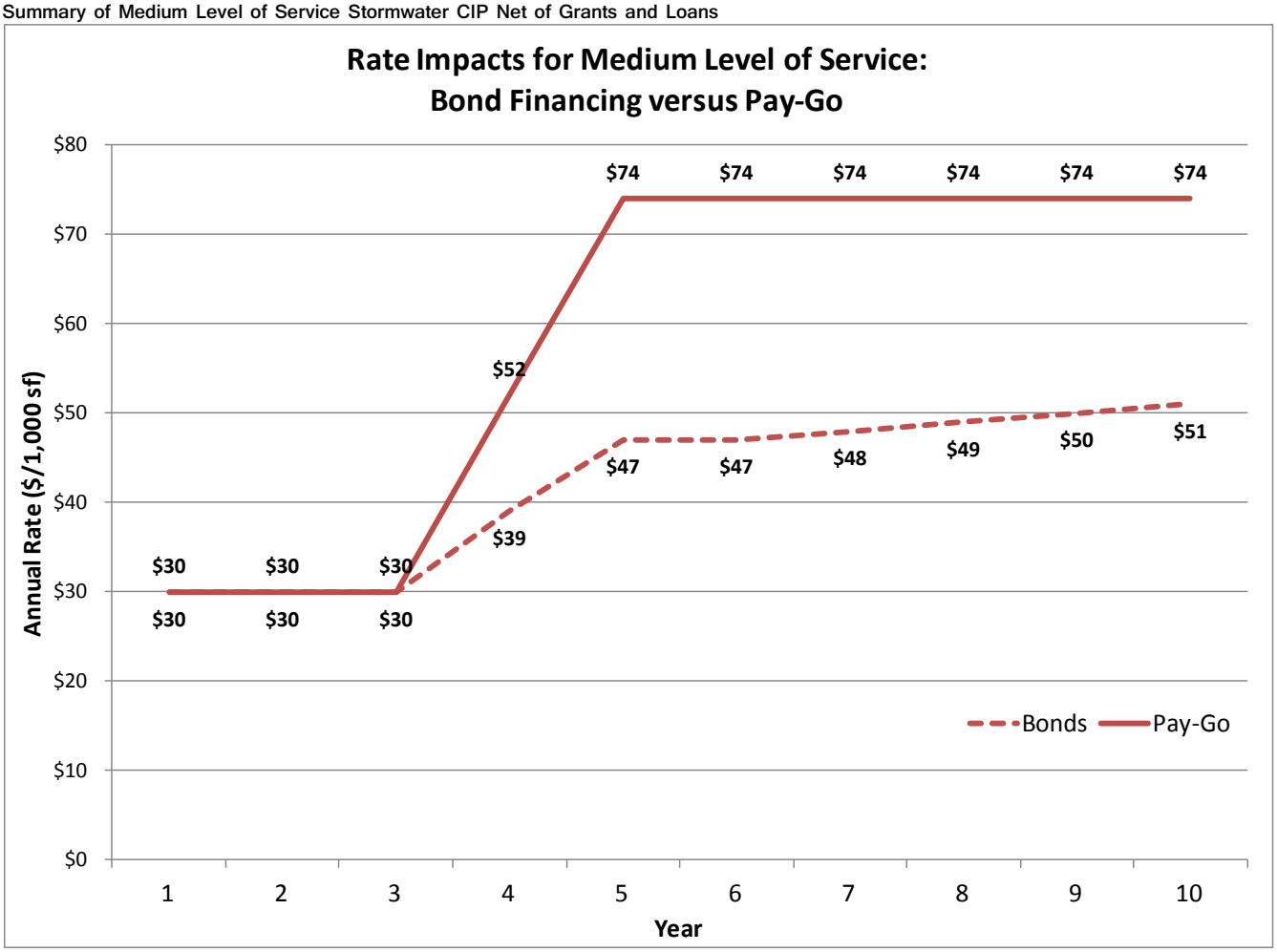
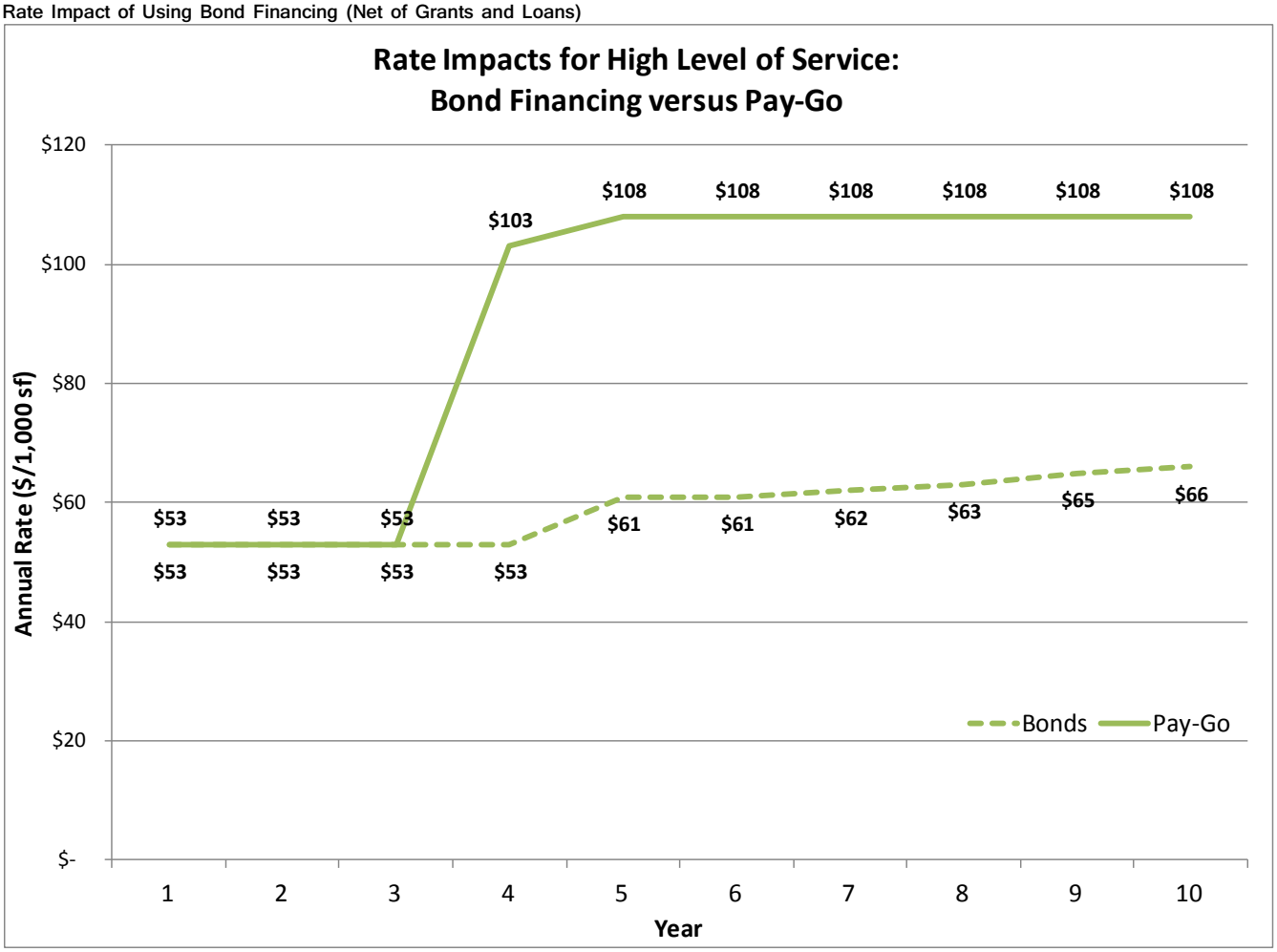


FIGURE 3
Rate Impact of Using Bond Financing (Net of Grants and Loans)



Stormwater Utility SWU Fee Credits / Incentives Policy Paper

Stormwater Utility Fee Credits / Incentives **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: May 24, 2012 *Date Revised*: *Date Final*: September 17, 2012

Policy Issue: What type of type of credits or incentives should be provided to property owners for on-site facilities or green infrastructure? What is the likely impact on the range for the initial rate for the stormwater utility fee?

Many stormwater utilities provide incentives for properties with onsite stormwater facilities to treat stormwater runoff. Two types of incentive programs typically are considered:

- Rebates or grants
- Credits

The purpose of grants or rebates is to provide one-time subsidy to reduce construction costs associated with installation of stormwater facilities on private property. This sort of program is fairly uncommon, but is growing in popularity among jurisdictions with CSO and MS4 permit mandates. Examples include Montgomery County, Maryland's RainScapes program, Washington, DC's RiverSmart Homes, and Portland, Oregon's program (links are provided below). For example, RainScapes provides grants of up to $1,200 for residential property and up to $5,000 for commercial, multi-family, or institutional properties, depending on project type. Eligible practices include but are not limited to rain gardens, tree canopy, permeable pavers, green roofs, and rain barrels. RainScapes is funded by the County's stormwater utility. Similarly, DC's RiverSmart Homes program funds up to $1,200 for similar project types, but is restricted to private residences.

The purpose of credits is to help property owners reduce their stormwater charge, thus providing an incentive for implementing stormwater management facilities. Historically, credits have been offered to commercial properties, but recent trends show that single-family properties are now eligible for certain types of credits. The credit amount that a property can receive varies among stormwater utilities. Most utilities provide only a partial credit, while others provide a full credit. The criteria for determining the credit amount typically are based on type of facility, and percent of impervious area treated (usually just the onsite impervious area). Some utilities provide credits to properties that do not have qualifying facilities but agree to participate in public education or outreach programs. Exhibit 1 provides a summary of credit programs around the United States. Exhibit 2 provides a list of potential credit amounts by stormwater project type being considered by Montgomery County, Maryland.

As part of a grant to evaluate GI, the City has identified possible credit scenario case studies based on implementing GI. These case studies consider residential and commercial facilities and are summarized in Exhibit 3.

Links to sample rebate/grant programs:

http://www.montgomerycountymd.gov/dectmpl.asp?url=/content/dep/water/rainscapes.asp

http://ddoe.dc.gov/service/riversmart-homes-overview

http://www.pidc-pa.org/development-and-contract-opportunties/rfp-rfq-opportunities/43

Links to sample credit programs:

http://www.portlandonline.com/bes/index.cfm?c=43444&

Stormwater Utility Fee Credits / Incentives **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: May 24, 2012 *Date Revised*: *Date Final*: September 17, 2012

Policy Issue: What type of type of credits or incentives should be provided to property owners for on-site facilities or green infrastructure? What is the likely impact on the range for the initial rate for the stormwater utility fee?

Policy Options

1) Rebates or grants:
   a) Property Eligibility for Credits
      i) Provide credits to only commercial properties
      ii) Provide credits to all properties
   b) Amount of Credit
      i) $ limits by project type
      ii) $ limits by property type
   c) Qualifying Facilities / Activities
      i) Approved BMPs, GI
2) Credits:
   a) Property Eligibility for Credits
      i) Provide credits to only commercial properties
      ii) Provide credits to all properties
   b) Amount of Credit
      i) Partial (less than 100-percent reduction in charge)
      ii) Full (complete waiver of charge)
   c) Qualifying Facilities / Activities
      i) Approved BMPs, GI
      ii) Participation in activities (such as public education program, adopt-a-highway)

Issues, Concerns, Benefits

Both rebates and credit programs represent a policy option to increase stormwater treatment and improve compliance with permit requirements by incentivizing property owners to build stormwater facilities on private property. But these programs represent a cost (in the case of rebates) or a reduction in revenue, in the case of credits. Both types of programs have administrative costs that should be considered. All credit programs typically require some sort of maintenance agreement between the property owner and the utility to ensure that the facility is built appropriately and maintained in proper working order according to established design standards. The City of Portland's Clean River Rewards stormwater credit program required 2 full-time personnel—one to administer and promote the program and another to conduct inspections to be sure facilities are being maintained. Credits typically require submittal of an application to be eligible for the credit, with residential programs typically being granted without inspection of more than a small sample of properties, and nonresidential facility credits requiring a site inspection. The period for which credits are kept in place varies, with some utilities requiring annual re-application, some granting credits for longer periods (3-5 years), and some granting credits indefinitely without reapplying.

The question of what is the maximum level of credit is a policy question. Few jurisdictions grant 100-percent credit (essentially a waiver). Often these are situations in which the facility is an industrial facility with its own stormwater permit, or they discharge entirely directly to "waters of the U.S." without passing through the MS4 system. More often, only partial credits are allowed (25-, 35- or 50-percent reduction, for example), with the rationale being that even if the property controls 100 percent of stormwater onsite, the municipality still has costs to manage stormwater offsite that everyone benefits from (for example, program administration for the permit, drainage from public roads).

Consultant Recommendation

- The consultant recommends developing both a credit and a rebate program to support MS4 and CSO LTCP compliance, with credits of not more than 50 percent. These programs could be phased in after initial implementation of an impervious arear fee, largely to allow time to set up administrative systems and outreach programs to support them.

Stormwater Utility Fee Credits / Incentives **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: May 24, 2012 *Date Revised*: *Date Final*: September 17, 2012

Policy Issue: What type of type of credits or incentives should be provided to property owners for on-site facilities or green infrastructure? What is the likely impact on the range for the initial rate for the stormwater utility fee?

Decision/Action

Because the GI Plan requires a significant proportion of new capital facilities to be built on private property, the GIAC recommends providing an incentive program funded by the IAF. This would include some combination of rebates for facility construction, as well as credits to encourage maintenance of those facilities. Credits have the added benefit of giving property owners some mechanism of reducing the financial impact of the IAF.

EXHIBIT 1

Example Credit Programs

Municipality	Single Family Residential?	Non-Residential and Multi-Family Residential?	Types of Credits	Maximum Credit Allowed
Chesapeake, VA	No	Yes	Application of onsite BMPs that provide water quality or water quantity benefits..	Water quality (20%) Water quantity (20%) Maximum of 40%
Prince William County, VA	No	Yes	Control stormwater onsite; non-structural program participation	50% for structural control; 30% for non-structural controls compiled as follows: 30% for nutrient mgmt. plan 30% for public education program 10% for attending workshop 10% site cleanup
Virginia Beach, VA	No	Yes	Manage stormwater quality onsite	30% for management to pre-developed condition 20% for management to Chesapeake Bay standards
Portland, OR	Yes	Yes	Low-impact development (ecoroof, rain barrel, rain garden) Tree canopy Downspout disconnect Stormwater quality Stormwater quantity Stormwater planters	35% of total stormwater charges Credit for tree canopy based on number of trees greater than 15 feet.
Philadelphia, PA	No	Yes, must have >500 sf impervious area	IA Gross Area NPDES Credit Application and renewal fee apply	Except monthly minimum charge. Up to 100% of stormwater charge for IA and Gross Area credit 7% for NPDES Credit
NEORSD, Cleveland, OH	Yes	Yes	Stormwater quality credit (25%) Stormwater quantity credit (50%) Education credit (25%)	Up to 75% Up to 100% for public/private schools

EXHIBIT 2

Example of Stormwater Facility Classifications for Credits (Montgomery County MD)

Pretreatment 10% credit	Water Quality (WQ) 25% credit	Water Quantity (QN) 25% credit	Both (B) 50% credit	Green Infrastructure (Low Impact Development, ESD, etc.) 25% credit	Programmatic 15% credit (regardless of impervious area treated)
AQSW – aquaswirl	AQFIL – aquafilter	PDQN – Dry Pond	DS – dry swale	RG – rain garden	Adopt-a-Stream
BAYSAV – baysaver	BF – Bayfilter	PDQNED – Dry Pond with extended detention	BR – bioretention	PP – permeable pavement	Adopt-a-Road
BSFS – baysaver flow splitter	INF – Infiltration Trench	UG – underground storage facility	BRQN – bioretention	Rainbarrel	Integrated Pest Management
SEP –oil/grit separator	INFIL – Infiltrator	UGINF – underground storage facility with infiltration	BS – bioswale	Cistern	*Other DEP-approved program participation
SNOUT	INFU – Infiltration Trench, buried by design		INFQN – infiltration with quality and quantity control	Micro – bioretention	Industrial Permit
STC – stormceptor	PDIB – Infiltration basin		INFUQN – underground infiltration with quality and quantity control	Submerged gravel wetlands	
V2B1	PSF – Peat sand filter		PDQNSF – dry pond with sand filter base	Landscape Infiltration	
VORTEC - vortechnics	SC – stormchamber		PDIBQN – infiltration basin with quantity control	Infiltration Berm	
	SEPSF – separator sand filter		PDWD – constructed wetland	Swales	
	SF – surface sand filter		PDWDED – constructed wetland with extended detention	Green Roofs	
	SFU – underground sand filter		PDWT – Wet pond	Reinforced Turf	
	STFIL – stormfilter		PDWTED – wet pond with extended detention	Disconnection	
			SFQN – surface sand filter with quantity control	Sheet Flow	
			TB – tree box	Dry well	

EXHIBIT 3

Summary of Case Studies from Keith Campbell Grant Study Report (CH2M HILL, 2011)

Property ID	Property Name	Land Use Category	Annual Stormwater Charge	Charge after Credits	Payback (Years)	Median Impervious Area (sf) for Group	Impervious Area (sf) for Property
P-21	Two Dudes Painting	Commercial	$1,600	$900	105	2,800	19,900
P-82	Sundown Lounge	Commercial	$200	$100	190	2,800	2,600
P-111	Ace Rents	Industrial	$21,300	$10,650	85	31,200	265,800
P-25	Novelty Brush	Industrial	$2,600	$1,906	244	31,200	32,600
P-47	Lancaster County Library	Institutional	$2,300	$1,693	196	29,400	29,000
P-100	Water Street Mission	Institutional	$9,400	$8,623	131	29,400	117,100
P-34	Public Parking: Dauphin St	Local Govt.	$1,700	$850	77	8,300	21,750
P-84	Apts at Mulberry Ct	Multi-Family	$1,000	$692	455	1,200	12,900
P-51	Private Parking Water St	Parking	$5,100	$2,550	78	2,800	63,200
P-85	James St Mennonite Church	Religious	$2,300	$1,693	160	8,600	28,800
P-99	Trinity Lutheran Church	Religious	$3,500	$2,287	150	8,600	43,500
SFR-01	600 block Ocean Ave	Single Family	$40	$30	10	900	400
SFR-02	500 Poplar St	Single Family	$80	$40	53	900	800
SFR-03	900 Block Lehigh Ave	Single Family	$120	$72	31	900	4,800
P-106	Green Alley at Alley 7 (Option #1)	Single Family	$80	$40	57	900	22,300
P-106	Green Alley at Alley 7 (Option #2)	Single Family	$80	$49	34	900	51,340

Note: Charges assume $5/month/1000 sf of IA.

Stormwater Utility – Impervious Area Fee (SWMF) Billing System Policy Paper

Stormwater Utility Impervious Area Fee (IAF) Billing System **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: August 29, 2012 *Date Revised*: September 11, 2012 *Date Final*:

Policy Issue: Should the proposed IAF appear on the property tax bill, water/sewer bill, or be a separate, stand- alone billing system?

Overview

Three billing methods are commonly used to collect stormwater utility charges: real estate tax bills, water/sewer utility bills, or separate billing systems. Selection of a billing system is unique to the locality establishing a stormwater utility. The water/sewer bill may only cover part of the stormwater utility service area, whereas the property tax database provides complete coverage. It may be the case that the stormwater utility service area is not covered by either database system. The selection of the billing method should be cost- effective, timely, and capture all affected properties.

Policy Options

- Line item on the real estate tax bill
- Line item on the water/sewer bill
- Stand-alone stormwater bill

Issues, Concerns, Benefits

Water/Sewer Bills

Pros

- Provides near full coverage of all properties in the City, except for properties not receiving water and sewer bills, such as parking lots and vacant lots with IAs.
- Established enforcement mechanism is in place for collecting delinquent bills, that is, by shutting off water.
- Quarterly billing cycle reduces the charge paid per bill and improves cash flow. The City has 13 billing quarterly billing cycles, so bills are going out every week to a different group of accounts, each of which receives bills quarterly.
- Reinforces perception that the IAF is a fee for service, not a tax.
- Existing water/sewer billing system will allow the addition of another line item on the existing bill layout.

Cons

- Collection rate is typically lower than real estate tax bill. Lancaster imposes a payment order whereby the first dollar received is applied tosewer, and the last to water, and it aggressively uses water shutoffs to improve collections. Therefore current collection rates are ….
- The IAF could be similar in magnitude to existing water/sewer fees, thus drawing attention.
- Could require additional non-water/sewer accounts to be added to current master billing file (such as parking lots or vacant land with IA). There are approximately XX non-water/sewer accounts.
- Bills are sent to tenants, not owners. Tenants are less likely to be interested in incentive programs for managing IA on the property. Approximately 3,000 to 6,000 accounts out of nearly 16,000 are tenant-occupied in Lancaster.
- The City is in the midst of converting its billing system software and has not selected a vendor yet for the new system. Therefore there are uncertainties as to how the IAF would be integrated with the new billing system.

Stormwater Utility Impervious Area Fee (IAF) Billing System **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: August 29, 2012 *Date Revised*: September 11, 2012 *Date Final*:

Policy Issue: Should the proposed IAF appear on the property tax bill, water/sewer bill, or be a separate, stand- alone billing system?

Issues, Concerns, Benefits (continued)

Real Estate Tax Bill

Pros

- Provides near full coverage of all properties in the City, except for properties that are tax-exempt, such as faith community, non-profits, and government. There are approximately 700 accounts that would need to be added to the billing database to cover these tax-exempt properties if this approach is used.
- Established enforcement mechanism is in place for collecting delinquent bills, by placing a lien on a property.
- Payment of many bills through escrow payments to mortgage companies and typically increases collection rate.
- The IAF could be smaller than real-estate taxes, thus not drawing attention.
- Bills are sent to owners, not tenants. Owners are more likely to be interested in incentive programs for managing IAs area on their properties.

Cons

- Reinforces perception that the IAF is a tax, not a fee for service. The IAF is not based on property value. Rather, it is based on a property's IA and its contribution to stormwater runoff.
- Creates confusion on whether fee is tax-deductable.
- Requires special handling of tax-exempt accounts. For example, separate assessment notices may be required.
- Annual billing cycle increases the charge paid per bill, and affects cash flow (i.e., once or twice per year depending on tax assessment cycles).
- Existing real estate tax bill may not allow the addition another line item or could require additional cost to add another line item.

Stand-Alone Bill

Pros

- Can be used if existing water/sewer and real estate billing systems require significant reprogramming to accommodate another line item.

Cons

- High initial cost to set up and increased administrative tasks to send bills out and track accounts receivable.
- Results in high level of non-payment.
- Enforcement could be limited to collection agencies, which require additional costs.

Stormwater Utility Impervious Area Fee (IAF) Billing System **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: August 29, 2012 *Date Revised*: September 11, 2012 *Date Final*:

Policy Issue: Should the proposed IAF appear on the property tax bill, water/sewer bill, or be a separate, stand- alone billing system?

Issues, Concerns, Benefits (continued)

Implementation Issues

Most billing options will calculate stormwater fees and credits external to the actual billing system that prints bills and tracks account receivable. Bills can be calculated manually with a series of geographic information system data and billing data queries, but these are often better accomplished if a custom database software application is developed that tracks all the billing rules reflected in the ordinance and policy decisions. Key implementation issues for any billing method will include the following:

- Coding/programming for IA-based fees/charges
- Creation of database for properties currently not charged
  - Hardware
  - Software
- Integration with existing systems may require modification or replacement of legacy billing systems.
- Funding for these activities, sometimes taken as a "loan" against the Sewer Fund or the General Fund that is subsequently paid back by the user fee.
- Coding/programming for exemptions, credits.
- Handling delinquent accounts and late payments? Some utilities will assess a late payment (typically 10 percent).
- Public/stakeholder education/awareness
  - Before billing begins (see outreach strategy, which includes assessment notices, mailers, web sites, and stakeholder meetings and presentations)
  - After first bills are issued (use a phone bank/call center, with operators trained to respond to FAQs; City currently has a call tree set up for different utilities)
  - Ongoing
- Regardless of the approach taken, need to clearly define who is responsible for maintaining related billing data, which fall into four categories: account information (owner or tenant), and IA information, accounts receivable, and adjustments/credits. One entity needs to manage the overall process.

Consultant Recommendation

Use the water/sewer bill because it will require fewer new accounts to be billed than the real estate tax bill, and promotes the view that the charge is a fee for service, not a tax.

Decision/Action

Assume will use the quarterly water/sewer bill.

Stormwater Utility – Impervious Area Fee (SWMF) Appeals Policy Paper

Stormwater Utility — Impervious Area Fee (IAF) Appeals Policy Development Summary

Lancaster, PA

Policy Paper No. 6

Date Prepared: August 29, 2012
Date Revised: September 11, 2012
Date Final: September 13, 2012

Policy Issue: Should the proposed IAF allow for fees to be appealed, and what issues can be appealed?

Overview

All stormwater utility charges typically provide a mechanism for rate payers to appeal their bills, both to give them the ability to correct erroneous information and allow them the ability to correct erroneous information.. However, what can be appealed, when, and the process for submitting and reviewing appeals need to be clearly defined to make the fee defensible and manageable.

Policy Options

What can be appealed:

- IA calculation and tier assignment
- Determination of exemption status (for example, if the ordinance exempts local and state governments)
- Credit calculation (assumes a property owner applied for a credit)

When are appeals submitted:

- Typically only once per year, well in advance of billing cycle (60-90 days), but with quarterly billing cycle; perhaps this is done more frequently.

Process for submitting appeals:

- Typically a form is developed that contains basic property owner information, and the onus is on the owner to provide backup information in the form of maps, aerials, or documentation of charges.
- Review is performed by someone designated as the administrator of the fee or their designee, and within a prescribed time to respond (typically 30-60 days)

Issues, Concerns, Benefits

Appeals should be allowed only once per year, to minimize administrative costs. The City recommended that the deadline be 6 months before the first bills go out in a given fiscal year. Assuming first bills go out July 1, appeals would be due on January 1. Note that in the first year of the IAF, the City anticipates issuing an assessment notices\ to allow customers to budget for the new fee. The goal would be to issue that assessment notice well in advance of the appeal date, with a target of July 1.

Consultant Recommendation

Allow for limited appeals based on IA, tier assignment, charge calculation, or credit calculation. Appeals must be submitted 6 months before new fees, or fee increases, are in effect. Appeals should put the burden of proof on the customer filing the appeal.

Decision/Action

Include provision for appeals in proposed ordinance that would establish the fee.

Appendix B
Stormwater Management Program Needs

Stormwater Management: Program Needs, Levels of Service, Cost, and Preliminary Rate Projections

Prepared for

City of Lancaster, PA

March 17, 2014

CH2MHILL®

1717 Arch Street

Suite 4400

Philadelphia, PA 19103

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C Inspection and Maintenance Cost Estimates
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Acronyms and Abbreviations

AWWTP	advanced wastewater treatment plant
BMP	Best Management Practice (stormwater control, sometimes used interchangeably with GI)
CIP	Capital Improvement Plan
CSS	combined sewer system
CSO	combined sewer overflow
EPA	U.S. Environmental Protection Agency
ERU	equivalent residential unit
FTE	full-time equivalent
FY	fiscal year
GI	Green Infrastructure
GIAC	Green Infrastructure Advisory Committee
IA	impervious area
IDDE	illicit discharge detection and elimination
LOS	level of service
LTCP	Long-Term Control Plan for CSOs
MS4	Municipal Separate Storm Sewer System
MCMs	minimum control measures (required by NPDES MS4 permit)
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
PAC	Personnel Administration Center
PA DEP	Pennsylvania Department of Environmental Protection
TMDL	Total Maximum Daily Load
WIP	Watershed Implementation Plan

Executive Summary

Purpose

The purpose of this technical memorandum is to document the various activities of the bureaus within the City of Lancaster (the City) Department of Public Works that contribute to stormwater management and watershed protection and to document the baseline and potential program enhancements and cost recovery requirements that will provide for regulatory compliance and improved customer service. A stormwater management program assessment was developed for the following program elements and their respective costs:

- Program Administration
- Inspection and maintenance of Stormwater Best Management Practices (BMPs) and Green Infrastructure (GI)NPDES Phase II Permit Implementation for Municipal Separate Storm Sewer Systems (MS4)Water Quality Monitoring (TMDL compliance)
- Compliance with Total Maximum Daily Load (TMDL) and Watershed Implementation plans
- Flood Control and Floodplain Management Programs
- Wet Weather related Wastewater Treatment
- Wet Weather Capital improvement program (CIP) including Green Infrastructure

For each of these program elements, the Project Team analyzed and summarized internal and external program costs for a five-year period for three different level-of-service alternatives and compared these to the current program. Staffing needs and preliminary analysis of dedicated cost recovery options and rates associated with these program elements are documented in two separate technical memoranda.

Benefits of a Dedicated Cost Recovery Source for Stormwater Management

A dedicated cost recovery source, such as an Impervious Area Service Fee, provides the City with the following benefits:

- For citizens
  - Improved public health and safety
  - Improved customer service and a reduced backlog of customer complaints
  - Reduction of long-term capital costs through proactive maintenance
  - Protection of property value
  - Local drainage improvements that help to reduce localized flooding
- For businesses
  - Improved City services
  - Cleaner streets, which help improve the business climate
  - Support of economic development initiatives and public-private partnerships
- For environmental quality
  - Meeting local and regional regulations on water quality, reducing the possibility of US EPA fines for compliance with permit requirements
  - Creating cleaner rivers, creeks and streams
  - Cleaner waterfront and park areas

There are significant issues related to stormwater management, which are the focus of recent regulatory requirements such as the MS4 permit and consent orders related to CSOs. Projects and programs related to stormwater are dispersed throughout Public Works and implementation of a dedicated cost recovery source can help highlight projects and programs. One of the main benefits is movement away from a reactive, customer-complaint driven model for stormwater management to a proactive, strategic and customer-service driven approach.

Key Findings and Recommendations

Although no two stormwater utilities (IA-based user fee programs) are exactly alike, the program elements cost recovered by the fee are generally similar. In order to identify the program costs for the proposed fee, individual program elements were evaluated and estimates were developed based on a combination of previous studies, staff salaries, estimated time spent on stormwater-related functions/services, and other expenditures.

Level-of-Service Alternatives

Level-of-Service (LOS) considerations were made in order to identify a range of program costs. The LOS alternatives considered consist of the following:

Low — Assumes current level of expenditures and MS4 permit implementation

Medium — Assumes GI Plan implementation (public properties only), MS4 permit implementation, increased maintenance and customer service

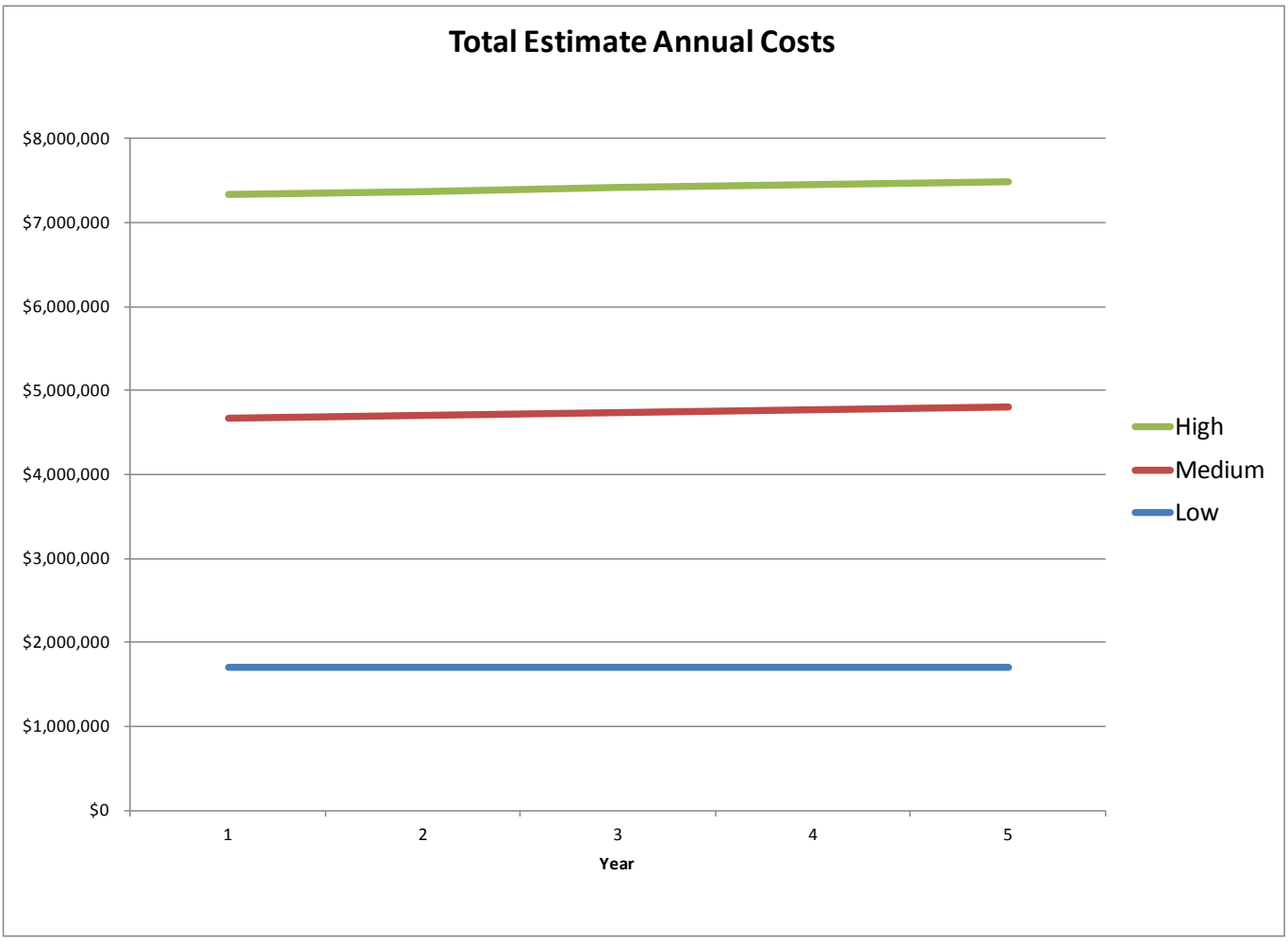
High — Assumes GI Plan implementation (public and private properties), MS4 permit implementation, high level of maintenance and customer service

Table ES-1 summarizes the LOS cost estimates for program elements for the proposed impervious area service fee. Figure ES-1 shows how costs are assumed to be distributed over the first 5 years of the program, for the medium and high LOS alternatives.

TABLE ES-1
Level of Service Cost Estimate Summary

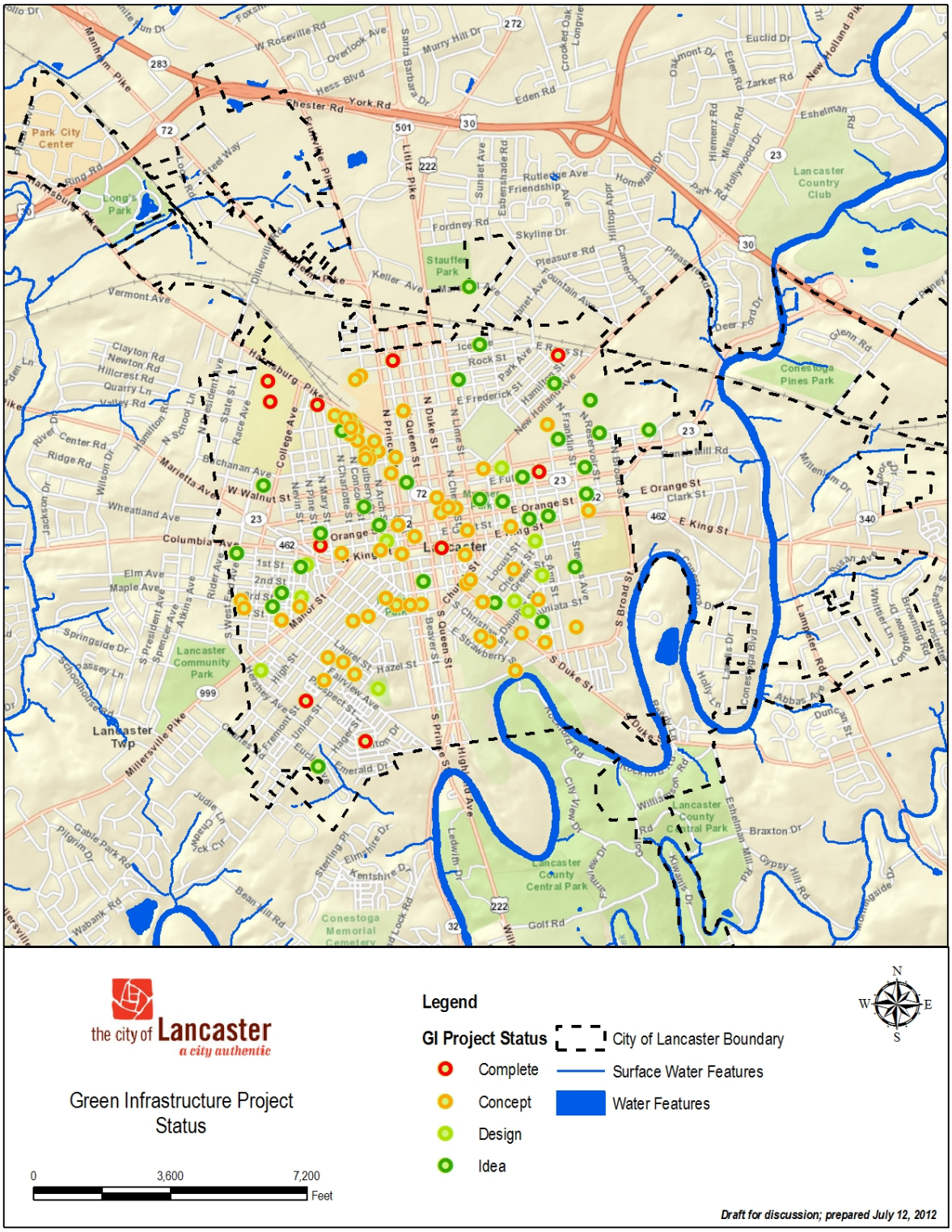
	Estimated Annual Costs		
	Low	**Medium**	**High**
Operating and Maintenance			
Green Infrastructure*	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
Green Infrastructure	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

FIGURE ES-1
Level of Service Program Needs for Next Five Years



As part of the City's green infrastructure program, the Impervious Area Fee would cover costs associated with ongoing planning, engineering and construction of projects shown in Figure ES-2.

FIGURE ES-2
Green Infrastructure Project Status Map



SECTION 1

Introduction

1.1 Purpose

The purpose of this technical memorandum is to document the various activities of the bureaus within the City of Lancaster (the City) Department of Public Works that contribute to stormwater management and watershed protection and to document potential program enhancements and cost recovery requirements that will provide for regulatory compliance and improved customer service. A stormwater management program assessment was developed for the following program elements:

- Program administration
- Inspection and maintenance of stormwater Best Management Practices (BMPs) and Green Infrastructure (GI)
- National Pollutant Discharge Elimination System Phase II Permit Implementation for Municipal Separate Storm Sewer Systems (MS4)
- Water quality monitoring
- Compliance with Total Maximum Daily Load (TMDL) and Watershed Implementation Plans (WIPs)
- Flood control and floodplain management programs
- Wet-weather-related wastewater treatment
- Wet-weather Capital improvement Program (CIP), including GI

1.2 Project History

Faced with significant increases in regulatory requirements and anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to complying with regulatory requirements while meeting City goals for economic development, and to evaluate the feasibility of developing an impervious area (IA) -based user fee (sometimes known as a stormwater utility). To attract broad stakeholder input to these studies, the City formed the Green Infrastructure Advisory Committee (GIAC) in 2010, including representatives from business owners, citizens, institutions, environmental groups, state government, and Lancaster city and county government. Based on the GIAC's recommendations, the City retained CH2M HILL in March 2012 to assist in moving towards implementing an IA-based fee. Studies and activities completed before the current implementation efforts include the following:

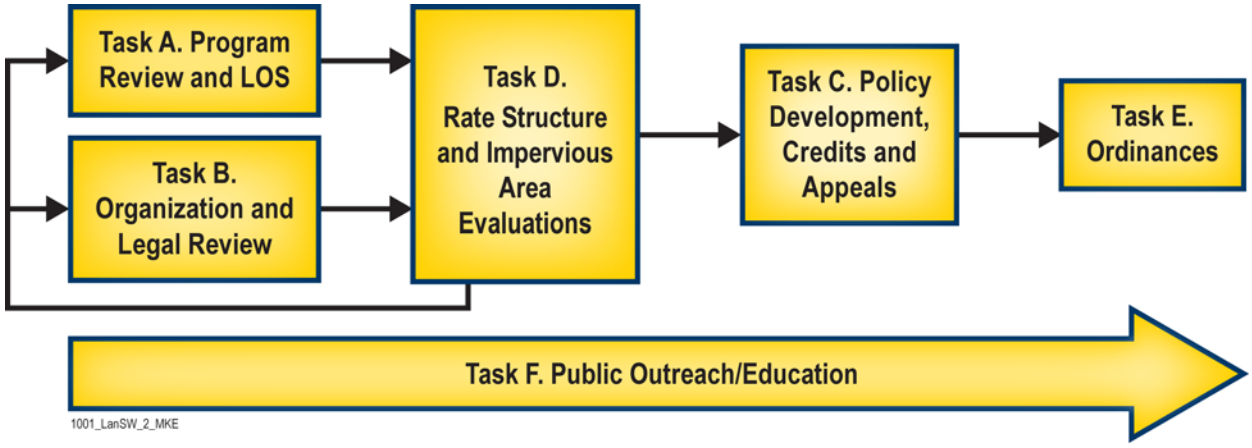
- Stormwater Utility Feasibility Analysis Status Briefing (CDM, November 2010)
- *Urban Tree Canopy: A Report on the City of Lancaster's Existing and Possible Tree Canopy* (DCNR and UVM, February 2011)
- *Stormwater Fee Structure Evaluation* (CDM, March 2011)
- *Green Infrastructure Master Plan for the City of Lancaster* (CH2M HILL, April 2011)
- *Lancaster City Tree Inventory and Summary Report* (Draft, Penn State, October 2011)
- *Keith Campbell Grant: Stormwater Utility Credits and Incentives for Green Infrastructure – A Case Study Assessment* (CH2M HILL, November 2011)

The GIAC has continued to support the impervious area fee evaluation through a series of meetings to evaluate policy options. These options, deliberations, and recommendations by the GIAC will be documented in a separate report.

1.3 Impervious Area-based Stormwater User Fee Implementation Steps

Figure 1-1 shows the overall sequence of tasks that are being followed to move towards implementing an IA-based stormwater user fee. This technical memorandum documents the review of program requirements and level of service (LOS) options in Task A. Those costs are being used to evaluate staffing needs in Task B, and cost recovery options and policy implications in Tasks D and C, with review and input by the GIAC. The GIAC's input constitutes the first step of a concerted public outreach program in Task F that will continue with a series of public outreach activities targeting a cross-section of stakeholder groups.

FIGURE 1-1
Impervious Area Fee Feasibility Study and Implementation Road Map



1.4 Stormwater Management Program Overview

Public Works consists of seven bureaus, and the stormwater management-related functions and services are provided primarily by the Operations and Wastewater Operations bureaus. The stormwater functions/services currently provided by Public Works include:

- Street sweeping
- Catch basin cleaning and maintenance
- Inspection of stormwater BMPs
- NPDES Phase II (MS4) implementation
- GI project planning and implementation

1.5 Drivers for Dedicated Source of Cost Recovery for Stormwater Management

Numerous drivers requiring changes to the way the City manages urban runoff support the need for a dedicated cost recovery source, all of which are addressed in the City's GI Plan.

In early 2008, the U.S. Environmental Protection Agency (EPA) initiated correspondence with the City requesting information on the City's Long-Term Control Plan (LTCP) for combined sewer overflows (CSOs). In response, the City prepared an update to its LTCP in mid-2009 and continues to make system upgrades and communicate progress on these improvements and the ongoing long-term planning. The City is continuing to discuss the adaptation of the CSO control program to include GI through this planning effort and has already started implementing GI throughout the city to reduce CSOs as well as to respond to the evolving requirements of the Chesapeake Bay Total Maximum Daily Load (TMDL) and associated WIP being prepared by Pennsylvania Department of Environmental Protection (PA DEP).

Under the Chesapeake Bay Program, EPA is leading a major initiative to restore polluted streams in the Chesapeake Bay watershed that currently do not meet water quality standards. Working with state partners, EPA is setting binding limits on nutrient (nitrogen and phosphorus) and sediment pollution through a TMDL analysis or pollution "diet". The TMDL is a tool of the federal Clean Water Act and requires the City to reduce pollutant loads to the Chesapeake Bay. The present program seeks to ensure that all practices to fully restore the health of the Bay are in place by 2025, with 60 percent of the actions taken by 2017.

In September 2010, PA DEP released a Draft Phase 1 WIP and on November 29, 2010, released the Final Phase 1 WIP as mandated by EPA. The Phase 1 WIP identifies pollution reduction targets by major watershed and source sector (agriculture, stormwater, wastewater treatment plants, etc.) and provides a description and schedule of actions to be taken to achieve the reductions. Now that EPA has approved the WIP, the plan will be supported by a series of 2-year milestones for achieving specific near-term pollution reductions needed to keep pace with long-term restoration commitments. Pennsylvania and EPA will monitor the effectiveness of those actions in order to assess progress and water quality improvement. EPA would take federal steps if there are insufficient commitments in a jurisdiction's implementation plan or a failure to meet the established 2-year milestones.

These regulatory programs will all require the City to invest in controls that reduce stormwater runoff, CSOs, and the pollutants they contain. The GI Plan completed by the City in 2010 seeks to address all of these new regulatory requirements in an integrated manner that focuses on fixing other necessary City infrastructure at the same time. The GI Plan will accomplish this objective by providing conceptual plans that incorporate rain gardens, tree trenches, vegetated curb extensions, and other GI techniques throughout the City's urban environment. A second objective to the County's goal is to "enhance the quality of surface and groundwater resources." The City of Lancaster's GI Plan will achieve this objective by providing detailed guidance on demonstration projects that capture stormwater and infiltrate it into the local groundwater table as well as allow for increased evapotranspiration, rather than sending it through the combined sewer system (CSS).

1.6 Policy Paper

As part of this study, a policy paper was developed and presented to the GIAC. The purpose of the policy paper is to identify the stormwater programs to be cost recovered by the IA service fee. In addition, the policy paper discusses the issues, concerns, and benefits associated with cost recovery for the program with dedicated cost recovery sources. Lastly, the policy paper documents the GIAC's comments. The policy paper on program needs is provided in Attachment A.

SECTION 2

Overview of Current Program

Information on current (existing) stormwater program functions and cost recovery has been developed through a number of sources and meetings in 2012. Figure 2-1 shows the overall organization of City of Lancaster government.

FIGURE 2-1
City of Lancaster Organizational Chart

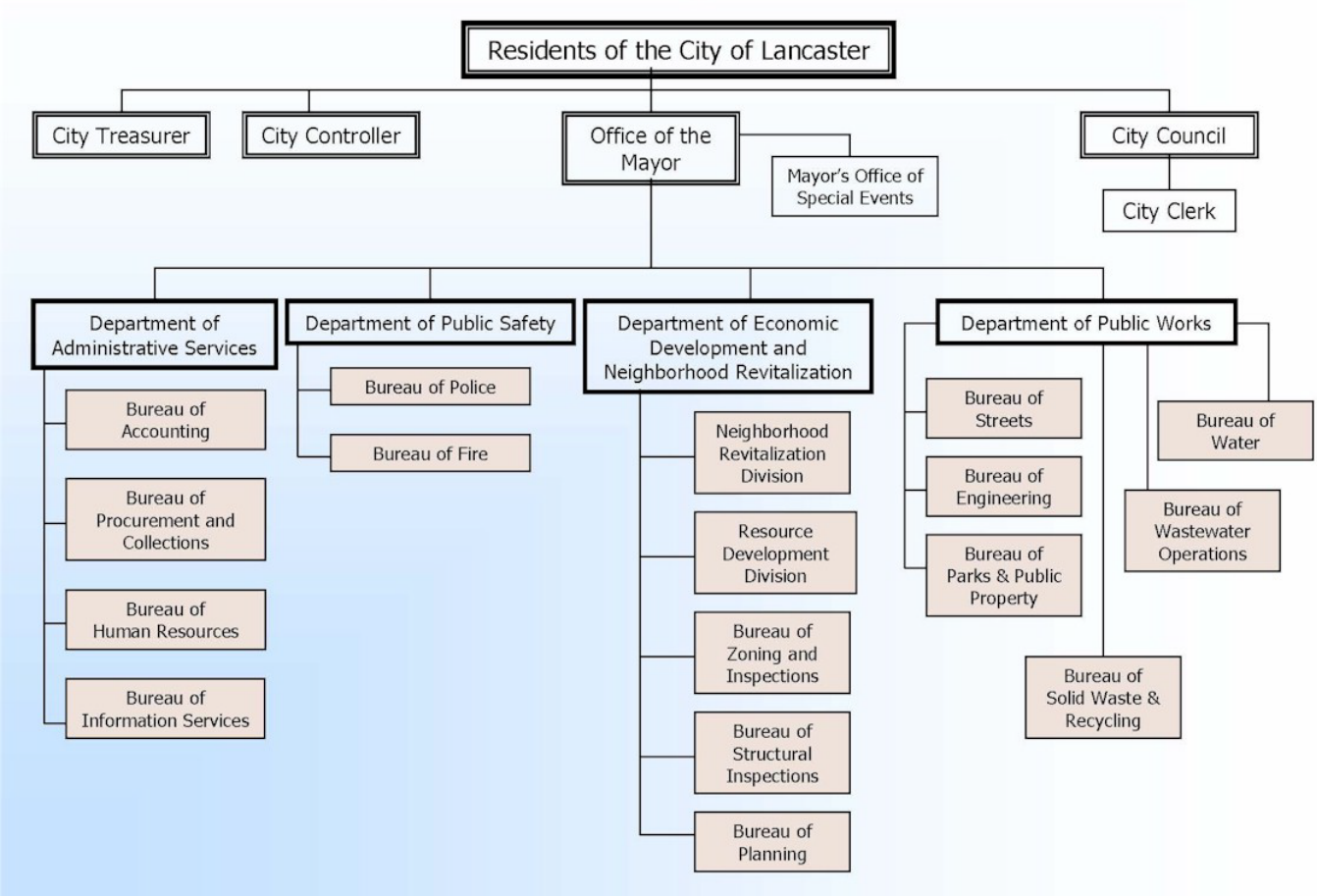
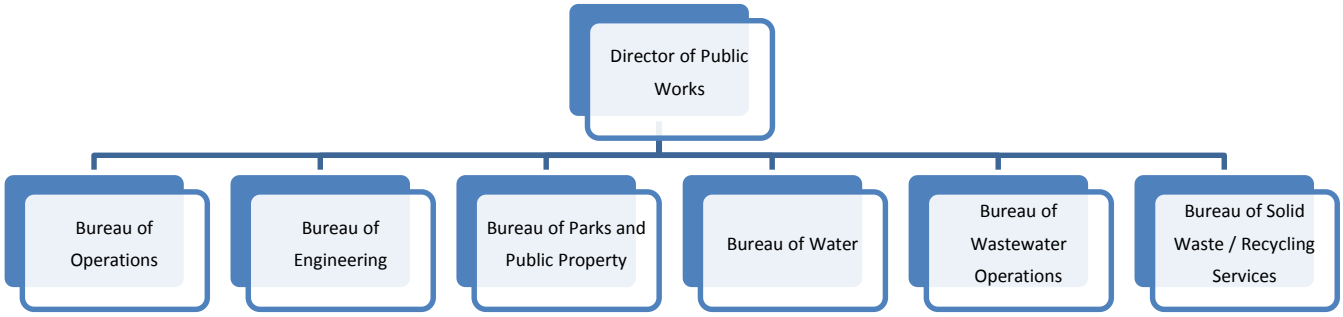


Figure 2-2 shows the organization of the City's Department of Public Works. The project team has met with various entities within the Department of Public Works. Stormwater functions/services currently provided by the Department include the following:

- MS4 permit compliance
- Street sweeping
- Catch basin cleaning
- GI planning
- The primary cost recovery sources for the Department of Public Works are the Solid Waste and Recycling Fund, Water Fund, and Sewer Fund. Currently, stormwater functions/services are cost recovered through the sewer charge and/or the General Fund. The Bureau of Public Art receives cost recovery from the Lancaster County Community Foundation. There are six operating bureaus under the Department of Public Works, with Wastewater Operations currently providing most of the stormwater services and functions.

FIGURE 2-2
Organization Chart for the Department of Public Works



Director of Public Works

- Includes Director of Public Works and secretary. Provides oversight of entire department, including stormwater functions/services. The Director also administers the City's Capital Improvement Plan (CIP), serves as chief technical advisor/liaison with community on behalf of the Mayor and Council, and represents the City on boards and commissions.
  - Includes Public Art manager (reimbursed by Lancaster County Community Foundation), who provides coordination of public art and educational signage for GI projects

Bureau of Operations

- Includes Streets, Parks, Motor Vehicles, and Traffic sections
- Stormwater functions/services provided by Streets Section include street cleaning (sweeping).

Bureau of Engineering

- Stormwater functions/services include:
  - Technical review of stormwater management plans submitted by developers
  - Development and review of plans and specification for GI projects to reduce stormwater runoff
  - Administration of the wet-weather planning and capital program
  - Bid and construction management for CSO, GI, and stormwater drainage improvement projects

Bureau of Parks and Public Property

- Stormwater functions/services include:
  - Maintenance of GI facilities at parks
  - Ongoing maintenance and replacement of street trees that reduce stormwater
  - Administration and distribution of wholesale trees to support the residential planting program

Bureau of Water

- No stormwater functions/services provided.

Bureau of Wastewater Operations

- Stormwater functions/services include catch basin cleaning, inspection of municipally owned stormwater facilities, and operation and maintenance (O&M) and capital improvements for improving and maintaining the collection system and advanced wastewater treatment plant (AWWTP) ability to process wet-weather flows.

Bureau of Solid Waste and Recycling

- No stormwater functions/services provided.

Table 2-1 summarizes the fiscal year (FY) 2012 budget for Public Works and includes expenditures for salaries, benefits, equipment, capital outlay (CIP), principal and interest on debt, transfers to the General Fund, as well as employees for each bureau. Table 2-2 summarizes the total number of employees by cost recovery source.

TABLE 2-1
Budget Summary for Public Works (FY 2012)

Bureau	Employees	FY2012 Budget Total	Cost Recovery Source
Director of Public Works	3	$1,020,844	General Fund
Operations			
Administration	0	$155,515	General Fund
Streets	23	$1,878,010	General Fund
Motor Vehicles	4	$193,008	General Fund
Parks & Public Property	22	$1,882,021	General Fund
Engineering	4	$383,808	General Fund
Water			
Administration	12	$13,727,755	Water Fund
Susquehanna Treatment	18	$2,721,476	Water Fund
Conestoga Treatment	16	$2,410,242	Water Fund
Transmission & Distribution	20	$2,131,305	Water Fund
Meter Shop	13	$1,062,596	Water Fund
Grounds Maintenance	11	$424,026	Water Fund
Laboratory	4	$244,951	Water Fund
Wastewater Operations			
Administration	6	$5,125,526	Sewer Fund
Collections	11	$664,443	Sewer Fund
Pumping Stations	15	$1,168,134	Sewer Fund
Treatment	17	$4,769,572	Sewer Fund
Grounds Maintenance	3	$121,042	Sewer Fund
Solid Waste Recycling Service	8	$3,889,712	Solid Waste & Recycling Fund

TABLE 2-2
Cost Recovery Source Summary for Public Works (FY 2012)

Public Works	Employees	FY2012 Budget Total
		$5,513,206
Sewer Fund	52.43	$11,848,717
Water Fund	93.66	$22,722,351
Solid Waste & Recycling Fund	7.63	$3,889,712
Total	**209.26**	**$43,973,986**

Source: FY 2012 Budget.

The total General Fund FY 2012 budget for the City is $46,271,459 and Public Works accounts for $5,513,206 (approximately 12 percent of the total General Fund). The portion that relates to stormwater functions/services is estimated to be $455,638 for street cleaning (approximately 1 percent of the total General Fund). As the City

considers implementing an IA-based stormwater user fee, these expenditures for stormwater functions/services would be cost recovered by the IA -based fee and no longer by the General Fund.

The total Sewer Fund FY 2012 O&M expenditures is $11,848,717. The portion that relates to stormwater functions/services is estimated to be $ 614,162 (approximately 5.2 percent of the total sewer O&M allocation). As the City considers implementing the Stormwater Utility, these expenditures for stormwater functions/services would be fund by the IA-based fee and no longer by the Sewer Fund. This will help offset sewer rate increases.

In addition to the Department of Public Works, stormwater functions and services are provided by the Bureau of Planning, which is in the Department of Economic Development and Neighborhood Revitalization (see Figure 2-1).Stormwater functions of the Bureau of Planning include administration of the post-construction stormwater management program, review of development plan submittals, and administration and inspection of the First Flush ordinance to reduce stormwater pollutants from redevelopment projects.

SECTION 3

Program Elements for Impervious Area User Fee

Although no two stormwater utilities (IA-based user fee programs) are exactly alike, the program elements cost recovered by the Stormwater Utility are generally similar. In order to identify the program costs for the proposed Stormwater Utility, individual program elements were evaluated and estimates were developed based on a combination of previous studies, staff salaries, estimated time spent on stormwater-related functions/services, and other expenditures.

In addition, LOS considerations were made in order to identify a range of program costs. The LOS alternatives considered consist of the following:

Low Assumes current level of expenditures

Medium Includes current level of expenditure, plus additional program elements

High Includes higher level of service for current program, plus additional program elements

Table 3-1 summarizes the LOS cost estimates for program elements for the proposed Stormwater Utility.

TABLE 3-1
Level of Service Cost Estimate Summary

	Estimated Annual Costs		
	Low	Medium	High
O&M			
GI	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
GI	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

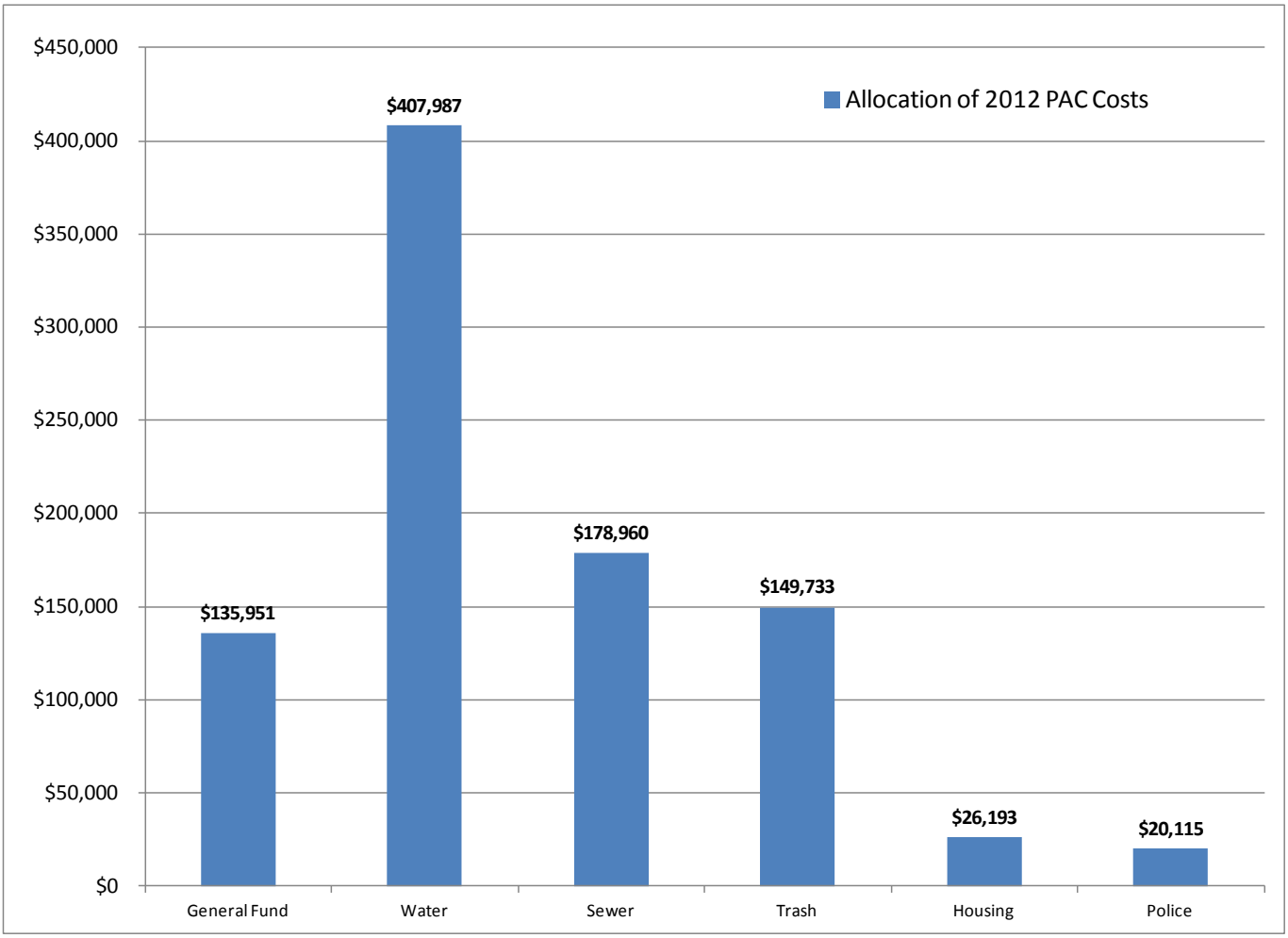
3.1 Program Administration

Program administration components and their respective costs for the proposed Stormwater Utility are discussed in the following sections.

3.1.1 Billing and Collection

Billing and collection is for the cost of generating data to be included in Stormwater Utility bill item and allocation of postage and other costs. The City provided the 2012 Personnel Administration Center (PAC) cost allocation. These costs include expenditures for billing and collections personnel, postage, printing, equipment, supplies, etc. Based on feedback from Public Works, for purpose of this study, allocation for the proposed Stormwater Utility assumes half of the sewer 2012 PAC costs, amounting to approximately $90,000. For purpose of this study, it was assumed that the Stormwater Utility charge will be a line item on the existing utility bill. Figure 3-1 and Table 3-2 summarize the allocation of administrative costs provided in the 2012 PAC. The 2012 PAC details are provided in Attachment B.

FIGURE 3-1
Allocation of 2012 Personnel Administration Center Costs



Source: City of Lancaster Treasury Bureau.

TABLE 3-2
Allocation of 2012 PAC Costs

Expense Item	Total	General Fund	Water	Sewer	Trash	Housing	Police
Personnel (salary, temporary, overtime)	$587,397	$98,948	$272,264	$119,426	$96,758	$0	$0
Uniforms (mail clerk)	460	82	207	91	81	0	0
Equipment Maintenance	21,644	4,071	9,611	4,216	3,746	0	0
Dues & Subscriptions	730	730	0	0	0	0	0
Postage	193,940	13,693	74,058	32,485	29,213	26,193	17,707
Printing	33,679	3,429	15,376	6,745	5,722	0	2,408
Telephone	5,520	986	2,480	1,088	966	0	0
Travel	250	250	0	0	0	0	0
Miscellaneous	250	250	0	0	0	0	0
Office Supplies	10,000	1,786	4,493	1,971	1,751	0	0
Minor Equipment	65,660	11,727	29,498	12,939	11,496	0	0
Total	**$919,530**	**$135,951**	**$407,987**	**$178,960**	**$149,733**	**$26,193**	**$20,115**

Source: City of Lancaster Treasury Bureau.

3.1.2 Incentive/Credit Program

It is not uncommon for stormwater utilities to offer incentives/credits to property owners who own and maintain stormwater management facilities. The incentives are typically one-time rebates, while credits are annual deductions towards the property owner's stormwater bill. In order to properly implement an incentive/credit program, it is necessary to process application forms, conduct periodic inspections, address inquiries from the public, and develop reports. Based on experience and feedback from other stormwater programs (such as the City of Portland, OR program), one to two full-time equivalents FTEs are required. Table 3-3 summarizes the estimated costs for administering the incentive/credit program.

TABLE 3-3
Estimated Program Administration Costs for Incentive/Credit Program

Credits and Incentives	Low (1)	Medium (2)	High (3)
Program Administrator (4)	0	$ 43,000	$ 86,000
Program Inspector (5)	0	$ 34,000	$ 68,000
Total	$ -	$ 77,000	$ 154,000

(1) For the low LOS, no costs are assumed because the City does not currently have an incentive/credit program.
(2) For the medium LOS, 0.5 FTE for a Program Administrator and 0.5 FTE for an Inspector.
(3) For the high LOS, 1 FTE for a Program Administrator and 1 FTE for an Inspector.
(4) The assumed salary and benefits for the Program Administrator is $85,900
(5) The assumed salary and benefits for the Inspector is $67,960

3.1.3 NPDES Permit Administration

The City holds NPDES permits with PA DEP for its AWWTP that include requirements for the ongoing performance, maintenance, and capital improvements to wet-weather collection and treatment capacity to convey and treat wetweather flows. The programs in this permit (#0026743) require upgrades to these systems and an updated CSO LTCP that the City continues to negotiate with PA DEP and EPA. In addition, the permit requires the following programs:

- Documentation of the implementation of the Nine Minimum Controls, including:
    1. Proper O&M of the sewer system and CSO outfalls
    2. Maximize use of the collection system for storage
    3. Review and modification of the industrial pretreatment program to minimize industrial pollutants in CSO discharges
    4. Maximization of flow to the AWWTP
    5. Elimination of dry-weather CSOs
    6. Control of solids and floatables in CSOs
    7. Pollution prevention programs to reduce contaminants in CSO discharges
    8. Public notification programs to ensure the public receives adequate notification of CSO impacts
    9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls
- Ongoing monitoring requirements and annual status reports

MS4 permit - The City also holds an NPDES permit (#133577, expired March 9, 2008) that identifies the conditions for the six minimum control measures (MCMs) to be implemented in the City, including:

1. Public outreach and education
2. Public participation / involvement
3. Illicit discharge detection / elimination
4. Construction site runoff control

5. Post-construction stormwater management
6. Pollution prevention

In addition, EPA has been conducting program audits of the MS4 and CSO system components and the AWWTP and requiring additional evaluations and operational improvements.

The details and cost estimates for each of these are provided in Section 3.3. This section is concerned with the overall administration of the permit. Table 3-4 summarizes the cost estimates for administering the permit. It is assumed that there is no difference in LOS. The same LOS for plan review is assumed because NPDES permit administrative costs do not vary.

TABLE 3-4
Estimate NPDES AWWTP and CSO Permit Administration Costs

	Low	Medium	High
NPDES Permit Administration for AWWTP and CSOs*	$29,000	$29,000	$29,000

* Assumes Manager, Wastewater - 120 hrs / yr (for MS4) and City Engineer -- 6 hrs / wk = 312 hrs / yr

3.1.4 Post Construction Stormwater Management Plan Review

The Bureau of Planning, in conjunction with the Bureau of Engineering, reviews development plans and post-construction stormwater management plans that accompany the development plan submittal for technical adequacy in reducing stormwater volume, rate, and pollutants.

The same LOS for administration of plan review is assumed because plan review activities do not vary or increase according to LOS assumptions.

TABLE 3-5
Estimate NPDES MS4 Permit Administration Costs

	Low	Medium	High
Post-construction Stormwater Management Plan Review*	$23,000	$23,000	$23,000

* Assumes Manager, Wastewater - 52 hrs / yr; City Engineer -- 104 hrs / yr; Senior Planner -- 300 hrs / yr.

3.2 Inspections and Maintenance

3.2.1 Green Infrastructure

The GI plan consists of the following project/program types:

- Green streets
- Park improvements / greening
- Disconnection, porous pavement
- Porous pavement, bioretention
- Vegetated roofs / disconnection
- Disconnection/rain gardens
- Enhanced tree planting
- Green schools

The annual maintenance costs for these GI plan projects/programs are based on a percentage of capital costs (details are provided in Attachment C). Table 3-6 summarizes the annual LOS cost estimates for the fifth year of the program. It is assumed that these costs are phased in over a 5-year period. For example, the cost presented in Section 4 will show total first-year costs of $32,400 ($162,000/5) (medium LOS). The City does not currently provide maintenance for the GI Plan projects/programs, so there is no cost for the low LOS scenario.

TABLE 3-6
Annual Level of Service Cost Estimates for Green Infrastructure Inspections and Maintenance, for the Fifth Year of the Program

GI Facility Type	Low	Medium	High
Green Streets	$0	$29,000	$36,250
Park Improvements / Greening	$0	$24,000	$30,000
Disconnection, Porous Pavement	$0	$16,000	$20,000
Porous Pavement, Bioretention	$0	$3,000	$3,750
Vegetated Roofs / Disconnection	$0	$10,000	$12,500
Enhanced Tree Planting	$0	$50,000	$62,500
Green Schools	$0	$30,000	$37,500
Sub-total GI	$0	$162,000	$202,500

3.2.2 Existing City-owned Stormwater Management Facilities

The MS4 stormwater management program protocols developed by PA DEP specifies that municipally owned stormwater facilities (typically extended detention or retention ponds) be inspected and maintained to correct indentified deficiencies. As part of the Pollution Prevention MCM, the protocol calls for baseline inspection to document current conditions and required maintenance.

As part the City's MS4 permit, municipally owned BMPs are required to be inspected. The City does not currently perform maintenance, nor does it currently inspect privately owned BMPs. Based on information provide the City, nine BMPs are inspected (Table 3-7). Based on feedback from the City staff, it takes 3 days to inspect these facilities. Table 3-8 provides estimated inspection costs. The same LOS for plan review is assumed because plan review activities do not vary.

TABLE 3-7
BMPs inspected by the City

ID #	Project	Owner	Structural BMP
1	Lowes of Lancaster	PR Lancaster, LP	Detention Basins
2	Lancaster Leaf	Lancaster Leaf Tobacco Co. of Lancaster Leaf Tobacco Co. of PA, Inc	Constructed Wetland Constructed Wetland Infiltration Basins
3	George Washington Elementary	School District of Lancaster	Infiltration Basin & Detention Basin
4	Lafayette Elementary School	School District of Lancaster	Detention Basin & Infiltration Trench
5	Sheetz	1081 Dillerville Road, LP	Underground Detention Basin
7	F&M New College House	Franklin & Marshall College	Stormwater Ponds, Swale
8	F&M Race Avenue F&M Race Avenue Parking Lot	Franklin & Marshall College	Vegetated Infiltration Beds & Porous Paving
10	Conestoga WTP Upgrade	City of Lancaster	Retention Basin and Swale
11	Armstrong Building 800 Expansion	Armstrong World Industries	Infiltration Basin, Detention Basin

TABLE 3-8
Estimate Municipal Owned BMP Inspection Costs

	Low	Medium	High
BMP inspection*	$2,300	$2,300	$2,300

* Assumes Manager, Wastewater - 24 hrs / yr and vehicle costs.

3.2.3 Street Sweeping

The City conducts street sweeping for approximately 379 miles of streets. There are several routes maintained by the City (Table 3-9). Table 3-10 summarizes the LOS cost estimates for street sweeping. The details for street sweeping maintenance are provided in Attachment C.

TABLE 3-9
Street Sweeping Routes

Route	Miles	Frequency of Sweeping
Normal Route (8)	151	2x per month
Development Route	25	2x per month
Alleys	45	2x per month
Park City Route	22	2x per month
5th Week Route	8	2x per month
Downtown District	10	5x per week
Miscellaneous Sweeping	118	2x per month
Total	379	

TABLE 3-10
Level of Service Cost Estimates for Street Sweeping

Cost Item	Cost/mile	Low LOS*	Medium LOS*	High LOS^
Maintenance Cost	$2.18	$24,900	$24,900	$34,600
Disposal Cost	$4.03	$46,100	$46,100	$63,900
Fuel Costs	$1.17	$13,400	$13,400	$18,600
Personnel	$7.37	$84,400	$84,400	$117,000
Total		$168,800	$168,800	$234,100

* Assumes Downtown District maintained 5 times per week, all other routes 2 times per month.
^ Assumes Downtown District maintained 5 times per week, all other routes 3 times per month.

3.2.4 Catch Basins and Inlets

The City currently maintains 2,747 catch basin / inlets once a year. To perform this maintenance, two operators and one vactor truck operate 8 hours a day, 5 days a week. Sometimes a second vactor truck may be used. Table 3-11 summarizes the LOS cost estimates for catch basin and inlet cleaning and disposal.

TABLE 3-11
Level of Service Cost Estimate for Catch Basin

	Low*	Medium*	High^
Maintenance Cost	$2,000	$2,000	$4,000
Fuel Cost	$5,000	$5,000	$10,000
Labor	$134,000	$134,000	$268,000
Disposal Costs	$60,000	$60,000	$120,000
Total Costs	$201,000	$201,000	$402,000

* Assumes 2,747 catch basins maintained once per year; two operators and one vactor truck operating 8 hours a day, 5 days a week.
^ Assumes 2,747 catch basins maintained twice per year; two operators and one vactor truck operating 8 hours a day, 5 days a week.

This maintenance schedule helps the City achieve the MS4 permit Pollution Prevention MCM.

3.2.5 CSO / Wet-weather Facilities

The City's Bureau of Wastewater Operations provides maintenance for the following CSO and wet-weather facilities:

- Diversion chambers
- Junction chambers
- Manholes
- Outfalls
- Pressure junction
- Pump station
- Force main sewer
- Gravity main sewer
- Flow monitoring

The costs for maintaining these facilities are cost recovered by the Sewer Fund. For purposes of this study, it was assumed that the proposed IA service fee does not fund these maintenance activities.

3.3 NPDES Phase II Implementation (MS4 Permit)

PA DEP issued guidance (protocols) to help municipalities comply with their MS4 permits. The following sections provide an overview of the protocols identified in PA DEP's guidance. Protocols are identified for each MCM.

3.3.1 Public Outreach and Education

Protocols for public outreach and education include the following:

- Develop and update a Public Education Plan.
- Develop and update target audiences.
- Disseminate materials to all target audiences using appropriate distribution channels.
- Advertise in newspapers.

In addition to these activities, outreach pertaining to incentives/credits for the IA service fee is conducted. This includes developing and providing dedicated materials explaining the incentives, how to calculate them, and how to apply. A detailed program was developed by LiveGreen and CH2M HILL public outreach specialists, and it is provided in Attachment D.

Table 3-12 summarizes the LOS cost estimates for public outreach and education.

TABLE 3-12
Level of Service Cost Estimates for Public Education MCM

Public Education	LOS 1	LOS 2	LOS 3
Assumed Avg Salary + Benefits	$120,000	$120,000	$120,000
FTEs	0.11	0.60	0.90
Salary + Benefits	$12,692	$72,000	$108,000
Misc Expenses	$3,000	$20,000	$28,000
Public Outreach and Education (MCM 1)	$15,692	$92,000	$136,000

3.3.2 Public Participation / Involvement

Protocols for public participation / involvement include the following:

- Develop public involvement plan.
- Notify and solicit public input/involvement on stormwater plan development and implementation

- Notify public as needed.
- Involve the public in the development and evaluation of alternatives.
- Obtain public input on the selection and implementation of the long-term plan.

Table 3-13 provides LOS cost estimates for public participation / involvement, though some items are overlapping with Public Outreach and Education and are captured in Table 3-10. The details for public participation / involvement are provided in Attachment D.

TABLE 3-13
Level of Service Cost Estimates for Public Participation MCM

Public Education	LOS 1	LOS 2	LOS 3
Assumed Avg Salary + Benefits	$120,000	$120,000	$120,000
FTEs	0.03	0.10	0.30
Salary + Benefits	$3,462	$12,000	$36,000
Misc Expenses	$3,000	$3,000	$11,000
Public Outreach and Education (MCM 1)	$6,462	$15,000	$47,000

3.3.3 Illicit Discharge Detection / Elimination

Protocols for illicit discharge detection and elimination (IDDE) include the following:

- Develop a map of MS4, including outfalls and receiving surface water bodies. Complete mapping by Year 1. Establish priority areas for 25 percent of the system each year for years 2 through 5.
- Adopt/enact an ordinance that prohibits illicit discharges in Year 1. Implement and enforce ordinance years 2 through 5.
- Implement an IDDE program that includes field screening program/procedures and elimination of illicit discharges. Screening and corrective actions to remove illicit discharges occur in years 2 through 5.
- Conduct public awareness and reporting program (see also the Public Education and Outreach portion of this manual). In Year 1, distribute education material about the IDDE program. Continue distribution of education materials in years 2 through 5.

Cost estimates for IDDE developed previously by CDM were reviewed and are summarized in Table 3-14. Attachment D provides the source information from the CDM report.

TABLE 3-14
Cost Estimates for Illicit Discharge Detection / Elimination Program

Item	CDM Estimate	
	FTE	Estimated Total Cost
Map MS4	0.15	$8,650
Adopt/Enact an Ordinance that Prohibits Illicit Discharges	0.15	$7,150
Implement and Enforce IDDE ordinance	0.25	$12,750
Implement screening program for IDDE	0.15	$11,150
Conduct public awareness (CDM identifies employee training)	0.10	$14,100

Source: CDM Report, Attachment A.

3.3.4 Construction Site Runoff Control

Protocols for construction site runoff control include the following:

- If not already part of stormwater ordinance, enact, implement and enforce a stormwater control ordinance that requires the review of erosion and sediment control plans for earth disturbance of 1 acre or more in which runoff enter the MS4. Also applies to any earth disturbance of 5 acres or more regardless of the planned runoff. In addition, preparation of erosion and sediment control plans should be a prerequisite for obtaining land development plans and building permits.
- To assist in meeting the Public Education MCM, distribute educational materials to land developers with the applications for building permits and other land development/redevelopment permits or approvals.

Cost estimates for construction site runoff control developed previously by CDM were reviewed and are summarized in Table 3-15. Attachment D provides the source information from the CDM report. However, this function is currently provided by the Lancaster County Conservation District at no cost to the City of Lancaster, and is paid for through plan review fees assessed by the Conservation District.

TABLE 3-15
Cost Estimates for Construction Site Runoff Control*

Item	CDM Estimate	
	FTE	Estimated Total Cost
Review and adopt/enact an ordinance that requires erosion and sediment control plans for earth disturbance.	0.10	$5,100
Implement / enforce ordinance by requiring construction site operators to use BMPs to control erosion and sediment. Also, require the control waste that could impact water quality.	0.50	$22,500
Site plan review procedures for water quality impacts	0.15	$8,650
Develop procedures for public comments	0.10	$5,100
Site inspections	0.25	$11,250

Source: CDM Report, Attachment A.

*Note: This function is provided by the Lancaster County Conservation District at no cost to the City of Lancaster, and is paid for through plan review fees assessed by the Conservation District

City Planning inspects BMPs at completion for compliance with plans and Wastewater Operations inspects annually for the permit.

3.3.5 Post-construction Stormwater Management

Protocols for post-construction stormwater management include the following:

- If not already part of stormwater ordinance, enact and implement ordinance that requires post-construction stormwater controls before approval of land development plans and building permits.
- If there is no PA DEP review of post-construction controls, coordinate with County Conservation District.
- The standard for design, construction, and maintenance of post-construction BMPs is to comply with Act 167.
- For each year, ensure that BMPs are built, operated, and maintained as designed.

Cost estimates for post-construction stormwater management developed previously by CDM were reviewed and are summarized in Table 3-16. Attachment D provides the source information from the CDM report.

TABLE 3-16
Cost Estimates for Post-Construction Stormwater Management

Item	CDM Estimate	
	FTE	Estimated Total Cost
Implement strategies for BMPs (structural and non-structural).	0.15	$9,650
Adopt ordinance to address post-construction runoff	0.10	$5,100
BMPs are built, operating, and maintained as designed.	0.05	$3,050

Source: CDM Report, Attachment A.

3.3.6 Pollution Prevention

Protocols for pollution prevention include the following:

- Develop inventory of BMPs.
- Develop stormwater facility O&M program.
- Inspect municipally owned stormwater facilities.
- Develop a vehicle O&M program.
- Conduct employee training on O&M programs.

Cost estimates for pollution prevention developed previously by CDM were reviewed and are summarized in Table 3-17. Attachment D provides the source information from the CDM report.

TABLE 3-17
Cost Estimates for Pollution Prevention

Item	CDM Estimate	
	FTE	Estimated Total Cost
Develop O&M Program	0.25	$15,250
Conduct employee training on O&M programs	0.10	$14,100
Stormwater Inspectors	1	$123,000
Administrative	1	$152,862

Source: CDM Report, Attachment A.

The Pollution Prevention MCM requires inspection of municipally owned BMPs. A separate cost estimate is provided in Section 3.2.

In addition, the Pollution Prevention MCM requires maintenance (cleaning) of catch basins. A separate cost estimate is provided in Section 3.2.

3.4 Water Quality Monitoring (TMDL compliance)

Water quality monitoring for compliance with TMDLs is conducted by PA DEP and is not assumed to be cost recovered by the IA user fee.

3.5 Flood Control and Floodplain Management

Flood control and floodplain management typically refers to mapping of riverine flooding areas, such as might occur from overtopping the banks of the Conestoga River. The City does not currently have authority over those programs, which generally are administered by the Federal Emergency Management Agency. Therefore these are not assumed to incur costs that would be cost recovered by the IA user fee.

3.6 Wastewater Treatment

As part of a separate analysis, CDM identified wet-weather flow treatment costs of $780,000 ("Stormwater Fee Structure Evaluation," March 23, 2011). This analysis estimated a wet-weather flow fee based on equivalent residential units (ERUs) and a program costs requirement of $748,565 (2011 dollars). Assuming total ERUs of approximately 62,000, this is a rate of $12.07 per ERU.

The current feedback from the City is that treatment of wet-weather flows will be cost recovered by the Sewer Fund.

3.7 Capital Improvement Projects

3.7.1 Green Infrastructure Program

Table 3-18 summarizes capital cost estimates for GI projects. Because the GI is only just being implemented this year, the low LOS assumes no costs for GI projects. The medium LOS assumes public projects and the high LOS assumes public and private projects. For purposes of this study, it was assumed that these costs are equally distributed over 5 years (Tables 3-19 and 3-20). Details of the GI Program capital costs are provided in Attachment C.

TABLE 3-18
Capital Cost Estimates for the Green Infrastructure Program

Project / Program Type	Estimated Capital Cost for Public Property (Medium LOS)[1]	Estimated Capital Cost for Public and Private (High LOS)[2]
Green Streets	$2,650,000	$3,313,000
Park Improvements / Greening	$999,000	$1,249,000
Disconnection, Porous Pavement	$1,162,000	$1,453,000
Porous Pavement, Bioretention	$140,500	$1,756,000
Vegetated Roofs / Disconnection	$694,000	$2,340,000
Disconnection/Rain Gardens	---	$3,276,000
Enhanced Tree Planting	$2,875,000	$3,594,000
Green Schools	$1,025,000	$1,281,000

[1] Estimated construction costs for public property (e.g., rights-of-way, parks, sidewalks, schools, 10% of parking lots, and a portion of roofs)
[2] Estimated capital/implementation costs includes an additional 25% for survey, site testing, design, construction oversight, etc.

TABLE 3-19
Green Infrastructure Capital Costs (Medium LOS)

Green Infrastructure Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Green Streets	$530,000	$530,000	$530,000	$530,000	$530,000	**$2,650,000**
Park Improvements / Greening	$199,800	$199,800	$199,800	$199,800	$199,800	**$999,000**
Disconnection, Porous Pavement	$232,400	$232,400	$232,400	$232,400	$232,400	**$1,162,000**
Porous Pavement, Bioretention	$28,100	$28,100	$28,100	$28,100	$28,100	**$140,500**
Vegetated Roofs / Disconnection	$138,800	$138,800	$138,800	$138,800	$138,800	**$694,000**
Enhanced Tree Planting	$575,000	$575,000	$575,000	$575,000	$575,000	**$2,875,000**
Green Schools	$205,000	$205,000	$205,000	$205,000	$205,000	**$1,025,000**
Total	**$1,909,100**	**$1,909,100**	**$1,909,100**	**$1,909,100**	**$1,909,100**	**$9,545,500**

TABLE 3-20
Green Infrastructure Capital Costs (High LOS)

Green Infrastructure Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Green Streets	$662,600	$662,600	$662,600	$662,600	$662,600	$3,313,000
Park Improvements / Greening	$249,800	$249,800	$249,800	$249,800	$249,800	$1,249,000
Disconnection, Porous Pavement	$290,600	$290,600	$290,600	$290,600	$290,600	$1,453,000
Porous Pavement, Bioretention	$351,200	$351,200	$351,200	$351,200	$351,200	$1,756,000
Disconnection/Rain Gardens	$468,000	$468,000	$468,000	$468,000	$468,000	$2,340,000
Vegetated Roofs / Disconnection	$655,200	$655,200	$655,200	$655,200	$655,200	$3,276,000
Enhanced Tree Planting	$718,800	$718,800	$718,800	$718,800	$718,800	$3,594,000
Green Schools	$256,200	$256,200	$256,200	$256,200	$256,200	$1,281,000
Total	$3,652,400	$3,652,400	$3,652,400	$3,652,400	$3,652,400	$18,262,000

3.7.2 CSO / Wet-weather Projects (Wastewater CIP)

Based on feedback provide by the City staff, Table 3-21 provides a list of CIP projects related to CSO and wet weather. For purposes of this study, it was assumed that these projects are cost recovered by the Sewer Fund. Attachment E provides the details of the CIP for CSO and wet-weather projects.

TABLE 3-21
CSO and Wet-weather CIP Projects

ID	Project Name
1a	North Pumping Station (NPS) Expansion
1b	NPS FM Surge Control System
2	NPS Basin Screening and Grit Removal Facility
3	NPS Basin CSO Diversion Chamber & Deflection Screen
4	WWTP Solids Dewatering & Maintenance Buildings Roof Replacements
5	NPS & SAPS Force Main Upgrade
6	WWTP Facilities Plan
7	North Pumping Station Sewershed Evaluation
8	Stevens Avenue Pumping Station Sewershed Evaluation
9	North PS CSO Storage
10	WWTP Upgrade/Expansion
11	WWTP Anoxic Zone Modifications
12	WWTP North Final Clarifier Drive Mechanisms
13	WWTP North A/O Building MCC and Primary Sludge Pumping Upgrade
14	WWTP North A/O Distribution Box Corrosion Repair
15	WWTP Chlorination Building MCC Upgrade
16	WWTP Oxygen Plant Instrumentation Upgrade
17	Collection System Improvements
18	Maple Grove Pumping Station Expansion
19	Engleside Sewershed
20	Stevens Ave & Engleside Bar Screen Replacement
21	Engleside CSO Parallel Outfall Culvert

3.7.3 Catch Basin Rehabilitation and Replacement

Based on feedback from the City staff, Table 3-22 summarizes estimated costs for catch basin rehabilitation and replacement, which are typically performed in conjunction with street repairs. The estimates are the same for all LOS alternatives.

TABLE 3-22
Catch Basin Rehabilitation and Replacement

Catch Basin	Year 1	Year 2	Year 3	Year 4	Year 5
Rehabilitation*	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement*	$82,000	$82,000	$82,000	$82,000	$82,000

50% of 4 staff members total of $134,000 + $15,000 (fuel, vehicle maintenance)

3.7.4 Combined and Separate Storm Sewer Rehabilitation and Replacement

The City has an estimated 105 miles of storm sewer, with approximately 79 miles as part of the MS4 and 26 miles in the CSS. As this infrastructure ages, the storm sewers need to rehabilitated or replaced. Tables 3-23 and 3-24 summarize LOS cost estimates for the storm sewer rehabilitation or replacement. The City does not currently fund storm sewer rehabilitation or replacement, so cost estimates for the low LOS are not provided. Detailed cost estimates are provided in Attachment C.

TABLE 3-23
Cost Estimates for Medium LOS Combined and Separate Storm Sewer Rehabilitation and Replacement

	Year 1	Year 2	Year 3	Year 4	Year 5
MS4					
Rehabilitation*	$667,000	$667,000	$667,000	$667,000	$667,000
Replacement^	$417,000	$417,000	$417,000	$417,000	$417,000
Information Management	$2,000	$2,000	$2,000	$2,000	$2,000
CSS					
Rehabilitation*	$220,000	$220,000	$220,000	$220,000	$220,000
Replacement^	$137,000	$137,000	$137,000	$137,000	$137,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000

*Assume 80% requires rehab every 100 years.
^Assume 20% requires rehab every 100 years.

TABLE 3-24
Cost Estimates for High LOS Combined and Separate Storm Sewer Rehabilitation and Replacement

	Year 1	Year 2	Year 3	Year 4	Year 5
MS4					
Rehabilitation*	$890,000	$890,000	$890,000	$890,000	$890,000
Replacement^	$556,000	$556,000	$556,000	$556,000	$556,000
Information Management	$3,000	$3,000	$3,000	$3,000	$3,000
CSS					
Rehabilitation*	$293,000	$293,000	$293,000	$293,000	$293,000
Replacement^	$183,000	$183,000	$183,000	$183,000	$183,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000

*Assume 80% requires rehab every 75 years.
^Assume 20% requires rehab every 75 years.

3.7.5 Flood Control Master Planning

Based on discussions with the City, it was assumed that the City has no immediate needs to develop a flood control master plan and therefore it was not assumed to be required for the IA user fee program.

SECTION 4

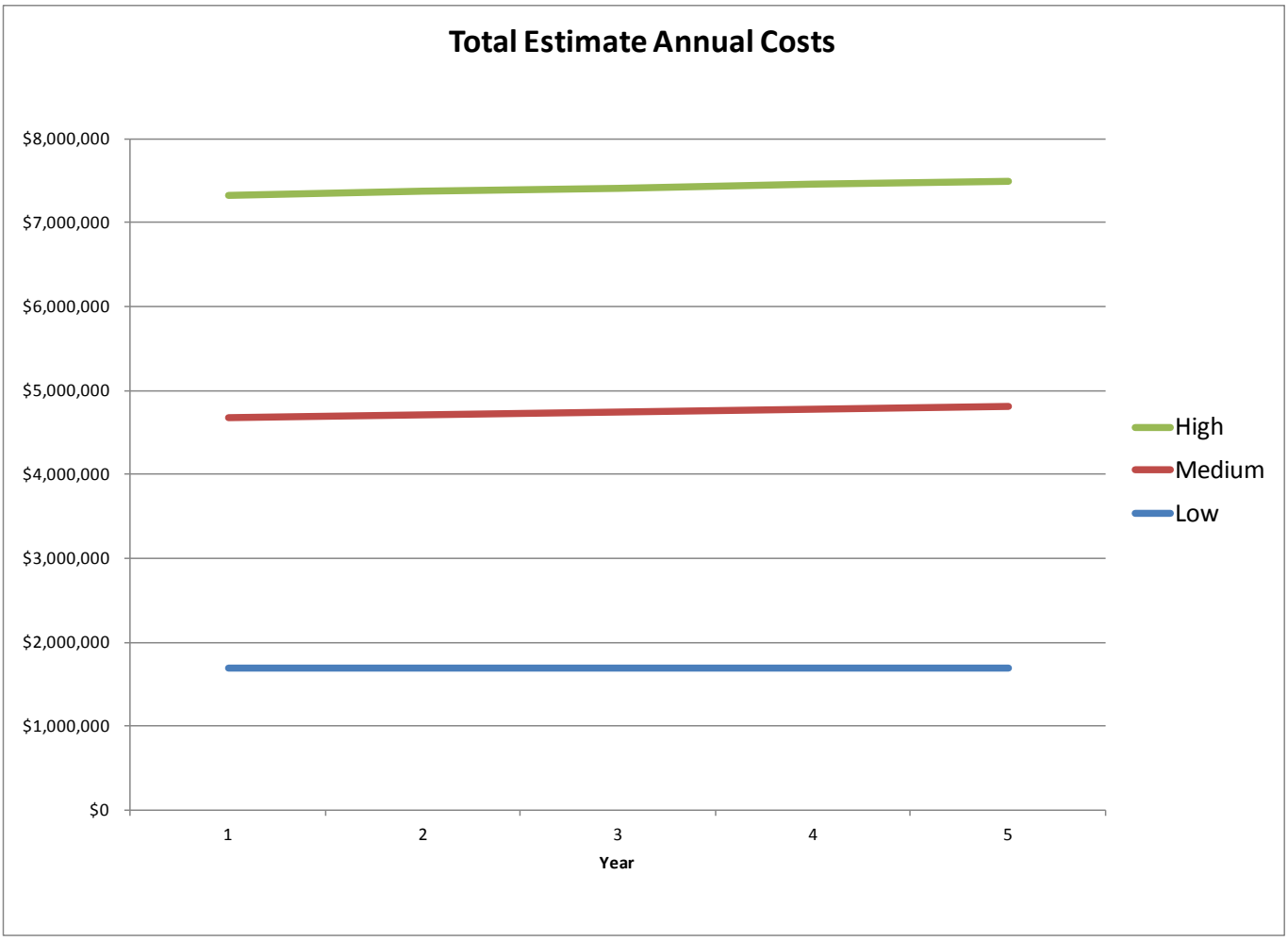
Program Needs for Next 5 Years

The program needs for the next 5 years for stormwater functions/services include O&M and capital costs. LOS cost estimates described in Section 3 were used define total program needs.

- LOS Alternative 1 – Current LOS and MS4 permit implementation
- LOS Alternative 2 – GI Plan implementation (public only), MS4 permit implementation, increased customer service
- LOS Alternative 3 – GI Plan implementation (public and private), MS4 permit implementation, high level of customer service

Figure 4-1 summarizes these estimates for the low, medium and high LOS evaluated during this study.

FIGURE 4-1
Level of Service Program Needs for the Next 5 Years



LOS Alternative 3 would provide cost recovery for a comprehensive program that includes preventive and corrective maintenance, inspection of facilities, additional CIP projects, including implementation of GI Plan elements on both public and private property. However, the resulting rate would be higher and may not be politically acceptable.

LOS Alternative 1 provides only the bare bones program with very little advancement above the current program. The resulting rate could be nominal, but the services are not comprehensive.

LOS Alternative 2 provides advancement above the current program, including implementation of GI Plan elements on public property. This alternative could be more acceptable because it attempts to provide a balance between the rates and the programs needed to comply with state and federal regulations.

In addition to considering policies related to the program costs recoveredby the rate, related policy issues include debt financing of CIP and payment of existing debt service for current CIP. These issues will be addressed in a separate TM on rate structures and rates.

4.1 Low Level of Service

LOS Alternative 1 (low LOS) consists of programs that are currently cost recovered by Public Works using General Fund resources. The current programs include items related to the City's existing MS4 permit and are geared toward satisfying the six MCMs.

Table 4-1 summarizes the estimated program costs for the low LOS (Alternative 1). Underlying assumptions for each item are provided in Section 3.

TABLE 4-1
Low Level of Service Cost Estimates

O&M	Year 1	Year 2	Year 3	Year 4	Year 5
GI					
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$168,800	$168,800	$168,800
Catch Basin	$201,000	$201,000	$201,000	$201,000	$201,000
Storm Drainage					
MS4 Implementation	$452,000	$452,000	$452,000	$452,000	$452,000
Program Administration	$142,000	$142,000	$142,000	$142,000	$142,000
Capital Costs					
GI	$730,600	$730,600	$730,600	$730,600	$730,600
Storm Drainage					
Catch Basin					
Total	**$1,696,700**	**$1,696,700**	**$1,696,700**	**$1,696,700**	**$1,696,700**

4.2 Medium Level of Service

LOS Alternative 2 (medium LOS) consists of programs that are currently cost recovered by Public Works using General Fund resources, plus additional programs and greater LOS. The current programs include items related to the City's existing MS4 permit and are geared toward satisfying the six MCMs. In comparison to the low LOS, the medium LOS includes O&M for GI facilities constructed as part of the GI plan. There are no capital cost assumed for the low LOS, whereas capital costs for the public facilities identified in the GI Plan are included in the medium LOS. Capital costs related to rehabilitation and replacement of storm drains is also included. The medium LOS cost estimate in Year 5 is approximately $3,000,000 greater than the low LOS estimate and provides additional O&M for facilities and greater emphasis on capital projects. Table 4-2 summarizes the estimated program costs for the medium LOS (Alternative 2). Underlying assumptions for each item are provided in Section 3.

TABLE 4-2
Medium Level of Service Cost Estimates

O&M	Year 1	Year 2	Year 3	Year 4	Year 5
GI	$32,400	$64,800	$97,200	$129,600	$162,000
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$168,800	$168,800	$168,800
Catch Basin	$201,000	$201,000	$201,000	$201,000	$201,000
Storm Drainage					
MS4 Implementation	$536,000	$536,000	$536,000	$536,000	$536,000

TABLE 4-2
Medium Level of Service Cost Estimates

O&M	Year 1	Year 2	Year 3	Year 4	Year 5
Program Administration	$219,000	$219,000	$219,000	$219,000	$219,000
Capital Costs					
GI	$1,909,100	$1,909,100	$1,909,100	$1,909,100	$1,909,100
Storm Drainage	$1,444,000	$1,444,000	$1,444,000	$1,444,000	$1,444,000
Catch Basin	$164,000	$164,000	$164,000	$164,000	$164,000
Total	**$4,676,600**	**$4,709,000**	**$4,741,400**	**$4,773,800**	**$4,806,200**

4.3 High Level of Service

LOS Alternative 3 (high LOS) consists of programs that are currently cost recovered by Public Works using General Fund resources plus additional programs and greater LOS. The current programs include items related to the City's existing MS4 permit and are geared toward satisfying the six MCMs. In comparison to the medium LOS, the high LOS includes additional O&M for green infrastructure facilities constructed on private property as part of the GI Plan, as well as capital costs for private and public facilities identified in the GI Plan. Capital costs related to a higher frequency of rehabilitation and replacement of storm drains is also included. The high LOS cost estimate in Year 5 is approximately $2,600,000 greater than the medium LOS and provides additional O&M for facilities and greater emphasis on capital projects. Table 4-3 summarizes the estimated program costs for the high LOS (Alternative 3). Underlying assumptions for each item are provided in Section 3.

TABLE 4-3
High Level of Service Cost Estimates

TABLE 4-3
High Level of Service Cost Estimates

O&M	Year 1	Year 2	Year 3	Year 4	Year 5
GI	$40,500	$81,000	$121,500	$162,000	$202,500
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300	$2,300	$2,300
Street Sweeping	$234,100	$234,100	$234,100	$234,100	$234,100
Catch Basin	$402,000	$402,000	$402,000	$402,000	$402,000
Storm Drainage					
MS4 Implementation	$612,000	$612,000	$612,000	$612,000	$612,000
Program Administration	$296,000	$296,000	$296,000	$296,000	$296,000
Capital Costs					
GI	$3,652,400	$3,652,400	$3,652,400	$3,652,400	$3,652,400
Storm Drainage	$1,926,000	$1,926,000	$1,926,000	$1,926,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000	$164,000	$164,000
Total	**$7,329,300**	**$7,369,800**	**$7,410,300**	**$7,450,800**	**$7,491,300**

Attachment A
Stormwater Utility Program Needs Policy Paper

Stormwater Utility Program Needs
Policy Development Summary
Lancaster, PA

Policy Paper No. 1

Date Prepared: April 25, 2012
Date Revised: May 9, 2012
Date Final: September 13, 2012

Policy Issue: What is funded by the proposed Stormwater Utility?

Overview

There are several types of funding sources, which may include one or a combination of *ad valorem* taxes, grants, loans, and/or user charges. A stormwater utility is a funding mechanism that is dedicated for a variety of stormwater program elements, which may include conveyance, maintenance, and capital improvements. Currently, the City's General Fund and Sewer Fund are the source of funding for stormwater programs. In order to consider funding source, it is important to define the costs and level of service (LOS) for stormwater programs. The purpose of this policy paper is to define which program elements (Operations and Maintenance [O&M] and Capital Improvement Program [CIP]) should be funded by the proposed stormwater utility fee pursuant to Pennsylvania law.

A stormwater utility can fund O&M and/or capital projects. O&M can include administrative costs, inspection/maintenance costs, billing/collection costs, and other stormwater-related functions. Capital project costs can include rehabilitation and replacement of stormwater facilities. Program elements that could be funded by the stormwater utility fee include the following:

- Capital Improvement Projects
  - Green Infrastructure (GI) Program (Tables 5.9 and 5.10 from GI plan)
  - Combined sewer overflow (CSO) / wet-weather-related projects from wastewater CIP (funding source = Sewer Fund)
  - Catch Basin Rehabilitation and Replacement
  - Storm Drain Rehabilitation and Replacement
  - Stormwater / Drainage Master Plan CIP, for flood relief (not funded)
- Program Administration
  - Billing and Collection
  - Incentive/Credit Program (costs of administering program)
- Inspections and Maintenance
  - GI
  - Dry and Wet Ponds (inspection only, privately owned so not currently maintained by the City)
  - Street Sweeping
  - Catch Basin
  - Drainage Ditch
  - CSO / wet-weather facilities (funded by Sewer Fund)
    - Diversion Chambers
    - Junction Chambers
    - Manholes
    - Outfalls
    - Pressure Junction
    - Pump Station
    - Force Main Sewer
    - Gravity Main Sewer
    - Flow Monitoring
- National Pollutant Discharge Elimination System (NPDES) Phase II Implementation (Municipal Separate Storm Sewer System [MS4] Permit)
  - Public Education
  - Public Participation / Involvement
  - Illicit Discharge Detection / Elimination
  - Construction Site Runoff Control
  - Post-Construction Stormwater Management
  - Pollution Prevention
- Water Quality Monitoring (Total Maximum Daily Load compliance)
- Floodplain Management (not funded)
- Wastewater Treatment (funding source = Sewer Fund)

Exhibits 1a- e provide summary tables of the LOS assumptions. Exhibit 2 shows the estimated maintenance costs by LOS. Exhibits 3a-c summarize the estimated capital costs for the low, medium, and high LOS options. Exhibits 4a-b summarize the estimated capital costs for the high LOS option. Exhibits 5a-b summarize overall capital and maintenance costs for three levels of service options.

Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*: September 13, 2012

Policy Issue: What is funded by the proposed Stormwater Utility?

Policy Options

- LOS Alternative 1 – Current LOS and MS4 Permit Implementation
- LOS Alternative 2 – GI Plan Implementation (public only), MS4 Permit Implementation, Increased Maintenance and Customer Service
- LOS Alternative 3 – GI Plan Implementation, MS4 Permit Implementation, High Level of Maintenance and Customer Service

Issues, Concerns, Benefits

- LOS Alternative 3 would provide funding for a comprehensive program that includes preventive and corrective maintenance, inspection of facilities, additional CIP projects, and drainage master planning. However, the rate per equivalent residential unit may not be politically acceptable.
- LOS Alternative 1 provides only the bare-bones program with very little advancement above the current program. The fee is nominal, but the services are not comprehensive.
- LOS Alternative 2 provides advancement above the current program, including implementation of GI Plan elements on public property.
- Related policy issues include debt financing of CIP and payment of existing debt service for current CIP.
- A separate policy decision will be needed on whether existing program elements funded by the Sewer Fund will be funded by an impervious area fee, or whether new program costs due to regulatory drivers would be paid by the fee.

Advisory Committee Comments

What is funded by the Program?

- The City clarified that currently the potable water consumption is used to apportion costs for all sewer-related City services, including stormwater management.
- Question: is the user fee going to just reapportion existing costs, or will it also pay for the increase in program costs due to new elements and LOS increases? Response: it was clarified that this is a key decision that needs to be made. But the purpose of considering low, medium, and high program costs in developing fees is to bracket likely choices in terms of what programs could be funded by the fee.
- It was indicated that there is an inequity in using the current water/sewer fee system (based on water usage) to pay for stormwater/CSO issues, that are based on volume of runoff from each property.
- It was recommended to add flood relief to clarify the result of a stormwater/drainage master plan on the CIP list
- The City indicated that the CSO and treatment facility cost would remain in Sewer Fund
- Illicit discharge detection and elimination and cross-connections were discussed as a cost due to the need to inspect the system to locate cross-connected laterals, illegal connections, and sources of wet-weather flow into the sanitary sewer system, including sump pumps.
- It was suggested that we consider including a provision for expenses that we may not be thinking of (such as nutrient trading). The City clarified the role of the budget for nutrient credit purchase/sale in the sewer fund that provides the City with a cost benefit for its treatment of nutrients at the advanced wastewater treatment plant beyond the level required in its current allocation.

Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*: September 13, 2012

Policy Issue: What is funded by the proposed Stormwater Utility?

What LOS scenarios should be included in rate structure analysis?

- It was questioned whether the LOS would result in U.S. Environmental Protection Agency (EPA) acceptance of programs. Response: EPA rarely goes on record approving programs, so there's no certainty in what LOS is acceptable to meet EPA goals.
- The regulatory drivers for the program were discussed, including the uncertainties imposed by the EPA administrative order, the Total Maximum Daily Load, and future changes that are likely to occur in the City's MS4 permit.
- It was suggested to have an LOS between 2 and 3 to provide more granularity in options for LOS and to help clarify the understanding of the potential acceptability of the various Program components.
- It was suggested that LOS1 might be worth taking off the table. However, others pointed out that LOS1 illustrates the concept of the equity principle and is important to keep.
- The City indicated that the permit requirement is to clean once a year.
- Action - Fix LOS for street sweeping (CH2M HILL).
- Need to clarify the pollutant removal benefits of street sweeping (City has provided estimates for the Watershed Implementation Plan)
- It was noted that outreach could help reduce investments in ongoing street sweeping and inlet cleaning.
- Action - Need to include more intuitive metrics (CH2M HILL).

Consultant Recommendation

- The consultant recommended LOS2 or greater.

Decision/Action

The GIAC recommended that dedicated funding options be investigated to provide at least the medium level of service, with a goal of moving towards the higher level of service. It was generally agreed that the current low level of service would not be adequate to meet regulatory requirements.

EXHIBIT 1A

Catch Basin (n = 1,910)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Inlet Cleaning	2,747	1x per year	2,747	1x per year	2,747	2x per year
Rehabilitation / Replacement	72	Per year	72	Per year	72	Per year

EXHIBIT 1B

Street Sweeping (~300 miles)	LOS 1	LOS 2 (current funding)	LOS 3
Activity	Frequency	Frequency	Frequency
Routes 1-8	2 per month	2 per month	3 per month
Development Route	2 per month	2 per month	3 per month
Alleys	2 per month	2 per month	3 per month
Park City Route	2 per month	2 per month	3 per month
5th Week Route	2 per month	2 per month	3 per month
Downtown District	5 per week	5 per week	5 per week

EXHIBIT 1C

Storm Sewer (79 mi MS4, 26 mi CSS)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Maintenance	Current Funding Level					
Rehabilitation	None	N/A	80%	100 yrs	80%	75 yrs
Replacement	None	N/A	20%	100 yrs	20%	75 yrs

CSS = combined sewer system
mi - miles

EXHIBIT 1D

GI Infrastructure (O&M)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Vegetated Roof						
Inspection						
Maintenance			30,300 sf	Per year	30,300 sf	Per year
Infiltration Trenches w/ Pretreatment Inlets						
Inspection						
Maintenance			115 ea	Per year	115 ea	Per year
Porous Pavement Systems						
Inspection						
Maintenance			142,900 sf	Per year	142,900 sf	Per year
Bioretention/Rain Gardens						
Inspection						
Maintenance			66,000 sf	Per year	66,000 sf	Per year
Tree Plantings/Trenches						
Inspection						
Maintenance			1,250 ea	Per year	1,250 ea	Per year
Cisterns						
Inspection						
Maintenance			5 ea	Per year	5 ea	Per year

EXHIBIT 1E

MS4 Implementation (6 minimum controls)	LOS 1		LOS 2		LOS 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Public Education						
Public Participation / Involvement						
Illicit Discharge Detection / Elimination						
Construction Site Runoff Control						
Post-Construction Stormwater Management						
Pollution Prevention						

EXHIBIT 2

Maintenance	Estimated Annual Inspection/Maintenance Costs		
	Low	Medium*	High*
Green Infrastructure			
Green Streets		$29,000	$36,250
Park Improvements / Greening		$24,000	$30,000
Disconnection, Porous Pavement		$16,000	$20,000
Porous Pavement, Bioretention		$3,000	$3,750
Vegetated Roofs / Disconnection		$10,000	$12,500
Disconnection/Rain Gardens		---	---
Enhanced Tree Planting		$50,000	$62,500
Green Schools		$30,000	$37,500
Sub-total Green Infrastructure		$162,000	$202,500
Dry and Wet Ponds (inspection only)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation			
Public Education	$15,692	$92,000	$136,000
Public Participation / Involvement	$6,462	$15,000	$47,000
Illicit Discharge Detection / Elimination	$53,800	$53,800	$53,800
Construction Site Runoff Control [1]	$52,600	$52,600	$52,600
Post-Construction Stormwater Management	$17,800	$17,800	$17,800
Pollution Prevention	$305,212	$305,212	$305,212
Program Administration			
Billing and Collection	$90,000	$90,000	$90,000
Incentive/Credit Program	n/a	$77,000	$154,000
NPDES permit	$29,000	$29,000	$29,000
Plan Review	$23,000	$23,000	$23,000

*GI Plan annual maintenance costs are for the fifth year of GI implementation.

[1] This function is provided by the Lancaster County Conservation District at no cost to the City of Lancaster, and is paid for through plan review fees assessed by the Conservation District.

EXHIBIT 3A

Capital Costs (Low LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$132,600	$132,600	$132,600	$132,600	$132,600
Park Improvements / Greening	$50,000	$50,000	$50,000	$50,000	$50,000
Disconnection, Porous Pavement	$58,200	$58,200	$58,200	$58,200	$58,200
Porous Pavement, Bioretention	$70,200	$70,200	$70,200	$70,200	$70,200
Vegetated Roofs / Disconnection	$93,600	$93,600	$93,600	$93,600	$93,600
Disconnection/Rain Gardens	$131,000	$131,000	$131,000	$131,000	$131,000
Enhanced Tree Planting	$143,800	$143,800	$143,800	$143,800	$143,800
Green Schools	$51,200	$51,200	$51,200	$51,200	$51,200
Storm Drainage					
MS4					
Rehabilitation					
Replacement					
Information Management					
CSS					
Rehabilitation					
Replacement					
Information Management					
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$894,600**	**$894,600**	**$894,600**	**$894,600**	**$894,600**

EXHIBIT 3B

Capital Costs (Medium LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$530,000	$530,000	$530,000	$530,000	$530,000
Park Improvements / Greening	$199,800	$199,800	$199,800	$199,800	$199,800
Disconnection, Porous Pavement	$232,400	$232,400	$232,400	$232,400	$232,400
Porous Pavement, Bioretention	$28,100	$28,100	$28,100	$28,100	$28,100
Vegetated Roofs / Disconnection	$138,800	$138,800	$138,800	$138,800	$138,800
Disconnection/Rain Gardens	$0	$0	$0	$0	$0
Enhanced Tree Planting	$575,000	$575,000	$575,000	$575,000	$575,000
Green Schools	$205,000	$205,000	$205,000	$205,000	$205,000
Storm Drainage					
MS4					
Rehabilitation	$667,000	$667,000	$667,000	$667,000	$667,000
Replacement	$417,000	$417,000	$417,000	$417,000	$417,000
Information Management	$2,000	$2,000	$2,000	$2,000	$2,000
CSS					
Rehabilitation	$220,000	$220,000	$220,000	$220,000	$220,000
Replacement	$137,000	$137,000	$137,000	$137,000	$137,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$3,517,100**	**$3,517,100**	**$3,517,100**	**$3,517,100**	**$3,517,100**

EXHIBIT 3C

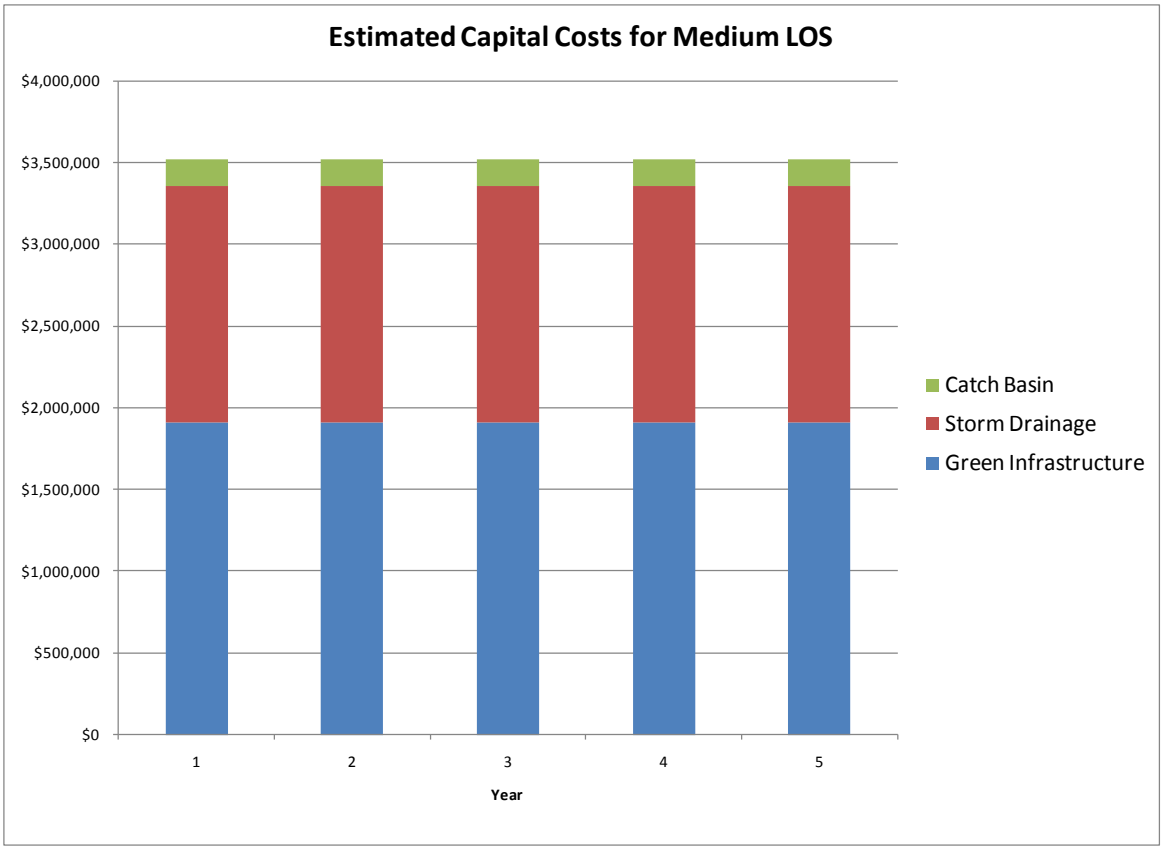

Estimated Capital Costs for Medium LOS
$4,000,000
$3,500,000
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
1
2
3
4
5
Year
Catch Basin
Storm Drainage
Green Infrastructure

EXHIBIT 4A

Capital Costs (High LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$662,600	$662,600	$662,600	$662,600	$662,600
Park Improvements / Greening	$249,800	$249,800	$249,800	$249,800	$249,800
Disconnection, Porous Pavement	$290,600	$290,600	$290,600	$290,600	$290,600
Porous Pavement, Bioretention	$351,200	$351,200	$351,200	$351,200	$351,200
Vegetated Roofs / Disconnection	$468,000	$468,000	$468,000	$468,000	$468,000
Disconnection/Rain Gardens	$655,200	$655,200	$655,200	$655,200	$655,200
Enhanced Tree Planting	$718,800	$718,800	$718,800	$718,800	$718,800
Green Schools	$256,200	$256,200	$256,200	$256,200	$256,200
Storm Drainage					
MS4					
Rehabilitation	$890,000	$890,000	$890,000	$890,000	$890,000
Replacement	$556,000	$556,000	$556,000	$556,000	$556,000
Information Management	$3,000	$3,000	$3,000	$3,000	$3,000
CSS					
Rehabilitation	$293,000	$293,000	$293,000	$293,000	$293,000
Replacement	$183,000	$183,000	$183,000	$183,000	$183,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$5,637,400**	**$5,637,400**	**$5,637,400**	**$5,637,400**	**$5,637,400**

EXHIBIT 4B

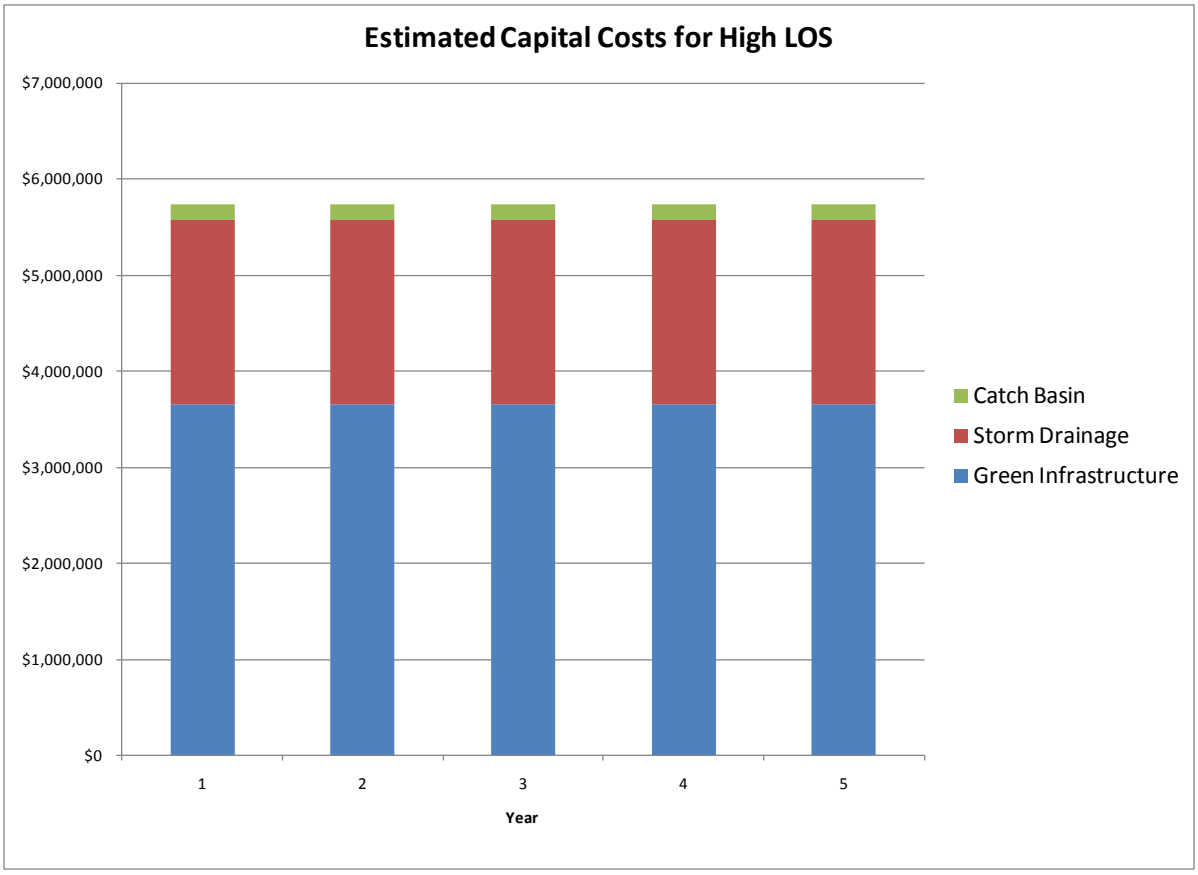
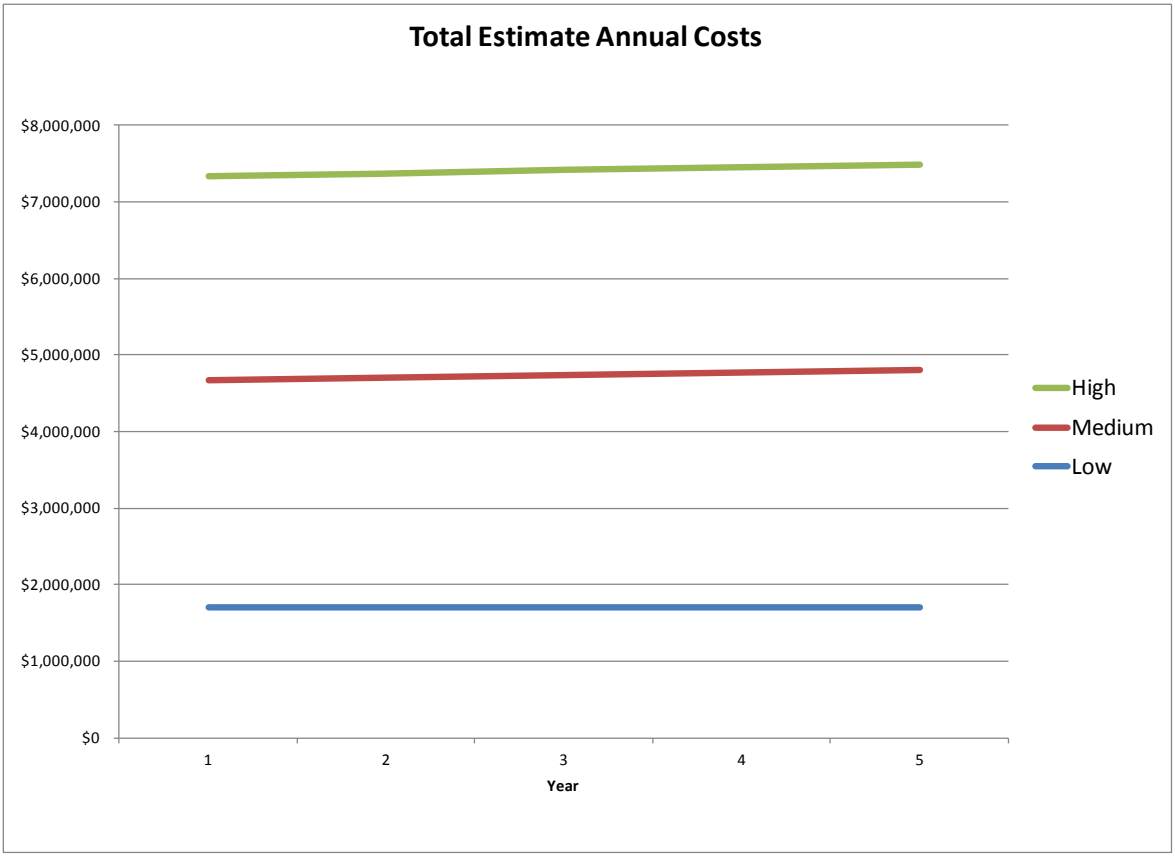


EXHIBIT 5A

	Estimated Annual Costs		
	Low	Medium	High
Operating and Maintenance			
Green Infrastructure*	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
Green Infrastructure	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

*GI Plan annual maintenance costs are for the fifth year of GI implementation.

EXHIBIT 5B


Total Estimate Annual Costs
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
1
2
3
4
5
Year
High
Medium
Low

Attachment B
Program Administration Costs

Estimate Program Administration Costs

Hours Per Year	Manager	City Engineer	Planner	Total
NPDES permit	120	312		432
Plan Review	52	104	300	456
Total Hours	**172**	**416**	**300**	**888**

Estimate Program Costs	Manager	City Engineer	Planner	Total
NPDES permit	$ 6,925	$ 21,912	$ -	$ 29,000
Plan Review	$ 3,001	$ 7,304	$ 12,390	$ 23,000
Total Estimated Program Costs	**$ 9,926**	**$ 29,216**	**$ 12,390**	**$ 52,000**

Estimated Administrative Costs for Credits and Incentives Program

	Level of Service		
Item	**Low**	**Medium**	**High**
Progarm Adminstration [1]	$ -	$ 43,000	$ 86,000
Program Inspector [2]	$ -	$ 34,000	$ 68,000
Total	**$ -**	**$ 77,000**	**$ 154,000**

[1] Medium LOS assumes 0.5 FTE of Senior Planner, High LOS assumes 1 FTE of Senior Planner
[2] Medium LOS assumes 0.5 FTE of Inspector, High LOS assumes 1 FTE of Inspector, 1 FTE = $68,000

2012 PAC COSTS AND ALLOCATED COSTS

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
TYPE OF ALLOCATION								
GF/Water/Sewer/Trash Allocation %	100.000%	A	17.860%	44.925%	19.706%	17.509%		
PAC/Police/Water/Sewer/Trash Allocation %	100.000%	P	9.390%	44.925%	19.706%	17.509%		8.470%
General Fund Only	100.000%	B	100.000%					
Water/Sewer/Trash Allocation %	100.000%	C		54.693%	23.991%	21.316%		
Water/Sewer Allocation %	100.000%	D		69.510%	30.490%			

2012 ALLOCATED COSTS TABLE				GF	Water	Sewer	Trash	Housing	Police
Salary --Bureau Chief				**101-4-402-6110**					
Bureau Chief	J Rhinier	61,025		10,899	27,415	12,026	10,685	-	-
Total Salary--Bureau Chief		**61,025**		**10,899**	**27,415**	**12,026**	**10,685**	**-**	**-**
Salary--Personnel				**101-4-402-6115**					
CC Supervisor	J Taylor	44,037	A	7,865	19,784	8,678	7,710		
Admin Support Supv-PROMOTION	M Dunn	41,305	A	7,377	18,556	8,140	7,232		
CCC	D McCLymont	39,630	A	7,078	17,804	7,809	6,939		
Data Coord	D Kilhefner	41,310	A	7,378	18,559	8,141	7,233		
CCC	C Kelly	38,953	A	6,957	17,500	7,676	6,820		
Utility Service Coordinator	R Maldonado	34,526	D	-	23,999	10,527	-		
CCC	L Parson	39,731	A	7,096	17,849	7,829	6,957		
Cashier	F Peters	35,146	A	6,277	15,789	6,926	6,154		
Cashier	Z Burgos	31,691	A	5,660	14,237	6,245	5,549		
Billing Coordinator	D Toy Rebert	34,979	A	6,247	15,714	6,893	6,124		
Revenue Clerk	V Kong Chiem	33,779	A	6,033	15,175	6,656	5,914		
Mail Clerk	Vacant	30,409	A	5,431	13,661	5,992	5,324		
CCC---NEW	Vacant	36,541	A	6,526	16,416	7,201	6,398		
Admin Support Clert--NEW	Vacant	31,689	A	5,660	14,236	6,245	5,548		
Data Entry	O Nguyen	12,396	A	2,214	5,569	2,443	2,170	-	-
Total Salary--Personnel		**526,122**		**87,799**	**244,849**	**107,401**	**86,074**	**-**	**-**
Temporary Employee				**101-4-402-6190**					
Temporary Cashier		-	A	-	-	-	-	-	-
Total Temporary Employee		**-**		**-**	**-**	**-**	**-**	**-**	**-**

2012 PAC COSTS AND ALLOCATED COSTS

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
TYPE OF ALLOCATION								
GF/Water/Sewer/Trash Allocation %	100.000%	A	17.860%	44.925%	19.706%	17.509%		
PAC/Police/Water/Sewer/Trash Allocation %	100.000%	P	9.390%	44.925%	19.706%	17.509%		8.470%
General Fund Only	100.000%	B	100.000%					
Water/Sewer/Trash Allocation %	100.000%	C		54.693%	23.991%	21.316%		
Water/Sewer Allocation %	100.000%	D		69.510%	30.490%			

2012 ALLOCATED COSTS TABLE				GF	Water	Sewer	Trash	Housing	Police
Overtime		250	B	250					
Total Overtime		**250**		**250**	**-**	**-**	**-**	**-**	**-**
Rental of Uniforms									
Shirts for Mail Clerk	Mail Clerk	460	**A**	82	207	91	81	-	-
Total Rental of Uniforms		**460**		**82**	**207**	**91**	**81**	**-**	**-**
Equipment Maintenance				**101-4-402-7230**					
Conestoga Business Systems	Time Clock	125	A	22	56	25	22		
Frasier	PAC Copier	780	A	139	350	154	137		
OPEX	Mail Machine	11,090	A	1,981	4,982	2,185	1,942		
BARSA (3yr maint pd in 2011)	IBM Infoprint	-	A	-	-	-	-		
NMS Imaging	Imaging	1,255	A	224	564	247	220		
RP Solutions	RP Machine	6,344	A	1,133	2,850	1,250	1,111		
CS Electronics Tadiran Phone Sys	Phone Module	1,800	A	321	809	355	315		
Miscellaneous Repair		250	B	250	-	-	-	-	-
Total Equipment Maintenance		**21,644**		**4,071**	**9,611**	**4,216**	**3,746**	**-**	**-**
Dues & Subscriptions				**101-4-402-7320**					
NIGP Dues		330		330					
Government Finance		200		200					
County Co-Op Dues		65		65					
PLCM Dues		65		65					
Pa Public PAC--Rhinier		15		15					
Pa Public PAC--Dunn		15		15					

2012 PAC COSTS AND ALLOCATED COSTS

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
TYPE OF ALLOCATION								
GF/Water/Sewer/Trash Allocation %	100.000%	A	17.860%	44.925%	19.706%	17.509%		
PAC/Police/Water/Sewer/Trash Allocation %	100.000%	P	9.390%	44.925%	19.706%	17.509%		8.470%
General Fund Only	100.000%	B	100.000%					
Water/Sewer/Trash Allocation %	100.000%	C		54.693%	23.991%	21.316%		
Water/Sewer Allocation %	100.000%	D		69.510%	30.490%			

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
Pcard Fee--Rhinier	20		20					
Pcard Fee--Dunn	20		20	-	-	-	-	-
Total Dues & Subscriptions	**730**		**730**	**-**	**-**	**-**	**-**	**-**
Postage			**101-4-402-7340**					
Real Estate Taxes	10,320		10,320					
Housing	26,193						26,193	
Fire	591							
Water/Sewer	105,699	D		73,471	32,227			
Trash	28,984					28,984		
Police	17,707							17,707
Miscellaneous GF Bills	1,939		1,939					
Post Office Box 1599	567	A	101	255	112	99		
Post Office Box 1020	341	A	61	153	67	60		
Bulk Mail Permit Fee	399	A	71	179	79	70		
PAC Office Postage	1,200		1,200	-	-	-	-	-
Total Postage	**193,940**		**13,693**	**74,058**	**32,485**	**29,213**	**26,193**	**17,707**
Printing			**101-4-402-7350**					
# 9 Regular 24 WW	10,490	P	985	4,712	2,067	1,837		888
#10 Window 24 WW Blue Ink	10,868	P	1,020	4,882	2,142	1,903		920
White Laser Paper	7,072	P	664	3,177	1,394	1,238		599
Zip-4 Software Annual Fee	2,400	A	429	1,078	473	420		
Applications for Water Service Cards	1,000	C		695	305			
Pitney Bowes Supplies	1,850	A	330	831	365	324	-	-
Total Printing	**33,679**		**3,429**	**15,376**	**6,745**	**5,722**	**-**	**2,408**

2012 PAC COSTS AND ALLOCATED COSTS

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
TYPE OF ALLOCATION								
GF/Water/Sewer/Trash Allocation %	100.000%	A	17.860%	44.925%	19.706%	17.509%		
PAC/Police/Water/Sewer/Trash Allocation %	100.000%	P	9.390%	44.925%	19.706%	17.509%		8.470%
General Fund Only	100.000%	B	100.000%					
Water/Sewer/Trash Allocation %	100.000%	C		54.693%	23.991%	21.316%		
Water/Sewer Allocation %	100.000%	D		69.510%	30.490%			

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
Telephone			**101-4-402-7360**					
Regular Phone Costs	5,520	A	986	2,480	1,088	966	-	-
Total Telephone	**5,520**		**986**	**2,480**	**1,088**	**966**	**-**	**-**
Travel			**101-4-402-7370**					
2 Pappa Meetings	200	A	200					
2 Co-Op Meetings	50	A	50					
Total Travel	**250**		**250**					
Miscellaneous			**101-4-402-7380**					
Repairs not covered by Contract	250	A	250					
Total Miscellaneous	**250**		**250**					
Training/School								
Tuition Reimbursement	-	A	-	-	-	-	-	-
Total Training/School	**-**		**-**	**-**	**-**	**-**	**-**	**-**
Office Supplies			**101-4-402-7603**					
PAC Office Supplies	10,000	A	1,786	4,493	1,971	1,751	-	-
Total Office Supplies	**10,000**		**1,786**	**4,493**	**1,971**	**1,751**	**-**	**-**
Minor Equipment			**101-4-402-8200**					
Frasier--Copier w/Fax Rental	1,464	A	261	658	288	256		
Replacement Printers	700	A	125	314	138	123		
Replacement Calculators	200	A	36	90	39	35		

2012 PAC COSTS AND ALLOCATED COSTS

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
TYPE OF ALLOCATION								
GF/Water/Sewer/Trash Allocation %	100.000%	A	17.860%	44.925%	19.706%	17.509%		
PAC/Police/Water/Sewer/Trash Allocation %	100.000%	P	9.390%	44.925%	19.706%	17.509%		8.470%
General Fund Only	100.000%	B	100.000%					
Water/Sewer/Trash Allocation %	100.000%	C		54.693%	23.991%	21.316%		
Water/Sewer Allocation %	100.000%	D		69.510%	30.490%			

2012 ALLOCATED COSTS TABLE			GF	Water	Sewer	Trash	Housing	Police
Receipt Printers	400	A	71	180	79	70		
Scanners (check)	850	A	152	382	168	149		
OPEX/RP Machine Lease	21,162	A	3,780	9,507	4,170	3,705		
Pitney Bowes Mail Machine	27,204	A	4,859	12,221	5,361	4,763		
Pitney Bowes Mail Steam Upgrade	13,680	A	2,443	6,146	2,696	2,395	-	-
Total Minor Equipment	**65,660**		**11,727**	29,498	12,939	11,496	-	-
TOTAL	**919,530**		**135,951**	**407,987**	**178,960**	**149,733**	**26,193**	**20,115**

Attachment C
Inspection and Maintenance Cost Estimates

Med_LOS

Miles of Pipe (MS4)	**79**
Miles of Pipe (CSS)	**26**
Linear feet of Storm Drain	**554,400**

Routine Maintenance Assumptions for Storm Drain	Frequency (years between maintenance events) (A)	Staff Cost/8 hour day (B)	Linear Feet / day (C)	Materials & Incidentals (D) (dollars per lf)	% storm drain (LF) Per Year That Is Budgeted for Rehabilitation/ Replacement
Rehabilitation MS4	100.00			$ 200	80%
Rehabilitation CSS	100.00			$ 200	80%
Replacement MS4	100.00			$ 500	20%
Replacement CSS	100.00			$ 500	20%
Information Management (Rehabilitation)	100.00			$ 0.5000	100%
Information Management (Replacement)	100.00			$ 0.5000	100%

Estimated Annual Costs (assumes 3% inflation)	LF of Storm Drain Maintained per year that is budgeted for maintenance	Year 1	Year 2	Year 3	Year 4	Year 5
Rehabilitation MS4	**3,337**	$ 667,392	$ 687,414	$ 708,036	$ 729,277	$ 751,156
Rehabilitation CSS	**1,098**	$ 219,648	$ 226,237	$ 233,025	$ 240,015	$ 247,216
Replacement MS4	**834**	$ 417,120	$ 429,634	$ 442,523	$ 455,798	$ 469,472
Replacement CSS	**275**	$ 137,280	$ 141,398	$ 145,640	$ 150,010	$ 154,510
Information Management (MS4)	**4,171**	$ 2,086	$ 2,148	$ 2,213	$ 2,279	$ 2,347
Information Management (CSS)	**1,373**	$ 686	$ 707	$ 728	$ 750	$ 773
		$ 1,444,212	$ 1,487,538	$ 1,532,165	$ 1,578,129	$ 1,625,473
		$ 1,444,000	$ 1,488,000	$ 1,532,000	$ 1,578,000	$ 1,625,000

Rehabilitation CSS
Replacement MS4

High_LOS

Miles of Pipe (MS4)	**79**
Miles of Pipe (CSS)	**26**
Linear feet of Storm Drain	**554,400**

Routine Maintenance Assumptions for Storm Drain	Frequency (years between maintenance events) (A)	Staff Cost/8 hour day (B)	Linear Feet / day (C)	Materials & Incidentals (D) (dollars per lf)	% storm drain (LF) Per Year That Is Budgeted for Rehabilitation/ Replacement
Rehabilitation MS4	75.00			$ 200	80%
Rehabilitation CSS	75.00			$ 200	80%
Replacement MS4	75.00			$ 500	20%
Replacement CSS	75.00			$ 500	20%
Information Management (Rehabilitation)	75.00			$ 0.5000	100%
Information Management (Replacement)	75.00			$ 0.5000	100%

Estimated Annual Costs (assumes 3% inflation)	LF of Storm Drain Maintained per year that is budgeted for maintenance	Year 1	Year 2	Year 3	Year 4	Year 5
Rehabilitation MS4	**4,449**	$ 889,856	$ 916,552	$ 944,048	$ 972,370	$ 1,001,541
Rehabilitation CSS	**1,464**	$ 292,864	$ 301,650	$ 310,699	$ 320,020	$ 329,621
Replacement MS4	**1,112**	$ 556,160	$ 572,845	$ 590,030	$ 607,731	$ 625,963
Replacement CSS	**366**	$ 183,040	$ 188,531	$ 194,187	$ 200,013	$ 206,013
Information Management (MS4)	**5,562**	$ 2,781	$ 2,864	$ 2,950	$ 3,039	$ 3,130
Information Management (CSS)	**1,830**	$ 915	$ 943	$ 971	$ 1,000	$ 1,030
		$ 1,925,616	$ 1,983,384	$ 2,042,886	$ 2,104,173	$ 2,167,298
		$ 1,926,000	$ 1,983,000	$ 2,043,000	$ 2,104,000	$ 2,167,000

Catch Basin Maintenance Costs

Level of Service	Inlets	Maintenance Cost	Fuel Cost	Labor	Disposal Costs	Total Costs	Crew / Equipment
Low LOS (inlets once per year)	2747	$2,000	$5,000	$134,000	$60,000	$201,000	2 operators, 1 vac truck
Medium LOS (inlets once per year)	2747	$2,000	$5,000	$134,000	$60,000	$201,000	2 operators, 1 vac truck
High LOS (inlets 2x per year)	2747	$4,000	$10,000	$268,000	$120,000	$402,000	4 operators, 2 vac truck

Inventory of BMPs inspected as required by NPDES Permit

ID #	Project	Structural BMP	BMP Street Address
1	Lowes of Lancaster	Detention Basins	1801 Hempstead Road, Lancaster, PA 17601
2	Lancaster Leaf	Constructed Wetland Constructed Wetland	209 Pitney Road,209 Pitney Road, Lancaster, PA 17601
3	George Washington Elementary	Infiltration Basin & Detention Basin	545 South Ann Street, Lancaster, PA 17602
4	Lafayette Elementary School	Detention Basin & Infiltration Trench	1000 St. Joseph Street, Lancaster, PA 17602
5	Sheetz	Underground Detention Basin	1080 Dillerville Road, Lancaster, PA 17601
7	F&M New College House	Stormwater Ponds, Swale	601 College Avenue, Lancaster, PA 17603 (Race and Harrisl
8	F&M Race AvenueF&M Race Avenue Parking Lot	Vegetated InfiltrationVegetated Infiltration E	601 College Avenue, Lancaster, PA 17603 (RaceLancaster,
10	Conestoga WTP Upgrade	Retention Basin and Swale	150 Pitney Road, Lancaster, PA 17602
11	Armstrong Building 800 Expansion	Infiltration Basin, Detention Basin	1215 Loop Road, Lancaster, PA 17601

Estimated Annual BMP Inspection Costs

assume 3 days to complete inspection, document BMP facilities deficiencies and mail letters

1 person (annual salary of $120,000)	$	2,000
vehicle	$	300
Total Estimated Annual BMP Inspection Costs	**$**	**2,300**

City of Lancaster
Street Cleaning Costs
Year 2011

There are three (3) street sweepers running Monday thru Friday, one of them sweeping the downtown are nightly, one is a relief sweeper.

Sweeper #111: ran 857 hours – 3375 miles
Cost for maintenance - $1,951.81
Cost for Fuel $4,670.40

Sweeper #118: ran 1027 hours – 3988 miles
Cost for maintenance - $14,185.69
Cost for Fuel $4,548.22

Sweeper #129: ran 548 hours – 2293 miles
Cost for maintenance - $1,603.59
Cost for Fuel $2,082,05

Sweeper #133: ran 380 hours – 1791 miles
Cost for maintenance - $7,189.25
Cost for Fuel $2,111.38

Three (3) Street Sweeper Operators:

Operator #1	hourly $17.19	annually	$35,755.20
Operator #2	hourly $18.60	annually	$38,688.00
Operator #3	hourly $17.15	annually	$35,672.00

*Fringe Benefit rate for 2011 was 69.9%

Sweeper Debris:

606.87 tons
2,427.48 cubic yards
$46,122.12 total cost for the year

Routes:

Route #1	16 miles
Route #2	12 miles
Route #3	33. Miles
Route #4	18 miles
Route #5	20 miles
Route #6	15.5 miles
Route #7	19 miles
Route #8	17 miles
Development Route	25 miles
Alleys	45 miles
Park City Route	22 miles
5th Week Route	8 miles
Downtown District	10 miles

***all routes are swept twice per month except for the Downtown District which is swept 5 nights per week.**

	Hours	Miles	Maintenance Cost	Fuel Cost	Labor	Disposal Costs	Total Costs
Sweeper #111	857	3,375	$1,952	$4,670	$25,710	$13,599	$45,931
Sweeper #118	1027	3,988	$14,186	$4,548	$30,810	$16,068	$65,612
Sweeper #129	548	2,293	$1,604	$2,082	$16,440	$9,239	$29,365
Sweeper #133	380	1,791	$7,189	$2,111	$11,400	$7,216	$27,917
Total	**2812**	**11,447**	**$24,930**	**$13,412**	**$84,360**	**$46,122**	**$168,825**

Debris Disposal	
cost	$46,122
tons	606.87
cubic yards	2,427.48
tons per mile	0.05302
$ / ton	$76

Maintenance Cost/mile	$2.18
Disposal Cost/mile	$4.03
Fuel Costs/mile	$1.17
Labor Cost/mile	$7.37

Operator #1	$ 29.21	$60,748	$ 17.19	69.90%
Operator #2	$ 31.60	$65,731	$ 18.60	69.90%
Operator #3	$ 29.14	$60,607	$ 17.15	69.90%
	$ 29.98	$187,086		

		Low			Medium (current)			High		
Route	**Miles**	**Frequency**	**Time Period**	**Miles**	**Frequency**	**Time Period**	**Miles**	**Frequency**	**Time Period**	**Miles**
Route #1	16	2	month	384	2	month	384	3	month	576
Route #2	12	2	month	288	2	month	288	3	month	432
Route #3	33	2	month	792	2	month	792	3	month	1,188
Route #4	18	2	month	432	2	month	432	3	month	648
Route #5	20	2	month	480	2	month	480	3	month	720
Route #6	16	2	month	372	2	month	372	3	month	558
Route #7	19	2	month	456	2	month	456	3	month	684
Route #8	17	2	month	408	2	month	408	3	month	612
Development Route	25	2	month	600	2	month	600	3	month	900
Alleys	45	2	month	1,080	2	month	1,080	3	month	1,620
Park City Route	22	2	month	528	2	month	528	3	month	792
5th Week Route	8	2	month	192	2	month	192	3	month	288
Downtown District	10	5	week	2,600	5	week	2,600	5	week	2,600
Misc. Sweeping to fill 2011 mile gap	118	2	month	2,835	2	month	2,835	3	month	4,253
Total	379			11,447			11,447			15,871

Cost Item	**Cost/mile**	**Low LOS**	**Medium LOS**	**High LOS**
Maintenance Cost	$2.18	$24,900	$24,900	$34,600
Disposal Cost	$4.03	$46,100	$46,100	$63,900
Fuel Costs	$1.17	$13,400	$13,400	$18,600
Personnel	$7.37	$84,400	$84,400	$117,000
Total		$168,800	$168,800	$234,100

Route	**Miles**	**Frequency of Sweeping**
Normal Route (8)	151	2x per month
Development Route	25	2x per month
Alleys	45	2x per month
Park City Route	22	2x per month
5th Week Route	8	2x per month
Downtown District	10	5x per week
Miscellaneous Sweeping	118	2x per month
Total	379	

General Green Infrastructure Type	Unit	Estimated Quantity for GI Plan, 5-year Implementation	Estimated Annual Maintenance Costs	*Maintenance Cost Assumptions*	*Quantity Assumptions*
Vegetated Roof	SF	30,300	$10,000	Jorg: $0.10-$0.30/SF.	Assume estimated quantity for PENNVEST (PV) is the total for the 5 year period
Infiltration Trenches w/ Pretreatment Inlets	EA	115	$29,000	OC Memo [$200/inlet/year plus $500 for flushing 10% per year]	Assume all of streets/alleys category with 1 inlet per 1000 SF of GI (based on PV projects)
Porous Pavement Systems	SF	142,900	$33,000	4 x OC Memo [$500/acre/year ($0.011/SF) for vacuuming + $0.02/SF for pavement patching] plus $250 per 2500 SF (inlet cleaning/mobilization)	Assume all of sidewalk GI plus half of parks and schools plus 10% of parking lot GI
Bioretention/Rain Gardens	SF	66,000	$38,000	5 times OC Memo plus $500 per 1000 SF area for mobilization (OC Memo: ~1.4 person-hour/2500 SF @ $25/hour ($0.014/SF))	Assume half of parks and schools GI
Tree Plantings/Trenches	EA	1250	$50,000	$40/year assumed based on conversations with OC arborist	Directly from GI Plan (250 trees/year)
Cisterns	EA	5	$3,000	$500/cistern/year assumed	Assume 1 cistern per year
Total	---	---	**$163,000**		
		Estimated Total Construction Cost	$8,850,000		Total of 5 public GI programs plus 10% of parkin
		Annual Maintenance Cost (% of Total Construction Cost)	1.84%		

General Green Infrastructure Type	Unit	Estimated Quantity for Public PENNVEST Projects	Estimated Annual Maintenance Costs	Source
Vegetated Roof	SF	30,300	$9,100	Jorg: $0.10-$0.30/SF. OC Memo [$75/1000SF/year ($0.075/SF) for weeding and $0.04/SF for fertilization] plus $250 per roof for mobilization
Infiltration Trenches w/ Pretreatment Inlets	EA	32	$10,400	OC Memo [$200/inlet/year plus $500 (+40% TBD) for flushing 1 system per year]
Porous Pavement Systems	SF	31,200	$3,500	2 x OC Memo [$500/acre/year ($0.012/SF) for vacuuming + $0.02/SF for pavement patching] plus $500 per event (2 times per year)
Bioretention/Rain Gardens	SF	8,700	$2,900	4 times OC Memo plus $300 per area for mobilization (OC Memo: ~1.4 person-hour/2500 SF @ $25/hour ($0.014/SF))
Tree Plantings/Trenches	EA	57	$4,300	OC Memo wasn't clear (maybe $100/year for mulch and pruning?), so $75/year assumed (also based on informal conversations with OC arborist)
Cisterns	EA	3	$1,500	$500/cistern/year assumed.
Total	---	---	**$32,000**	
		Approximate Total Construction Cost	$3,000,000	
			1.07%	

ESTIMATED PUBLIC CONSTRUCTION, CAPITAL, AND MAINTENANCE COSTS FOR 5-YEAR GREEN INFRASTRUCTURE IMPLEMENTATION

Area / Impervious Source	Green Infrastructure Project / Program Type	Area / Number of Green Infra-structure (ac. or no.)	Total Marginal Cost	Estimated Cost from GI Plan[1]	Estimated Cost from GI Plan w/ Contingency[2]	Estimated Construction Cost for Public Property[3]	Estimated Capital/ Implementation Cost[4]	Estimated Annual Public GI Maintenance Cost, Med LOS	Estimated Annual Public GI Maintenance Cost, High LOS
Roads / Alleys	Green Streets	2.64	$1,728,000	$2,304,000	$2,650,000	$2,650,000	$3,313,000	$29,000	$36,250
Parks	Park Improvements / Greening	1.33	$435,000	$869,000	$999,000	$999,000	$1,249,000	$24,000	$30,000
Sidewalks	Disconnection, Porous Pavement	1.55	$505,000	$1,010,000	$1,162,000	$1,162,000	$1,453,000	$16,000	$20,000
Parking Lots	Porous Pavement, Bioretention	2.16	$611,000	$1,222,000	$1,405,000	$140,500	$1,756,000	$3,000	$3,750
Flat Roofs	Vegetated Roofs / Disconnection	2.08	$452,000	$1,628,000	$1,872,000	$694,000	$2,340,000	$10,000	$12,500
Sloping Roofs	Disconnection/Rain Gardens	3.27	$1,709,000	$2,279,000	$2,621,000	---	$3,276,000	---	---
Street Trees	Enhanced Tree Planting	1250	$625,000	$2,500,000	$2,875,000	$2,875,000	$3,594,000	$50,000	$62,500
Public Schools	Green Schools	1.70	$445,000	$891,000	$1,025,000	$1,025,000	$1,281,000	$30,000	$37,500
Various (Ordinance)	Revised First-Flush Ordinance	53.83	$1,290,000	$1,290,000	$1,484,000	---	$1,855,000	---	---
TOTAL			**$7,800,000**	**$13,990,000**	**$16,090,000**	**$9,550,000**	**$20,120,000**	**$162,000**	**$203,000**

[1] *Estimated costs from the Green Infrastructure Plan which did not include contingency or design/engineering costs*

[2] *Estimated costs from the Green Infrastructure Plan including a 15% allowance for contingency*

[3] *Estimated construction costs for public property (e.g., ROW, parks, sidewalks, schools, 10% of parking lots, and a portion of roofs)*

[4] *Estimated capital/implementation costs includes an additional 25% for survey, site testing, design, construction oversight, etc.*

Attachment D
NPDES Phase II Implementation Cost Estimates

Program	Activity	LOS 1 (existing)	LOS 2	LOS 3
MS4 Protocol -- Public Outreach and Education	Develop and update Public Education Plan	Plan completed; reviewed annually.		
	Develop and update target audiences	Target audience list reviewed and updated annually.		
	Disseminate materials to all target audiences using appropriate distribution channels.	• "When it Rains, It Drains" on City website and in public information stands in City Hall • "After the Storm" pamphlet added to public info stands in City Hall	Distribute pamphlets in water bills	
		City mailed a spring 2010 newsletter to all City residents describing the MS4 and ways to reduce water pollution.	Distribute bi-annual newsletter to raise public awareness (not mail)	Mail quarterly newsletter to raise public awareness
	Newspaper advertisement	Ran ad in *Lancaster Sunday News* (2/20/11)	Run quarterly newspaper ads to raise public awareness	Run monthly ads to raise public awareness
	"Other components of the plan"	Solicited the School District to help the City distribute/post educational materials; provided materials	• Place posters in other public places, such as libraries. • Follow up with schools to see whether posters are displayed and materials sent home with students.	• Rotate posters so that target audiences see new posters periodically. • Develop Lancaster-specific posters.
		Continued to maintain City's website for public education on SW issues; PADEP link is included.		
			City developed Green Infrastructure Plan with additional public outreach materials and opportunities. LIVE Green conducted workshops focusing on reducing stormwater volume and pollution.	
			Continue to build and update LIVE Green's "Save It!"website with additional stormwater resources for various stakeholders.	
			Create a "speakers bureau" of people available to conduct civic and club presentations as needed.	Produce "give-aways" for fairs and public events.
				Develop a display to be used at fairs and public events; actively participate in such events.
		City signed a MOU with Lancaster County Conservation District (LCDD) which included LCCD distributing public educational materials.		
			Prepare public service announcements for radio (biannually)	Prepare public service announcements for radio (quarterly).
			Translate 2-4 public information materials into Spanish to better reach target audiences.	Translate 5+ public information materials into Spanish to better reach target audiences.
	ANNUAL COST:	**as per Bryan Harner: 120 hours per year + $3,000**	**0.4 FTE + $10,000**	**0.5 FTE + $12,000**

Program	Activity	LOS 1 (existing)	LOS 2	LOS 3
MS-4 Protocol -- Public Involvement and Participation	Develop public involvement plan.	Reviewed Public Involvement and Participation Plan Table for accuracy and updated information about target audiences.	Look for additional volunteer opportunities. Provide information to volunteer groups to send out in their own mailings.	
	Notify and solicit public input/involvement on SW Plan development and implementation.	Public meeting held on 11/22/04 with the Community Development and Planning Committee. Information presented to City	Annual presentation to City Council on progress.	Plan and conduct annual public meeting or "open house" workshop on progress.
	Notify public as needed	None because SW Management Program was not modified.	Solicit interest with stakeholders in a volunteer stream monitoring program and/or storm sewer stenciling program.	Initiate and actively support a volunteer stream monitoring program and/or storm sewer stenciling program.
	ANNUAL COST:	**No additional cost - included in Bryan Harners's estimate above**	**No additional cost - overlaps with additional activities above.**	**0.1 FTE + $3,000**
CSO (Guidance for Nine Minimum Controls) - Public Education	Conduct public education program (e.g., proper application of fertilizers, pesticides, and herbicides; public service announcements, advertising, storm drain stenciling, distribution of information through water and sewer bills, etc.)	(Accomplished through MS4 public education on stormwater issues.)	Issue Lancaster-specific fact sheets and brochures through water bills or as handouts	Conduct pre- and post-surveys to assess awareness of stormwater issues.
	ANNUAL COST:	**(no additional cost above current MS4 program)**	**.10 FTE + $5000**	**0.2 FTE + $8,000**
CSO (Guidance for Long-Term Control Plan) - Public Participation and Agency Interaction	Develop public participation program during system characterization.	Develop a public participation plan based on knowledge of the community.	Develop a public participation plan by interviewing key stakeholders and planning how the public will be kept informed and provided opportunities for involvement.	
		Use the GIAC as an advisory committee to obtain input.	Hold a series of GIAC meetings to obtain input; invite other stakeholders to participate, advertise the meetings as public workshops in newspaper advertisements and public service announcements on the radio	Interview other community leaders to obtain input. Hold a series of workshops or go to existing civic and club meetings to present information and obtain input.
	Involve the public in the development and evaluation of alternatives for CSO control.	Use the GIAC as an advisory committee to obtain input.	Hold a series of GIAC meetings to obtain input; invite other stakeholders to participate, advertise the meetings as public workshops in newspaper advertisements and public service announcements on the radio	
			Distribute informational materials in water bills and through the mail and schools.	Develop an educational program for children, conduct activities and workshops in schools.
			Develop and release information for the media; meet with media representatives (e.g., editors, environmental reporters) to provide background information	Hold periodic media briefings about specific projects or issues.
				Conduct a series of neighborhood meetings and do presentations at existing civic and club meetings

Program	Activity	LOS 1 (existing)	LOS 2	LOS 3
	Obtain public input on the selection and implementation of the long-term plan.	Use the GIAC as an advisory committee to obtain input.	Hold a series of GIAC meetings to obtain input; invite other stakeholders to participate, advertise the meetings as public workshops in newspaper advertisements and public service announcements on the radio.	Interview other community leaders to obtain additional input. Hold a series of workshops or go to existing civic and club meetings to present information and obtain input.
			Distribute informational materials in water bills and through the mail and schools.	Develop an educational program for children, conduct activities and workshops in schools. Adapt existing educational software.
			Develop and release information for the media; meet with media representatives (e.g., editors, environmental reporters) to provide background information.	Hold periodic media briefings about specific projects or issues.
				Conduct a series of neighborhood meetings and do presentations at existing civic and club meetings.
	ANNUAL COST:	**60 hours (PI plan + support for GIAC meetings)**	**0.1 FTE + $3000**	**0.2 FTE + $8,000**
Stormwater Utility Incentive Program	Dedicated materials explaining the incentives, how to calculate them, and how to apply	Develop two brochures for distribution to stakeholders and one new page on website.	Develop series of brochures on various ways to obtain credits and add more information to website, including examples and case-studies from other locations.	Develop series of brochures and conduct workshops and audits with various stakeholders and stakeholder groups to guide them through incentives. Develop Powerpoint presentation to be used at workshops and meetings.
	ANNUAL COST:	**100 hours + $3,000 (printing, supplies, no separate mailing)**	**0.1 FTE + $5000**	**0.2 FTE + $8,000**
	TOTAL by LOS:	**280 hours + $6,000**	**0.7 FTE + $23,000**	**1.2 FTE + $39,000**

	LOS 1 (existing)	LOS 2	LOS 3
Assumed Avg Salary + Benefits	$120,000	$120,000	$120,000
FTEs	0.13	0.70	1.20
Salary + Benefits	$16,154	$84,000	$144,000
Misc Expenses	$6,000	$23,000	$23,001
Public Education and Participation (MCM 1 and 2)	$22,154	$107,000	$167,001
CDM's Estimates for MCMs 1 and 2	$20,350	$20,350	$20,350
Difference	$1,804	$86,650	$146,651

Appendix
Minimum Control Measure Program Expenses

BMP ID	BMP	Full Time Equivalent Cost	Labor Cost	Material / Supplies	Minimum Control Measure (MCM) Cost	YR 1	YR 2	YR 3	YR 4	YR 5
MCM 1	**Public Education**									
1-1	Develop & Distribute Informational Brochure to the Public	10%	$4,100	$5,000	$9,100	$9,100	$9,373	$9,654	$9,944	$10,242
	Minimum Control 1 Sub Total:		**$4,100**	**$5,000**	**$9,100**	**$9,100**	**$9,373**	**$9,654**	**$9,944**	**$10,242**
	-	-	-	-						
MCM 2	**Public Participation / Involvement Implement**		-	-						
2-1	Comply with State Public Notice Guidelines	25%	$10,250	$1,000	$11,250	$11,250	$11,588	$11,935	$12,293	$12,662
	Minimum Control 2 Sub Total:		**$10,250**	**$1,000**	**$11,250**	**$11,250**	**$11,588**	**$11,935**	**$12,293**	**$12,662**
MCM 3	**Illicit Discharge Detection & Elimination**									
3-1	Map Outfalls & Receiving Waters	15%	$6,150	$2,500	$8,650	$8,650	$8,910	$9,177	$9,452	$9,736
3-2	Enact Ordinance Prohibiting Non Stormwater Discharges	15%	$6,150	$1,000	$7,150	$7,150	$7,365	$7,585	$7,813	$8,047
3-3	Implement Enforcement Actions	25%	$10,250	$2,500	$12,750	$12,750	$13,133	$13,526	$13,932	$14,350
3-4	Develop System for Detection and Elimination of Discharges	15%	$6,150	$5,000	$11,150	$11,150	$11,485	$11,829	$12,184	$12,549
3-5	Train Employees about IDDE Program	10%	$4,100	$10,000	$14,100	$14,100	$14,523	$14,959	$15,407	$15,870
	Minimum Control 3 Sub Total:		**$32,800**	**$21,000**	**$53,800**	**$53,800**	**$55,414**	**$57,076**	**$58,789**	**$60,552**
	-	-	-	-						
MCM 4	**Construction Site Stormwater Runoff Control**		-	-						
4-1	Enact Ordinance to require erosion and sedimentation controls.	10%	$4,100	$1,000	$5,100	$5,100	$5,253	$5,411	$5,573	$5,740
4-2	Require construction operators to implement appropriate erosion and sedimentation control BMPs.	25%	$10,250	$1,000	$11,250	$11,250	$11,588	$11,935	$12,293	$12,662
4-3	Require construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter which may cause adverse impacts to water quality.	25%	$10,250	$1,000	$11,250	$11,250	$11,588	$11,935	$12,293	$12,662
4-4	Implement procedures for site plan reviews to incorporate consideration of potential water quality impacts.	15%	$6,150	$2,500	$8,650	$8,650	$8,910	$9,177	$9,452	$9,736
4-5	Develop Procedures for Receipt and Consideration of Public Comment.	10%	$4,100	$1,000	$5,100	$5,100	$5,253	$5,411	$5,573	$5,740
4-6	Site Inspections of Stormwater Control and Material Management.	25%	$10,250	$1,000	$11,250	$11,250	$11,588	$11,935	$12,293	$12,662
	Minimum Control 4 Sub Total:	-	**$45,100**	**$7,500**	**$52,600**	**$52,600**	**$54,178**	**$55,803**	**$57,477**	**$59,202**
MCM 5	**5 Post-construction Stormwater Management in New Development and Redevelopment**									
5-1	Implement strategies which include a combination of structural and/or non structural BMPs.	10%	$4,100	$1,000	$5,100	$5,100	$5,253	$5,411	$5,573	$5,740
5-2	Require infiltration BMPs where practicable.	5%	$2,050	$2,500	$4,550	$4,550	$4,687	$4,827	$4,972	$5,121
5-3	Use an ordinance to address post-construction runoff from new development and redevelopment projects.	10%	$4,100	$1,000	$5,100	$5,100	$5,253	$5,411	$5,573	$5,740
5-4	Ensure adequate long-term operations and maintenance BMPs.	5%	$2,050	$1,000	$3,050	$3,050	$3,142	$3,236	$3,333	$3,433
	Minimum Control 5 Sub Total:	-	**$12,300**	**$5,500**	**$17,800**	**$17,800**	**$18,334**	**$18,884**	**$19,451**	**$20,034**
MCM 6	**6 Pollution Prevention/Good Housekeeping for Municipal Operations**	-	-	-						
6-1	Street sweeping activities of each street approximately every two weeks.	-	$422,880	-	$422,880	$422,880	$435,566	$448,633	$462,092	$475,955
6-2	Catch basin cleaning program.	25%	$152,500		$152,500	$152,500	$157,075	$161,787	$166,641	$171,640
6-3	Develop a written operations and maintenance plan.	25%	$10,250	$5,000	$15,250	$15,250	$15,708	$16,179	$16,664	$17,164
6-4	Develop and implement an employee training program.	10%	$4,100	$10,000	$14,100	$14,100	$14,523	$14,959	$15,407	$15,870
6-5	Stormwater manager and inspectors	100%	$123,000		$123,000	$123,000	$126,690	$130,491	$134,405	$138,438
6-6	Administrative	100%	$152,862		$152,862	$152,862	$157,448	$162,172	$167,037	$172,048
	Minimum Control 6 Sub Total:		**$865,592**	**$15,000**	**$880,592**	**$880,592**	**$907,010**	**$934,220**	**$962,247**	**$991,114**

Attachment E
CSO Wet Weather CIP

City of Lancaster

CAPITAL SEWER PROJECTS

		Engineering Cost	Construction Cost	Total Cost	Partners Cost Share Distribution										Escrow Payment	Schedule	
					City		ELSA		SLSA		LSA		LASA				
	Project/Description	($)	($)	($)	(%)	($)	(%)	($)	(%)	($)	(%)	($)	(%)	($)	Date	Start	End
1a	North Pumping Station (NPS) Expansion																
	Construction	0	9,700,000	9,700,000	34.51%	3,347,470	17.72%	1,718,840	0.00%	0	5.03%	487,910	42.74%	4,145,780	Jan-13	Jun-13	Nov-14
	Construction Management/RE	1,020,000	0	1,020,000	34.51%	352,002	17.72%	180,744	0.00%	0	5.03%	51,306	42.74%	435,948	Jan-13	Mar-13	Nov-14
1b	NPS FM Surge Control System																
	Construction		1,700,000	1,700,000	34.51%	586,670	17.72%	301,240	0.00%	0	5.03%	85,510	42.74%	726,580	Jan-13	Jun-13	Nov-14
	Construction Management/RE	90,000		90,000	34.51%	31,059	17.72%	15,948	0.00%	0	5.03%	4,527	42.74%	38,466	Jan-13	Mar-13	Nov-14
2	NPS Basin Screening and Grit Removal Facility																
	Design	422,000		422,000	100.00%	422,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	May-11	Feb-13
	Construction		5,500,000	5,500,000	100.00%	5,500,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Jun-13	Nov-14
	Construction Management/RE	590,000		590,000	100.00%	590,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Mar-13	Nov-14
3	NPS Basin CSO Diversion Chamber & Deflection Screen																
	Design	117,000		117,000	100.00%	117,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	May-11	Feb-13
	Construction		1,500,000	1,500,000	100.00%	1,500,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Jun-13	Nov-14
	Construction Management/RE	130,000		130,000	100.00%	130,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Mar-13	Nov-14
4	WWTP Solids Dewatering & Maintenance Buildings Roof Replacements		720,000	720,000	50.08%	360,576	14.93%	107,496	13.96%	100,512	2.23%	16,056	18.80%	135,360	Mar-12	Apr-12	Dec-12
5	NPS & SAPS Force Main Upgrade																
	Design		0	0	36.85%	0	38.44%	0	8.97%	0	1.66%	0	14.09%	0	Jan-15	Jan-15	May-15
	Construction	0		0	36.85%	0	38.44%	0	8.97%	0	1.66%	0	14.09%	0	May-15	Jun-15	Dec-15
6	WWTP Facilities Plan																
	Phase 2 - Alternatives Evaluation/Facilities Plan		0	0	50.08%	0	14.93%	0	13.96%	0	2.23%	0	18.80%	0	Oct-12	Oct-12	Jun-13
7	North Pumping Station Sewershed Evaluation																
	Phase 2 - Sewer System Capacity Evaluation		0	0	10.40%	0	3.50%	0	0.00%	0	10.70%	0	75.40%	0			
8	Stevens Avenue Pumping Station Sewershed Evaluation																
	Phase 2 - Sewer System Capacity Evaluation		0	0	21.20%	0	62.80%	0	13.72%	0	0.30%	0	2.00%	0			
9	North PS CSO Storage																
	Design	3,500,000	0	3,500,000	100.00%	3,500,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0			
	Construction		62,500,000	62,500,000	100.00%	62,500,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0			
	Construction Management/RE	4,000,000	0	4,000,000	100.00%	4,000,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0			
10	WWTP Upgrade/Expansion																
	Design			0	50.08%	0	14.93%	0	13.96%	0	2.23%	0	18.80%	0			
	Construction			0	50.08%	0	14.93%	0	13.96%	0	2.23%	0	18.80%	0			
	Construction Management/RE			0	50.08%	0	14.93%	0	13.96%	0	2.23%	0	18.80%	0			
11	WWTP Anoxic Zone Modifications																
	Design	270,000		270,000	50.08%	135,216	14.93%	40,311	13.96%	37,692	2.23%	6,021	18.80%	50,760	Jun-12	Jun-12	Dec-12
	Construction		2,300,000	2,300,000	50.08%	1,151,840	14.93%	343,390	13.96%	321,080	2.23%	51,290	18.80%	432,400	Dec-12	Feb-13	Dec-13
	Construction Management/RE	330,000		330,000	50.08%	165,264	14.93%	49,269	13.96%	46,068	2.23%	7,359	18.80%	62,040	Dec-12	Dec-12	Dec-13
12	WWTP North Final Clarifier Drive Mechanisms		750,000	750,000	50.08%	375,600	14.93%	111,975	13.96%	104,700	2.23%	16,725	18.80%	141,000			
13	WWTP North A/O Building MCC and Primary Sludge Pumping Upgrade		500,000	500,000	50.08%	250,400	14.93%	74,650	13.96%	69,800	2.23%	11,150	18.80%	94,000			
14	WWTP North A/O Distribution Box Corrosion Repair		700,000	700,000	50.08%	350,560	14.93%	104,510	13.96%	97,720	2.23%	15,610	18.80%	131,600			
15	WWTP Chlorination Building MCC Upgrade		200,000	200,000	50.08%	100,160	14.93%	29,860	13.96%	27,920	2.23%	4,460	18.80%	37,600			
16	WWTP Oxygen Plant Instrumentation Upgrade		300,000	300,000	50.08%	150,240	14.93%	44,790	13.96%	41,880	2.23%	6,690	18.80%	56,400			
	SUBTOTAL PARTNER PROJECTS	10,469,000	86,370,000	96,839,000	88.41%	85,616,057	3.22%	3,123,023	0.88%	847,372	0.79%	764,614	6.70%	6,487,934			

City of Lancaster
CAPITAL SEWER PROJECTS

	Engineering Cost	Construction Cost	Total Cost	Partners Cost Share Distribution										Escrow Payment	Schedule	
				City		ELSA		SLSA		LSA		LASA				
Project/Description	($)	($)	($)	(%)	($)	(%)	($)	(%)	($)	(%)	($)	(%)	($)	Date	Start	End
17 Collection System Improvements		3,618,710	3,618,710	100.00%	3,618,710	0.00%	0	0.00%	0	0.00%	0	0.00%	0			
18 Maple Grove Pumping Station Expansion																
Design	401,600	0	401,600	100.00%	401,600	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Nov-11	Mar-13
Construction	0	2,500,000	2,500,000	100.00%	2,500,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Jun-13	Jun-14
Construction Management/RE	375,000	0	375,000	100.00%	375,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Apr-13	Jun-14
19 Engleside Sewershed																
Phase 2 - Sewer System Capacity Evaluation		0	0	100.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0			
20 Stevens Ave & Engleside Bar Screen Replacement																
Construction	0	1,500,000	1,500,000	100.00%	1,500,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Feb-11	May-12
Construction Management/RE	179,600	0	179,600	100.00%	179,600	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Nov-10	May-12
21 Engleside CSO Parallel Outfall Culvert																
Final Design	100,000	0	100,000	100.00%	100,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Jun-12	Oct-12
Construction	0	1,164,000	1,164,000	100.00%	1,164,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Jan-13	Jul-13
Construction Management/RE	150,000	0	150,000	100.00%	150,000	0.00%	0	0.00%	0	0.00%	0	0.00%	0	---	Nov-12	Jul-13
SUBTOTAL CITY ONLY PROJECTS	1,206,200	8,782,710	9,988,910		9,988,910		0		0		0		0			
TOTAL ALL PROJECTS	11,675,200	95,152,710	106,827,910		95,604,967		3,123,023		847,372		764,614		6,487,934			

Notes:
1) Most of the costs shown are conceptual or preliminary at best. The costs will be updated as evaluation/design phases progress.
2) Color Coding:
- Projects with Escrow Agreements needing final signatures and/or deposits
- New Projects where Escrow Agreements are being drafted
- 10% Design Level Estimate
- Conceptual level costs that need to be further developed before finalizing
- Costs that need to be developed

Appendix C
Preliminary Stormwater Management Fee Analysis

Preliminary Stormwater Management Fee (SWMF) Analysis

Prepared for

City of Lancaster, PA

March 17, 2014

CH2MHILL®

1717 Arch St.

Suite 4400

Philadelphia, PA 19103

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A Stormwater Utility Program Needs Policy Paper
B Stormwater Utility Rate Structure and Rates Policy Paper
C Stormwater Utility CIP Policy Paper
D Stormwater Utility SWU Fee Credits / Incentives Policy Paper
E PennVest loan repayment schedule
F Impervious Area and Billing Units
G Rate Model Output

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Acronyms and Abbreviations

CIP	Capital Improvement Program
City	City of Lancaster
CSO	combined sewer overflow
DPW	Department of Public Works
ERU	equivalent residential unit
FY	fiscal year
GI	Green Infrastructure
GIAC	Green Infrastructure Advisory Committee
IA	impervious area
LOS	level of service
MS4	Municipal Separate Storm Sewer System
O&M	operating and maintenance
Pay–Go	equity-funded CIP
SF	square feet
SWMF	stormwater management facility

Executive Summary

The City of Lancaster's Department of Public Works currently provides stormwater functions and services, which fall under several bureaus. The stormwater management program is funded by the Sewer Fund and General Fund. There are significant issues related to stormwater management, which are the focus of recent regulatory requirements such as the Municipal Separate Storm Sewer System (MS4) permit and consent orders related to combined sewer overflows. Projects and programs related to stormwater are dispersed throughout the Department of Public Works, and implementation of a dedicated cost recovery source can help highlight projects and programs. Faced with significant increases in regulatory requirements and anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to complying with regulatory requirements while meeting City goals for economic development, and to evaluate the feasibility of developing an impervious area (IA) -based fee for stormwater services (sometimes known as a stormwater utility). As part of this study, a rate model was prepared to evaluate a Stormwater Management Fee (SWMF) to fund the City's stormwater management program.

Three rate structure options were evaluated using impervious area (IA) estimates based on aerial photography and digitization of IA included in the the City's geographic information system. For the three rate scenarios, the tiering method rate structure, which is applied to all properties, was used. The tiering method groups all properties within a range of IA, which are then assessed a fee based on a representative IA for that range. Based on feedback from the GIAC, using a rate structure based on four tiers was preferred over using actual IA, or lumping all single IA properties by type because it represents the most reasonable and equitable method.

The SWMF rate model evaluated the program costs based on three levels of service alternatives identified in Technical Memorandum #1. The recommended rate scenario is Rate Scenario 2 – Medium Level of Service, which represents the estimated program needs to satisfy MS4 permit and other regulatory requirements.

The capital requirements represent the largest expense item. The use of grants and loans in early years offset the improvement program (CIP) cost and help to keep the SWMF low. However, in years 4 and 5, the capital requirements increase significantly because available grants/loans are exhausted, which impacts the SWMF. To fund capital requirements in years 4 and 5, identify additional grants/loans or consider the use of debt financing.

Figure ES-1 illustrates the potential program costs that could be recovered based on the three rate scenarios evaluated as part of this study. The program costs recovered in the first 3 years are low compared to years 4 and 5 because the use of grants and loans help reduce the program costs that would need to be recovered by the fee.

Figure ES-2 illustrates the SWMF ($ per 1,000 square feet [sf]) to cover the program costs identified in Figure ES-1 and to cover the program cost requirements for each rate scenario assuming Pay Go CIP cost recovery. The significant increase in years 4 and 5 are due to the increase in capital requirements after available grants/loans are used to fund other capital projects. Figure ES-3 illustrates, for Rate Scenario 2 – Medium Level of Service, the sensitivity of using Pay-Go versus debt financing for the capital requirements starting in Year 4. The use of debt financing helps keep rates low and spreads the costs over time to current and future rate payers. Table ES-1 provides the financial summary for Rate Scenario 2 – Medium Level of Service. Table ES-2 summarizes the SWMF rate and annual SWMF per property by tier for Rate Scenario 2 – Medium Level of Service.

FIGURE ES-1
Comparison of Program Costs Covered by the SWMF by Rate Scenario (Pay-Go financing)

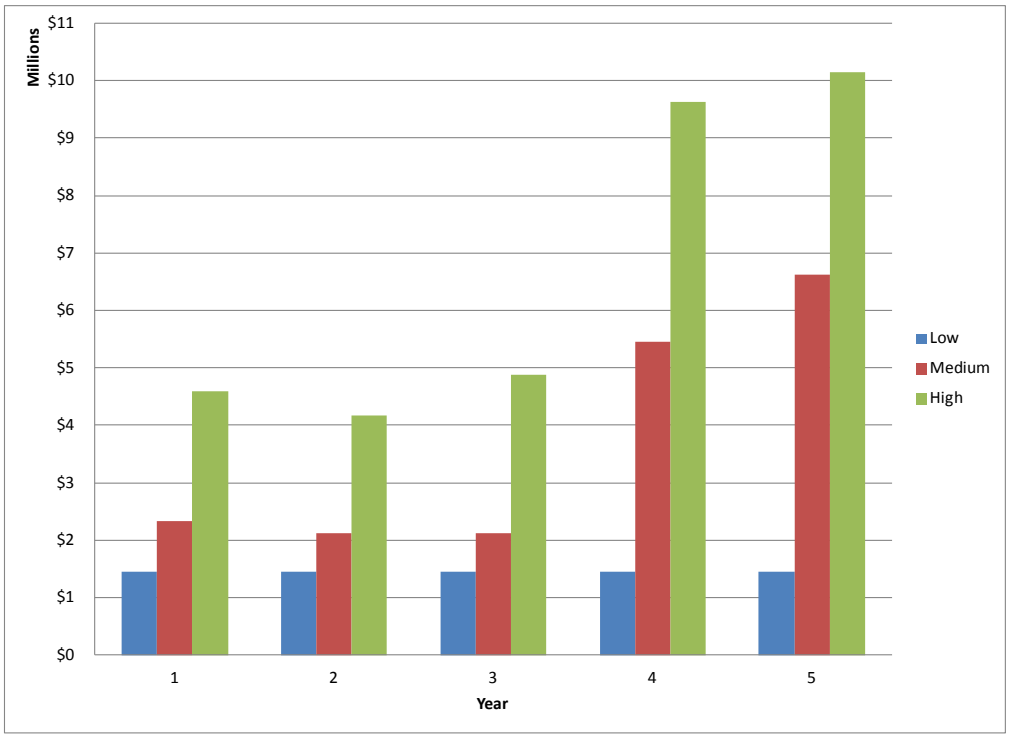


FIGURE ES-2
Comparison of SWMF by Rate Scenario (Pay-Go financing)

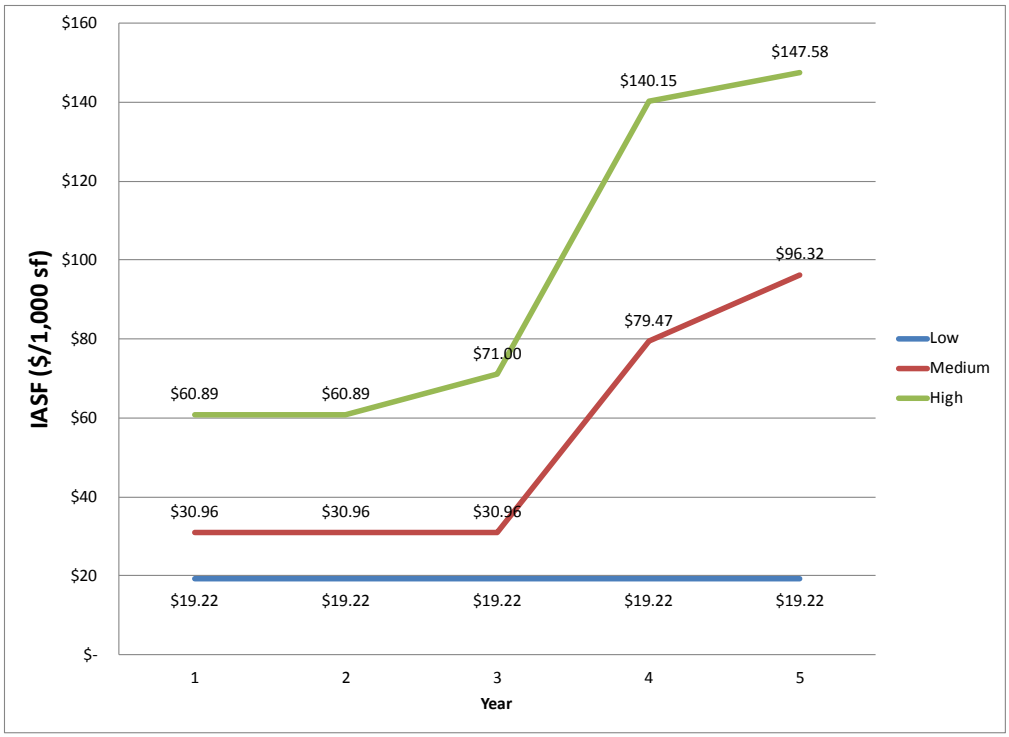


FIGURE ES-2
Comparison of SWMF by Rate Scenario (Pay-Go financing)

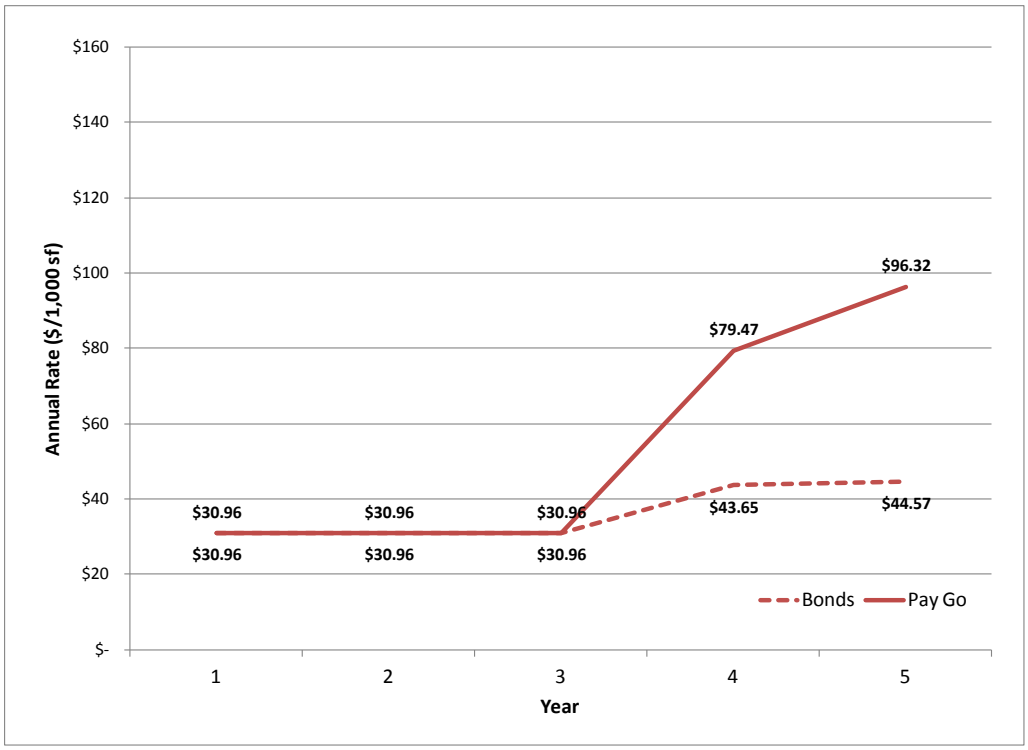


TABLE ES-1
Financial Summary for the Medium Level of Service Rate Scenario (Service Rate Scenario 2)

	Year 1	Year 2	Year 3	Year 4	Year 5
SWU Fee ($/1,000 sf)	$30.96	$30.96	$30.96	$79.47	$96.32
Equivalent Residential Units	83,745	83,787	83,829	83,870	83,912
Operating Revenues					
SWMF	$2,592,738	$2,594,030	$2,595,330	$6,665,180	$8,082,440
less Allowance for Uncollectable Accounts	($259,274)	($259,403)	($259,533)	($666,518)	($808,244)
less Credits/Incentives	$0	($210,859)	($210,964)	($541,786)	($656,989)
Interest Income	$600	$1,900	$2,700	$2,200	$1,400
Total Revenues	$2,334,064	$2,125,668	$2,127,533	$5,459,076	$6,618,607
Program Costs Covered					
O&M	$1,289,512	$1,328,197	$1,368,043	$1,409,085	$1,451,357
Non Operating	-	-	-	-	-
Debt Service	$104,700	$104,700	$255,000	$405,200	$405,200
Stormwater CIP (Pay Go)	$295,000	$118,000	$240,000	$4,423,000	$4,739,000
Total Program Costs Covered	**$1,689,212**	**$1,550,897**	**$1,863,043**	**$6,237,285**	**$6,595,557**
Beginning Balance	$0	$644,852	$1,219,623	$1,484,113	$705,904
Ending Balance	**$644,852**	**$1,219,623**	**$1,484,113**	**$705,904**	**$728,954**

TABLE ES-2
Stormwater Utility Rate and Annual SWMF per Property by Tier
Medium Level of Service (Rate Scenario 2)

Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$30.96	$30.96	$30.96	$79.47	$96.32
Percent Increase		0.0%	0.0%	156.7%	21.2%
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$15.48	$15.48	$15.48	$39.74	$48.16
Tier 2 (>1,000 sf and <=2,000 sf)	$46.44	$46.44	$46.44	$119.21	$144.48
Tier 3 (>2,000 sf and <=3,000 sf)	$77.40	$77.40	$77.40	$198.68	$240.80
Tier 4 (>3,000)	*Properties pay based on total IA / SWMF.*				

SECTION 1

Introduction

1.1 Purpose

The City of Lancaster's (City's) Department of Public Works (DPW) currently provides stormwater management functions and services, which fall under several bureaus. There are significant issues related to stormwater management, which are the focus of recent regulatory requirements such as the Municipal Separate Storm Sewer System (MS4) permit and consent orders related to combined sewer overflows (CSOs). Projects and programs related to stormwater are dispersed throughout DPW, and implementation of a dedicated cost recovery source can help highlight projects and programs. Faced with significant increases in regulatory requirements and anticipated cost recovery gaps, the City has conducted a series of activities to evaluate alternate approaches to complying with regulatory requirements while meeting City goals for economic development, and to evaluate the feasibility of developing an impervious area (IA) -based fee for stormwater services (sometimes known as a stormwater utility).

As part of this study, a rate model was prepared to evaluate a Stormwater Management Fee (SWMF) to recover the costs of the City's stormwater management program. The purpose of this technical memorandum includes the following:

- To summarize the impervious area (IA) analysis and recommended equivalent residential unit (ERU).
- To evaluate three rate structures and identity the advantages and disadvantages of each.
- To evaluate the program cost-that could be covered of an SWMF.
- To summarize the rate model results based on the three level of service (LOS) scenarios reported in Technical Memorandum #1.

1.2 Policy Papers

As part of this study, several policy papers have been developed and presented to the Green Infrastructure Advisory Committee (GIAC) in order to define certain aspects of the proposed stormwater utility and SWMF. In addition, these policy papers also help inform the rate modeling and include the following:

- Stormwater Utility Program Needs Policy Paper
- Stormwater Utility Rate Structure and Rates Policy Paper
- Stormwater Utility Capital Improvement Program (CIP) Policy Paper
- Stormwater Utility Credits / Incentives Policy Paper

The Program Needs Policy Paper identifies the stormwater programs to be cost recovered by the SWMF. In addition, this policy paper discusses the issues, concerns, and benefits associated with cost recovery for the program with dedicated cost recovery sources. Lastly, the policy paper documents the GIAC's feedback. The policy paper on program needs is provided in Attachment A.

The Rate Structure and Rates Policy Paper presents a rate structure option and preliminary rate model results. This policy paper discusses the issues, concerns, and benefits associated with the rate structure for the SWMF and resulting fees associated with three LOS scenarios. The policy paper on rate structure and rates is provided in Attachment B.

The CIP Policy Paper identifies options regarding CIP financing, including equity (Pay-Go) and debt financing. The capital requirements for the three LOSs and comparison of Pay-Go versus debt financing are summarized. The CIP Policy Paper is provided in Attachment C.

The Credits / Incentives Policy Paper identifies options for rate payers to reduce their SWMF by implementing onsite stormwater controls. This policy paper identifies eligibility criteria, qualifying stormwater control facilities, and amount of credit. The Credits / Incentives Policy Paper is provided in Attachment D.

1.3 Level of Service Alternatives and Program Cost Estimates

Technical Memorandum #1 identified LOS alternatives and program cost estimates. The LOS considerations consist of the following:

Low — Assumes current LOS and MS4 permit implementation.

Medium — Includes current level of expenditure, plus additional program elements. Green Infrastructure (GI) Plan Implementation (public only), MS4 permit implementation, increased maintenance and customer service.

High — Includes higher LOS for current program, plus additional program elements. GI Plan implementation (public and private), MS4 permit implementation, high level of maintenance and customer service.

These LOS scenarios are used to define the three rate scenarios. Table 1-1 provides the LOS cost summary presented in Technical Memorandum #1. The rate analysis uses these program cost estimates as a starting point to define the rate scenarios discussed in Section 4.

TABLE 1-1
Summary of Level of Service Cost Estimates

	Estimated Annual Costs		
	Low	Medium	High
Operating and Maintenance			
GI	n/a	$162,000	$202,500
Dry and Wet Ponds (inspection)	$2,300	$2,300	$2,300
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	$201,000	$201,000	$402,000
Storm Drainage	n/a	n/a	n/a
MS4 Implementation	$451,566	$536,412	$612,412
Program Administration	$142,000	$219,000	$296,000
Capital Costs			
GI	$730,600	$1,909,100	$3,652,400
Storm Drainage	n/a	$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,860,266**	**$4,806,612**	**$7,491,712**

SECTION 2

Program Financial Cost Requirements

2.1 Overview

Defining program financial cost requirements is one the first steps in conducting a rate study and developing the rate models. For purposes of this study, a 'cash basis' approach was assumed and the program financial cost requirements include the following:

- Operating and maintenance (O&M) expenditures
- Allowance for operating reserve
- Allowance for uncollectible accounts
- Allowance for stormwater management facility (SWMF) credits/incentives
- Debt service
- Equity-cost recovered CIP (Pay-Go)
- Less non-rate revenues (for example, interest income, grants, etc.)

The program financial cost requirements include the amount needed to be generated from rates and other sources (on a cash basis) to meet the stormwater utility's cash needs and other financial commitments. The net financial cost requirements represent the total program financial cost requirements less the non-rate revenues. The net financial cost requirements also represent the portion of the total program cost requirements that needs to be generated through the SWMF to cover stormwater management costs and other financial commitments. The net financial cost requirements are also sometimes referred to as the "rate revenue requirements."

The following sections describe the components that comprise the net financial cost requirements. Section 4 provides the estimated program financial cost requirements for each rate scenario evaluated. Tabular summaries are not provided here because some values are specific to a respective rate scenario.

2.2 Operating and Maintenance

Table 1-1 provides a summary of the O&M costs that are included in the program financial cost requirements. The details for the cost components are provided in Technical Memorandum #1. The rate scenarios presented in Section 4 use the assumed LOS costs. O&M include activities related to the following:

- GI
- Inspection of municipally owned best management practices (such as ponds)
- Street sweeping
- Catch basins
- MS4 permit implementation
- Program administration

2.3 Allowance for Operating Reserve

It is common for stormwater utilities to plan for and keep an operating reserve. The intent of the reserve is to provide a cushion for unexpected expenditures. The typical level of reserve is 6 to 9 months of annual operating expenditures. The rate scenarios presented in Section 4 assume a 6-month operating reserve.

2.4 Allowance for Uncollectible Accounts

For most utilities, there are some accounts that do not pay. The collection rate for stormwater utilities is a function of the billing mechanism (such as real estate tax bill, water/sewer bill, or standalone bill). For stormwater utilities that use a real estate tax bill, a collection rate of 99 percent is typical because the property owner does not directly pay the stormwater charge; instead it is paid once or twice a year through escrow payments.

For stormwater utilities that use a standalone bill, the collection rate is much lower because there is generally no enforcement mechanism. For standalone billing, a collection rate typically ranges from 70 to 80 percent.

For stormwater utilities that use an existing water/sewer bill, the collection rate is lower than the real estate tax bill method and can be as much as 90 percent. The collection rate will depend on the utility's policy regarding order of payment. For example, if an account pays a partial bill, does the water bill get paid first? For the rate scenarios presented in Section 4, a 90 percent collection rate was assumed.

2.5 Allowance for SWMF Credits/Incentives

Some utilities offer credits to accounts that own and maintain SWMFs. The intent is to provide incentive for property owners to manage stormwater on their properties. The level of credit available to property owners is typically based on the amount of IA treated. Some provide a full credit, whereas most offer partial credit. Attachment D provides a policy paper on a proposed system of credits for the City.

Because the level of participation in a credit program is uncertain, an allowance for credits was assumed for the rate scenarios presented in Section 4. For planning purpose, a percent of operating program costs was assumed. For example, it was assumed that 10 percent of total operating program costs is reasonable proxy for expected participation in the credit program.

Once a stormwater utility is operational, this assumption should be reviewed and the rate model updated to reflect actual level of participation.

2.6 Capital Improvement Projects

Table 1-1 provides summary of the CIP costs that are included in the program cost requirements. The details for the CIP components are provided in Technical Memorandum #1. The rate scenarios presented in Section 4 follow the assumed LOS costs estimates. The CIP components include the following:

- GI
- Storm drainage
- Catch basin

The distinction between the LOS estimates presented in Technical Memorandum #1 and the rate scenarios presented in Section 4 assume the ramp-up or phase-in of costs. The LOS estimates presented in Technical Memorandum #1 assume an equal annual amount (i.e., total divided by 5 years). The rate scenarios presented in Section 4 assume that costs ramp up over a 5-year period.

2.7 Debt Service

The City issues debt to fund municipal projects, including projects related to the Sewer Fund. The debt service on outstanding debt is paid for by a combination of the General Fund, Water Fund, and Sewer Fund. The City's fiscal year (FY) 2011 financial statements reported that $38,860,000 in General Obligation Bonds were issued to fund upgrades and improvements to the water and sewer system. After reviewing the notes to the financial statements, the description of the outstanding debt does not identify stormwater-related projects. However, it is possible that projects categorized as sewer upgrades or improvements could be stormwater-related. It was assumed that there no allocation of debt service for any outstanding debt is financed by the SWMF.

As the stormwater utility program evolves and more capital is required to respond to increasing regulatory requirements for stormwater management, debt financing is a possible cost recovery source. Issuing debt to finance capital improvement projects will result in debt service payments and require the stormwater utility to meet debt service coverage requirements (if applicable). Depending on future cost recovery of capital projects, it is possible that the stormwater utility could issue bonds. In Section 4, a cost recovery scenario is described that considers the use of debt financing in FY 2015. Attachment C includes the policy paper on CIP and debt financing.

Debt service could also include repayment of PennVest Loans. In Section 4, rate scenarios assume repayment of assumed PennVest loans based on the debt service schedule provided by the City (Attachment E).

2.8 Equity-cost recovered CIP (Pay-Go)

Equity-finacned CIP (Pay-Go) is the portion of the CIP that is paid for using current revenues generated by the SWMF. For example, if a portion of the CIP is cost recovered by grants, loans, or bonds, then the remaining CIP is typically paid for using current revenues or Pay-Go. The rate scenarios presented in Section 4 evaluate the sensitivity on rates based on Pay-Go versus debt financing.

2.9 Non-rate Revenues

Non-rate revenues are derived from sources other than the stormwater utility charge. This includes investment income, grants, developer contributions, and ancillary fees (such as permit fees). Non-rate revenues are subtracted from the annual costs and help reduce the expense burden.

2.9.1 Investment Income

Based on market conditions, the interest rate on money market investments is very low and does not yield much in terms of investment income. As market conditions improve and the stormwater utility fund maintains a target balance, investment income is likely to increase.

2.9.2 PennVest Loans

As part of the Non-point Source Loan Program (PennVest), the City secured a $7,000,000 loan for the design and construction of GI projects. For the rate scenarios presented in Section 4, it was assumed that the loan proceeds are used to fund GI CIP. Certain rate scenarios assume repayment of assumed PennVest loans based on the debt service schedule provided by the City (Attachment E).

2.9.3 Grants

Depending on availability, state and federal grants for stormwater management may be available. Based on market conditions, state and federal grant programs are limited. The City actively seeks grant financing for GI projects. For the rate scenarios presented in Section 4, it was assumed that $2,500,000 is used to fund GI CIP. Table 2-1 provides a list of grants the City has recently received for GI projects.

TABLE 2-1
Summary of Grants

Cost Recovery Source	Grant Name	Year	Amount	Match
PA Dept of Conservation & Natural Resources	Community Conservation Partnerships Program	2009	$70,000	
National Fish & Wildlife Foundation	Chesapeake Bay Stewardship Fund, Innovative Nutrient and Sediment Reduction	2010	$400,000	$520,000
PA Dept of Community & Economic Development	H2O PA - Water Supply, Sanitary Sewer and Storm Water Projects	2010	$768,333	$384,167
PA Dept of Environmental Protection	Growing Greener	2011	$225,000	
PA Dept of Environmental Protection	Safe Water Grant	2011	$770,000	
PA Office of the Budget	Redevelopment & Capital Improvement Assistance Program	2011	$1,500,000	
Keith Campbell Foundation for the Environment	Campbell Foundation's Chesapeake program	2011	$25,000	
National Fish & Wildlife Foundation	Chesapeake Bay Stewardship Fund, Innovative Nutrient and Sediment Reduction	2011	$400,000	
PA Dept of Environmental Protection	Growing Greener Plus	2012	$263,120	

SECTION 3

Stormwater Utility SWMF Rate Structure

To develop a stormwater utility rate structure, the IA of developed properties in the City were analyzed. IA includes buildings, walkways, driveways, parking lots, and other structures. IA does not allow stormwater to infiltrate and flow through the ground and instead directs runoff into the streets and waterways. So, IA is the best available measure of stormwater runoff and is used to develop a fair and equitable rate structure.

3.1 Impervious Area Estimates

Based on GIS provided by the City, IA estimates were developed. The IA is based on aerial photography and digitization of IAs. The stormwater class is based on the general land use information recorded in the IA database. The IA estimates are used to develop a rate structure, which begins with defining the ERU. The use of IA as the basis is the most common and appropriate method for distributing the costs associated with stormwater runoff equitably and fairly.

As part of this study, a random sample of 199 properties were selected from 2008 aerials and 2011 parcel boundaries and analyzed to estimate missing or incorrectly digitized IA mapping. The details of this analysis are provided in Attachment F. In summary, median deviation between the original data set and the corrected data was used to calculate an adjustment factor for missing IA. These factors were identified for each stormwater class and applied the each record identified in the IA database based on the respective stormwater class.. Adjustment factors ranged from 9 percent for commercial, up to 45 percent for residential.

Table 3-1 and Figure 3-1 provide a summary of IA and number of properties by stormwater class. These summaries help illustrate equity and fairness principal of using IA as the basis for the rate structure. For example, single family (residential) stormwater class represents 77 percent of properties but 22 percent of the IA. All other stormwater classes (non-residential) represent 23 percent of the properties and 78 percent of the IA. On a per-property basis, residential properties would pay a disproportionate share of the cost of stormwater runoff.

TABLE 3-1
Summary of Impervious Area and Number of Properties

Stormwater Class	Number of Properties	Percent	Impervious Area (sf)	Percent
Single Family	13,407	77	18,337,179	22
Multi-Family	1,976	11	9,909,174	12
Commercial	1,626	9	29,093,647	35
Industrial	111	0.64	15,205,021	18
Non-Profit	133	0.77	2,643,843	3
Institutional	44	0.25	4,824,416	6
Government	56	0.32	3,707,181	4
Total	**17,353**		**83,720,461**	

sf = square feet

FIGURE 3-1
Summary of Impervious Area and Number of Properties

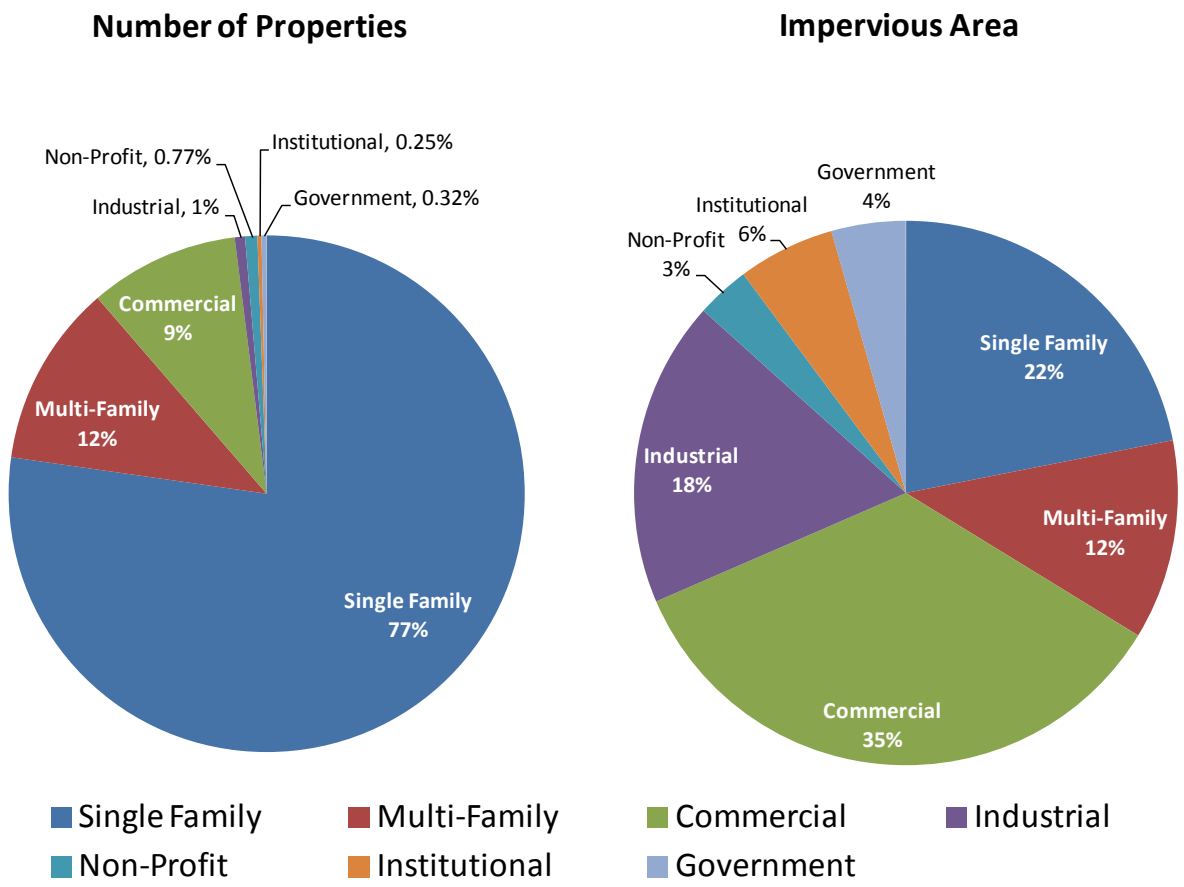


Figure 3-2 shows the distribution of impervious area across all properties in the City, indicating that the vast majority have small impervious areas, while a few properties have large impervious area. Table 3-2 lists the top 10 property owners and estimated IA of their parcels. In addition, the stormwater class, number of parcels, and percent of total IA are provided. The top 10 list was developed based on grouping by owner name and summing IA and counting the number of parcels. A different ranking is produced if the top 10 list is developed based on sorting by IA for individual parcels. Further, it is possible for a single owner to have multiple parcels with different stormwater class designations (i.e., a group of parcels for a single owner could be identified as commercial and institutional). The top 10 owners / parcels represent approximately 30 percent of the total estimated IA in the city. It is important to understand that property owners shown in Table 3-2 may have parcels that have IAs of less than 10,000 sf. Attachment F provides additional details.

FIGURE 3-2
Frequency Distribution for All Properties

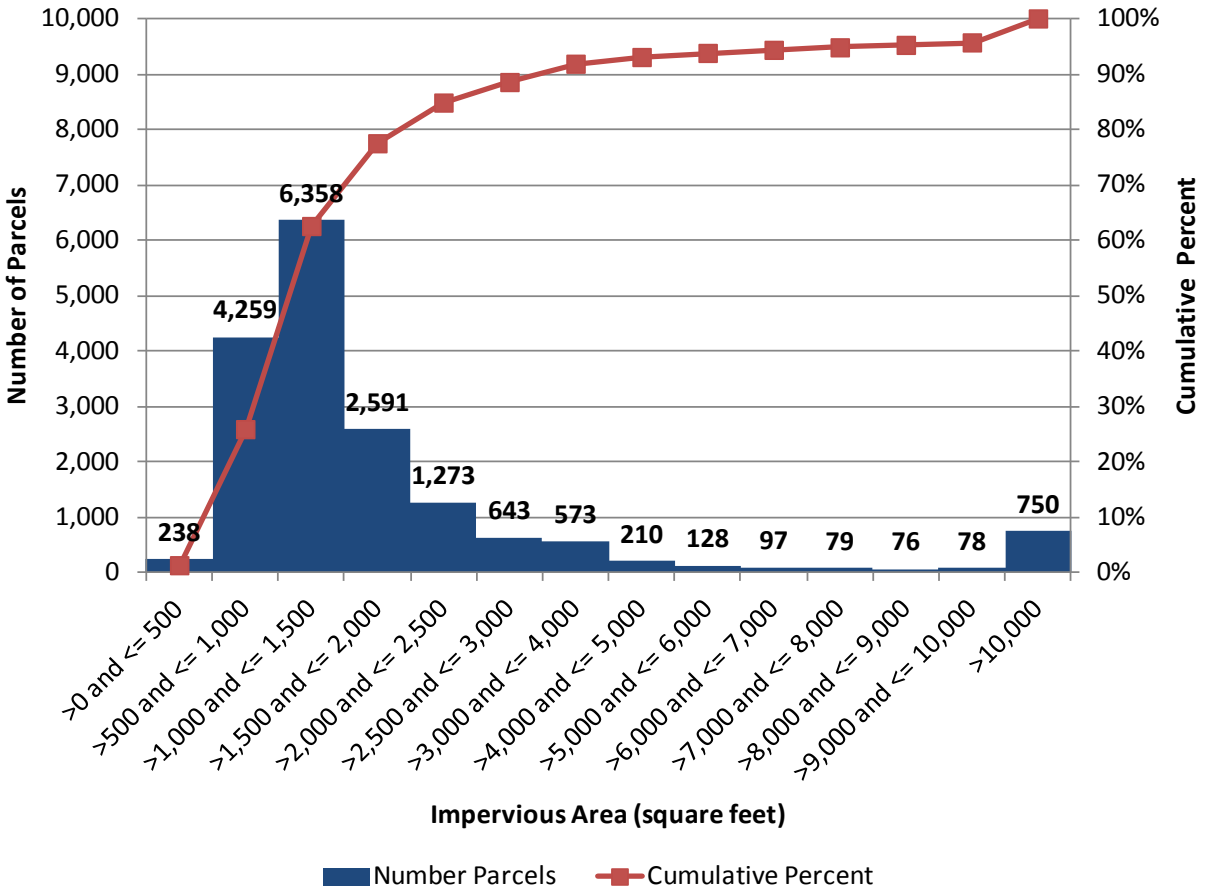


TABLE 3-2
Top 10 Owners Based on Total Estimated Impervious Area

Rank	Owner Name	Estimated Impervious Area (sf)	Percent of Total Impervious Area	Number of Parcels
1	Park City Center Business Trust	4,573,313	5	6
2	RR Donnelley & Sons	4,454,455	5	4
3	Franklin & Marshall College	2,764,125	3	48
4	Burle Business Park LP	2,472,367	3	1
5	School District Of Lancaster	2,425,635	3	17
6	Redcen Inc	2,160,910	3	1
7	Amtrak	1,620,875	2	13
8	Lancaster General Hospital	1,406,952	2	27
9	Armstrong World Industries Inc	1,401,167	2	2
10	County of Lancaster	927,245	1	10
	Total	**24,258,739**	**29**	**129**

List is based on grouping by owner name and summing estimated IA.

3.2 Equivalent Residential Unit Basis

The development of a stormwater utility rate structure begins with defining the ERU. For most stormwater utilities, the ERU is defined as the median or average IA for single-family properties. Typically, a single-family property is limited to detached dwellings and is contingent upon available data.

A recent trend among stormwater utilities is to base the rate structure on measurement of 1,000 sf instead of the median or average value for single-family properties. For purpose of this study, the rate structure was based on 1,000 sf.

3.3 Rate Structures

There are several options for developing a rate structure for a stormwater utility:

- ERU method
- Total IA method
- Tiering method

3.3.1 ERU Method

One of the most common rate structures among stormwater utilities is the ERU method. The first step in evaluating this method is to develop the descriptive statistics for the single-family residential stormwater class. Table 3-3 summarizes the descriptive statistics for single-family (residential) properties. Attachment F provides additional details of the statistical analysis for other stormwater classes.

TABLE 3-3
Descriptive Statistics for Single Family Properties in the City of Lancaster

Statistic	Total Impervious Area (sf)
Minimum	1
25th percentile	943
50th percentile (median)	**1,165**
75th percentile	1,533
Maximum	35,441
Average	1,368
Standard Deviation	957
Mode	933
Skewness	12
Count (number of parcels)	13,407
Sum	18,337,179

Assumes parcels with total IA > 0

Assuming that the ERU would equal the median IA, then 1 ERU would equal 1,165 sf. Under this rate structure option, single-family residential properties would be charged for 1 ERU. All other properties (non-residential) would be charged based their total IA divided by the ERU base unit. For example, if a non-residential property has 11,650 sf of IA, then the property would be charged 10 ERUs (11,650/1,165). Table 3-4 provides a summary of ERUs based on the ERU method.

TABLE 3-4
Summary of ERU Rate Structure Method

Stormwater Class	Impervious Area (sf)	Number of ERUs
Single Family	n/a	13,407
Multi-Family	9,909,174	8,506
Commercial	29,093,647	24,973
Industrial	15,205,021	13,052
Non-Profit	2,643,843	2,269
Institutional	4,824,416	4,141
Government	3,707,181	3,182
Total		**69,530**

1 ERU = 1,165 (median IA for single-family residential properties)

One advantage of this rate structure option is its simplicity. Detailed IA need only be maintained for 23 percent of the properties because single-family residential properties are charged 1 ERU.

The disadvantage of this rate structure is the intra-class equity among single-family residential properties. For example, if a property has an 800-sf house, then the owner would be paying more than his or her share of IA area. Conversely, if a property has a 2,500-sf house, then the owner is underpaying.

Further, another disadvantage is that non-residential rate payers subsidize residential properties.

If IA data are not available to support other rate structure methods, the ERU method is a reasonable estimate of stormwater runoff.

3.3.2 Total Impervious Area Method

Under the total IA method, a uniform rate is applied to all properties based on total IA. That is, each property owner pays based on the total IA calculated for his or her property. Under this option, the rate would be expressed as $ per 1,000 sf. Another way of explaining it would be that 1 ERU equals 1,000 sf.

For illustrative purposes, Table 3-5 provides the descriptive statistics for all properties. Table 3-6 provides a summary of the total IA method.

TABLE 3-5
Descriptive Statistics for All Properties

Statistic	Total Impervious Area (sf)
Minimum	1
25th percentile	992
50th percentile (median)	1,277
75th percentile	1,890
Maximum	4,246,304
Average	4,825
Standard Deviation	52,478
Mode	1,106
Skewness	49
Count (number of parcels)	17,353
Sum	83,720,461

Assumes parcels with total IA > 0

TABLE 3-6
Summary of Total Impervious Area Method

Stormwater Class	Impervious Area (sf)	Number of ERUs
Single Family	18,337,179	18,337
Multi-Family	9,909,174	9,909
Commercial	29,093,647	29,094
Industrial	15,205,021	15,205
Non-Profit	2,643,843	2,644
Institutional	4,824,416	4,824
Government	3,707,181	3,707
Total	**83,720,461**	**83,720**

1 ERU = 1,000

One advantage of this method is equity and fairness. All property owners pay based on their 'actual' contribution to stormwater runoff.

One disadvantage is the administrative burden and cost of data requirements. This option assumes that accurate and complete IA data are available for all properties. This option is not advisable because of the data requirements and administrative burden of managing detailed IA information for all properties.

Another disadvantage is the likelihood of more appeals from rate payers disputing small differences in the IA calculations.

3.3.3 Tiering Method

Although the ERU method is one of the most common rate structures for most of the stormwater utilities in operation now, recent trends show that utilities are opting for a tiered rate structure. A tiered rate structure defines tier ranges based on IA area and property owners assigned to tiers pay a flat rate. Property owners with an IA that exceeds an upper limit pay based on total IA.

For this study, four tier ranges were identified based on increments of 1,000 sf. The upper limit in which property owners pay, based on total IA, is 3,000 sf. The upper limit is based on 90 percentile (see Figure3-3). In order to relate billing units to ERUs, it was assumed that 1 ERU equals 1,000 sf. For the first three tiers, a multiplier is calculated based on the middle value of the IA tier range. For example, the middle value for Tier 1 with range of 0 to 1,000 sf is 500 sf. This is equivalent to 0.5 ERUs or a multiplier of 0.5. Table 3-7 provides a summary of the tiering method.

TABLE 3-7
Summary of Tiering Method

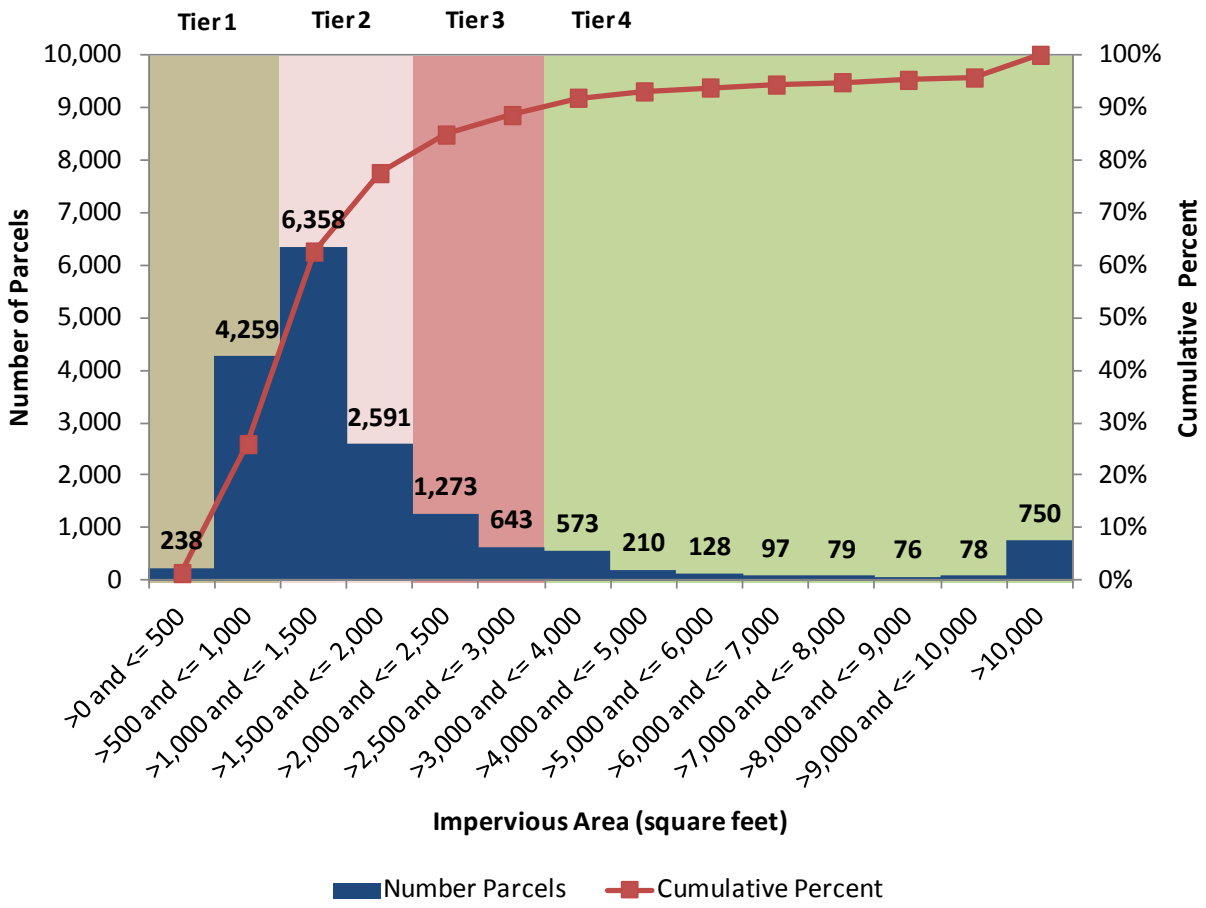
Stormwater Class	Tier 1 (<=1,000 sf)	Tier 2 (>1,000 sf and <=2,000 sf)	Tier 3 (>2,000 sf and <=3,000 sf)	Tier 4 (>3,000 sf)	Total
Multiplier	**0.5**	**1.5**	**2.5**	**n/a**	
Single Family					
Properties	4,254	7,508	1,245	400	13,407
IA	n/a	n/a	n/a	1,862,180	18,620
ERUs*	**2,127**	**11,262**	**3,113**	**1,862**	**18,364**
Multi-Family					
Properties	76	1,097	444	359	1,976
IA	n/a	n/a	n/a	7,110,661	7,110,661
ERUs*	**38**	**1,646**	**1,110**	**7,111**	**9,904**

TABLE 3-7
Summary of Tiering Method

Stormwater Class	Tier 1 (<=1,000 sf)	Tier 2 (>1,000 sf and <=2,000 sf)	Tier 3 (>2,000 sf and <=3,000 sf)	Tier 4 (>3,000 sf)	Total
Commercial					
Properties	161	334	203	928	1,626
IA	n/a	n/a	n/a	28,006,389	28,006,389
ERUs*	**81**	**501**	**508**	**28,006**	**29,095**
Industrial					
Properties	1	0	5	105	111
IA	n/a	n/a	n/a	15,192,014	15,192,014
ERUs*	**1**	**0**	**13**	**15,192**	**15,205**
Non-Profit					
Properties	1	9	11	112	133
IA	n/a	n/a	n/a	2,601,572	2,601,572
ERUs*	**1**	**14**	**28**	**2,602**	**2,643**
Institutional					
Properties	1	0	4	39	44
IA	n/a	n/a	n/a	4,814,796	4,814,796
ERUs*	**1**	**0**	**10**	**4,815**	**4,825**
Government					
Properties	3	1	4	48	56
IA	n/a	n/a	n/a	3,695,151	3,695,151
ERUs*	**2**	**2**	**10**	**3,695**	**3,708**
Total ERUs	**2,249**	**13,424**	**4,790**	**63,283**	**83,745**

1 ERU = 1,000
* Number of ERUs for Tiers 1 -3 are calculated based Property Count * Multiplier. Number of ERUs for Tier 4 is calculated based on IA / 1,000 sf. ERUs rounded to nearest whole number.

FIGURE 3-3
Frequency Distribution for All Properties with Tier Alignment



One advantage of the tiering method is equity and fairness. In addition, the likelihood of appeals decreases because properties are assigned to a tier in which the chances of falling into a different tier are smaller.

A disadvantage of the tiering method is additional analysis for billing system implementation and maintenance of IA data to support the assignment of properties to IA tiers.

In addition to the scenario based on four tiers, a scenario based on seven tiers was evaluated and presented to the GIAC (see policy paper in Attachment B). The GIAC selected the four-tier option based on a balance of equity versus administrative costs of tracking the IA for additional tiers.

3.4 Comparison of Methods and Recommendation

As described in the previous sections, several methods of developing billing units for the SWMF were evaluated. Each method has advantages and disadvantages. Table 3-8 summarizes the number of billing units by stormwater class, for each of the three rate structure methods.

The ERU method results in the fewest number of billing units and therefore would require the highest rate per ERU to cover the same program cost as other options with more billing units. While it is the simplest method, a disadvantage is that single-family (residential) properties only pay 1 ERU regardless of IA, which does not promote fairness and equity among rate payers.

The total IA and tiering methods generate a similar number of billing units. As noted, the disadvantage of the total IA method is the cost of maintaining IA data for all properties. Although there would be costs for maintaining IA data for the tiering method, it is relatively less. In addition, the tiering method would likely result in fewer appeals from rate payers disputing small differences in the IA calculations than the IA method.

The tiering method is the recommended rate structure because it balances a higher level of equity and fairness with reasonable level of costs and billing system maintenance. This method was presented to the GIAC, which supports a tiered rate structure using four tiers.

TABLE 3-8
Summary of Billing Units by Stormwater Class and Rate Structure Method

Stormwater Class	Rate Structure Method		
	ERU[a]	Total Impervious Area[b]	Tiering with 4 Tiers[b]
Single Family	13,407	18,337	18,364
Multi-Family	8,506	9,909	9,904
Commercial	24,973	29,094	29,095
Industrial	13,052	15,205	15,205
Non-Profit	2,269	2,644	2,643
Institutional	4,141	4,824	4,825
Government	3,182	3,707	3,708
Total ERUs	**69,530**	**83,720**	**83,745**

[a] Assume 1 ERU = 1,165 sf
[b] Assume 1 ERU = 1,000 sf

SECTION 4

Rate Scenarios

4.1 Overview of Scenarios

As noted in Section 1.3, LOS alternatives were evaluated and are documented in Technical Memorandum #1. The LOS alternatives consist of the following:

Level of Service	Rate Scenario	Description
Low	1	Assumes current LOS and MS4 permit implementation
Medium	2	Includes current level of expenditure, plus additional program elements. GI Plan implementation (on public properties only), MS4 Permit implementation, increased maintenance and customer service
High	3	Includes higher LOS for current program, plus additional program elements. GI Plan implementation (on public and private properties), MS4 permit implementation, high level of maintenance and customer service

By default, the rate scenarios assume no additional debt financing. However, rate scenarios 2 and 3 evaluate the sensitivity of debt financing in Year 4. This is important because it helps illustrate how sensitive rates are to financing assumptions. For example, if a utility is facing a significant CIP, Pay-Go financing could result in high rates. If debt financing is possible, the utility can generate the necessary capital and the annual debt service payments help keep the rates relatively low.

As noted in Section 2, the City has secured a PennVest loan and several grants for funding GI projects. Given the level of CIP projects identified to meet near-term MS4 permit requirements, the loan and grants keep the capital requirements relatively low for several years. When the loan and grant financing is exhausted, the level of CIP increases in the out years and cost recovery decisions are limited to receiving additional loans/grants, bond financing, or current program costs covered by the SWMF (Pay Go).

4.2 Low Level of Service (Rate Scenario 1)

The low LOS rate scenario assumes current LOS and MS4 permit implementation. This represents the stormwater function and activities currently provided by DPW.

4.2.1 Assumptions

The assumptions used for the “low LOS” rate scenario are:

- Rate Structure = tiering method (see Section 3.3.3)
- Collection Rate = 90 percent
- Allowance for operating reserve = 6 months annual O&M expense
- No allowance for SWMF credits/incentives
- Inflation Rate = 3 percent (O&M and CIP)
- No additional debt financing
- PennVest loans equal entire CIP for Years 1 – 5. Assumes the SWMF is not used for repayment of loan.
- No grants
- Growth in ERUs = 0.5 percent per year

4.2.2 Program Financial Cost Requirements

Table 4-1 summarizes the revenue requirements for the low LOS (Rate Scenario 1) based on the assumptions identified in Section 4.2.1.

TABLE 4-1
Program Cost Coverage Requirements for the Low Level of Service Rate Scenario (Rate Scenario 1)

	Year 1	Year 2	Year 3	Year 4	Year 5
O&M	$966,000	$995,000	$1,024,000	$1,055,000	$1,087,000
Allowance Uncollectible Accounts	$161,000	$161,000	$161,100	$161,200	$161,300
Allowance for SWMF Credits	-	-	-	-	-
Allowance for Operating Reserve	482,800	497,300	512,200	527,600	543,400
Debt Service	-	-	-	-	-
Stormwater CIP	677,000	844,000	953,000	1,153,000	1,205,000
Less: Non Rate Program Cost					
Investment Income	(500)	(1,400)	(2,300)	(3,100)	(3,900)
PennVest Loan	(677,000)	(844,000)	(953,000)	(1,153,000)	(1,205,000)
Grants	-	-	-	-	-
Net Program Cost Requirement	**$1,609,300**	**$1,651,900**	**$1,695,000**	**$1,740,700**	**$1,787,800**

4.2.3 Financial Summary

Table 4-2 provides a financial summary for the low LOS (Rate Scenario 1). Detailed rate model pro forma tables are provided in Attachment G. It was assumed that the stormwater CIP is cost recovered by the PennVest loan (Table 4-3) and repayment is not provided by the SWMF. Table 4-4 summarizes the rates for Rate Scenario 1.

TABLE 4-2
Financial Summary for the Low Level of Service Rate Scenario (Rate Scenario 1)

	Year 1	Year 2	Year 3	Year 4	Year 5
SWU Fee ($/1,000 sf)	$19.22	$19.22	$19.22	$19.22	$19.22
ERUs	83,745	83,787	83,829	83,870	83,912
Operating Revenues					
SWMF	$1,609,575	$1,610,380	$1,611,180	$1,611,990	$1,612,800
Less Allowance for Uncollectable Accounts	($161,000)	($161,000)	($161,100)	($161,200)	($161,300)
Less Credits/Incentives	$0	$0	$0	$0	$0
Interest Income	$500	$1,400	$2,300	$3,100	$3,900
Total Revenues	**$1,449,075**	**$1,450,780**	**$1,452,380**	**$1,453,890**	**$1,455,400**
Program Costs Covered					
O&M	$965,666	$994,636	$1,024,475	$1,055,209	$1,086,866
Non Operating	$0	$0	$0	$0	$0
Debt Service	$0	$0	$0	$0	$0
Stormwater CIP	$0	$0	$0	$0	$0
Total Program Costs Covered	**$965,666**	**$994,636**	**$1,024,475**	**$1,055,209**	**$1,086,866**
Beginning Balance	$0	$483,409	$939,553	$1,367,458	$1,766,139
Ending Balance	**$483,409**	**$939,553**	**$1,367,458**	**$1,766,139**	**$2,134,673**

TABLE 4-3
Capital Requirements for the Low Level of Service Rate Scenario (Rate Scenario 1)

Capital Requirements	Year 1	Year 2	Year 3	Year 4	Year 5
Total Stormwater CIP	$677,000	$844,000	$953,000	$1,153,000	$1,205,000
Less: PennVest Loan	$677,000	$844,000	$953,000	$1,153,000	$1,205,000
Less: Grants	$-	$-	$-	$-	$-
Amount to be funded by SWMF	$-	$-	$-	$-	$-
Percent Debt-Funded	0%	0%	0%	0%	0%
Percent Equity-Funded	100%	100%	100%	100%	100%
Amount Debt-Funded	$-	$-	$-	$-	$-
Amount Equity-Funded (Pay-Go)	$-	$-	$-	$-	$-

TABLE 4-4
Stormwater Utility Rate and Annual SWMF per Property by Tier
Low Level of Service (Rate Scenario 1)

Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$19.22	$19.22	$19.22	$19.22	$19.22
Percent Increase		0.0	0.0	0.0	0.0
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$9.61	$9.61	$9.61	$9.61	$9.61
Tier 2 (>1,000 sf and <=2,000 sf)	$28.83	$28.83	$28.83	$28.83	$28.83
Tier 3 (>2,000 sf and <=3,000 sf)	$48.05	$48.05	$48.05	$48.05	$48.05
Tier 4 (>3,000)		*Properties pay based on total IA / SWMF.*			

4.3 Medium Level of Service (Rate Scenario 2)

The medium LOS rate scenario evaluates the current level of expenditure plus additional program elements, such as maintenance for GI, administration of the SWMF credit program, and increased public education/outreach. In addition, this scenario assumes GI Plan implementation for publicly owned properties.

4.3.1 Assumptions

The assumptions used for the “low LOS” rate scenario are:

- Rate Structure = tiering method (see Section 3.3.3)
- Collection Rate = 90 percent
- Allowance for operating reserve = 6 months annual O&M expense
- Allowance for SWMF credits/incentives = 10 percent of program costs covered for tiers 3 and 4
- Inflation Rate = 3 percent (O&M and CIP)

- No additional debt financing. However, a sensitivity analysis assumes that 80 percent of the CIP in years 4 and 5 is debt-financed. Debt financing assumes an interest rate of 5 percent, 20-year term, 2 percent cost of issuance, 10 percent bond reserve, and target coverage ratio of 1.5.
- PennVest Loans equal to $7,000,000 and fund part of the CIP. Assumes SWMF is used to repay the loan based on schedule provided in Attachment E.
- Grants equal to $2,500,000 to fund part of the CIP.
- Growth in ERUs = 0.5 percent per year

4.3.2 Program Financial Cost Requirements

Table 4-5 summarizes the program financial cost requirements for the medium LOS (Rate Scenario 2) based on the assumption identified in Section 4.3.1.

TABLE 4-5
Program Cost Requirements for the Medium Level of Service Rate Scenario (Rate Scenario 2)

	Year 1	Year 2	Year 3	Year 4	Year 5
O&M	$1,290,000	$1,328,000	$1,368,000	$1,409,000	$1,451,000
Allowance Uncollectible Accounts	259,000	259,000	260,000	667,000	808,000
Allowance for SWMF Credits	-	211,000	211,000	542,000	657,000
Allowance for Operating Reserve	645,000	664,000	684,000	705,000	726,000
Debt Service	105,000	105,000	255,000	405,000	405,000
Stormwater CIP	2,946,000	3,425,000	3,782,000	4,423,000	4,739,000
Less: Non Rate Program Cost					
Investment Income	(600)	(1,900)	(2,700)	(2,200)	(1,400)
Penn Vest Loan	(1,473,000)	(2,794,000)	(2,733,000)	-	-
Grants	(1,178,000)	(513,000)	(809,000)	-	-
Net Program Cost Requirement	**$2,593,400**	**$2,683,100**	**$3,015,300**	**$8,148,800**	**$8,784,600**

4.3.3 Financial Summary

Table 4-6 provides a financial summary for the medium LOS (Rate Scenario 2). Detailed rate model pro forma tables are provided in Attachment G. It was assumed that part of the stormwater CIP is cost recovered by the PennVest loan and grants (Table 4-7) and repayment is provided by the SWMF. As shown, the capital requirements increase significantly in years 4 and 5 because loan/grant funding is exhausted. In order to maintain an adequate operating reserve, rates increase precipitously. Table 4-8 summarizes the rates for Rate Scenario 2.

TABLE 4-6
Financial Summary for the Medium Level of Service Rate Scenario (Service Rate Scenario 2)

	Year 1	Year 2	Year 3	Year 4	Year 5
SWU Fee ($/1,000 sf)	$30.96	$30.96	$ 30.96	$9.47	$96.32
ERUs	83,745	83,787	83,829	83,870	83,912
Operating Revenues					
SWMF	$2,592,738	$2,594,030	$2,595,330	$6,665,180	$8,082,440
less Allowance for Uncollectable Accounts	($259,274)	($259,403)	($259,533)	($666,518)	($808,244)
less Credits/Incentives	$0	($210,859)	($210,964)	($541,786)	($656,989)
Interest Income	$600	$1,900	$2,700	$2,200	$1,400
Total Revenues	$2,334,064	$2,125,668	$2,127,533	$5,459,076	$6,618,607

TABLE 4-6
Financial Summary for the Medium Level of Service Rate Scenario (Service Rate Scenario 2)

	Year 1	Year 2	Year 3	Year 4	Year 5
Program Costs Covered					
O&M	$1,289,512	$1,328,197	$1,368,043	$1,409,085	$1,451,357
Non Operating	-	-	-	-	-
Debt Service	$104,700	$104,700	$255,000	$405,200	$405,200
Stormwater CIP (Pay Go)	$295,000	$118,000	$240,000	$4,423,000	$4,739,000
Total Program Costs Covered	**$1,689,212**	**$1,550,897**	**$1,863,043**	**$6,237,285**	**$6,595,557**
Beginning Balance	$0	$644,852	$1,219,623	$1,484,113	$705,904
Ending Balance	**$644,852**	**$1,219,623**	**$1,484,113**	**$705,904**	**$728,954**

TABLE 4-7
Capital Requirements for the Medium Level of Service Rate Scenario (Service Rate Scenario 2)
Medium Level of Service (Rate Scenario 2)

Capital Requirements	Year 1	Year 2	Year 3	Year 4	Year 5
Total Stormwater CIP	$ 2,946,000	$3,425,000	$3,782,000	$4,423,000	$4,739,000
Less: PennVest Loan	$1,473,000	$2,794,000	$2,733,000	$-	$-
Less: Grants	$1,178,000	$513,000	$ 809,000	$ -	
Amount to be funded by SWMF	$295,000	$118,000	$240,000	$4,423,000	$4,739,000
Percent Debt-Funded	0%	0%	0%	0%	0%
Percent Equity-Funded	100%	100%	100%	100%	100%
Amount Debt-Funded	$-	$-	$-	$-	$-
Amount Equity-Funded (Pay-Go)	$295,000	$118,000	$240,000	$4,423,000	$4,739,000

TABLE 4-8
Stormwater Utility Rate and Annual SWMF per Property by Tier
Medium Level of Service (Rate Scenario 2)

Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$30.96	$30.96	$30.96	$79.47	$96.32
Percent Increase		0.0%	0.0%	156.7%	21.2%
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$15.48	$15.48	$15.48	$39.74	$48.16
Tier 2 (>1,000 sf and <=2,000 sf)	$46.44	$46.44	$46.44	$119.21	$144.48
Tier 3 (>2,000 sf and <=3,000 sf)	$77.40	$77.40	$77.40	$198.68	$240.80
Tier 4 (>3,000)	*Properties pay based on total IA/ SWMF.*				

4.3.4 Sensitivity Analysis

To test the rate sensitivity based on debt financing the CIP starting in Year 4, Table 4-9 summarizes the capital requirements assuming 80 percent of the CIP is debt financed for years 4 and 5. It was assumed bonds are issued in Year 4 to cover the CIP for years 4 and 5.

TABLE 4-9
Capital Requirements and Debt Financing
Medium Level of Service (Rate Scenario 2)

Capital Requirements	Year 1	Year 2	Year 3	Year 4	Year 5
Total Stormwater CIP	$2,946,000	$3,425,000	$3,782,000	$4,423,000	$4,739,000
Less: PennVest Loan	$1,473,000	$2,794,000	$2,733,000	$-	$-
Less: Grants	$1,178,000	$513,000	$809,000	$-	
Amount to be funded by SWMF	$295,000	$118,000	$240,000	$4,423,000	$4,739,000
Percent Debt-Funded	0%	0%	0%	80%	80%
Percent Equity-Funded	100%	100%	100%	20%	20%
Amount Debt-Funded	$--	$-	$-	$3,538,400	$3,791,200
Amount Equity-Funded (Pay-Go)	$295,000	$118,000	$240,000	$884,600	$ 947,800

The estimated debt service is summarized in Table 4-10. By issuing bonds in Year 4, the level of CIP funded by Pay-Go decreases and the annual debt service payments are at a level to keep future rate increase relatively low. To help ease the rate shock, one option is to implement periodic rate increases to avoid a sudden spike in rates. For example, in anticipation of significant capital requirements, if rates increase 10 percent annually starting in Year 2, then a significant rate increase can be avoided. Table 4-11 shows the rate sensitivity for Rate Scenario 2 based on debt financing.

Another approach would be to set the rate in Year 1 to cover the significant capital requirements in the future. This would allow the stormwater fund to generate adequate reserves and to avoid a significant rate increase in a future year. Often, this approach can result in the lowest long-term rate.

TABLE 4-10
Estimated Debt Service
Medium Level of Service (Rate Scenario 2)

	Year 1	Year 2	Year 3	Year 4	Year 5
Projected Debt Issuance					
Capital Requirements	**$0**	**$0**	**$0**	**$7,329,600**	**$0**
Cost of Issuance	$0	$0	$0	$146,592	$0
Bond Reserve	$0	$0	$0	$732,960	$0
Estimated Bond Issue	**$0**	**$0**	**$0**	**$8,209,152**	**$0**
Projected Debt Service					
Series Year 1	**$0**	$0	$0	$0	$0
Series Year 2		**$0**	$0	$0	$0
Series Year 3			**$0**	$0	$0
Series Year 4				**$658,724**	$658,724
Series Year 5					**$0**
Total Projected Debt Service	**$0**	**$0**	**$0**	**$658,724**	**$658,724**

TABLE 4-11
Rate Sensitivity Based on Debt Financing
Medium Level of Service (Rate Scenario 2)

Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$30.96	$30.96	$30.96	$43.65	$44.57
Percent Increase		0.0%	0.0%	41.0%	2.1%
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$15.48	$15.48	$15.48	$21.83	$22.29
Tier 2 (>1,000 sf and <=2,000 sf)	$46.44	$46.44	$46.44	$65.48	$66.86
Tier 3 (>2,000 sf and <=3,000 sf)	$77.40	$77.40	$77.40	$109.13	$111.43
Tier 4 (>3,000)		*Properties pay based on total IA/ SWMF.*			

4.4 High Level of Service (Rate Scenario 3)

The high LOS rate scenario evaluates the highest LOS, such as maintenance for GI, administration of the SWMF credit program, and increased public education/outreach. In addition, this scenario assumes GI Plan implementation for publicly and privately owned properties.

4.4.1 Assumptions

The assumptions used for the high LOS rate scenario are:

- Rate Structure = tiering method (see Section 3.3.3)
- Collection Rate = 90 percent
- Allowance for operating reserve = 6 months annual O&M expense
- Allowance for SWMF credits/incentives = 10 percent of program costs covered for tiers 3 and 4
- Inflation Rate = 3 percent
- No additional debt financing. However, a sensitivity analysis assumes 80 percent of the CIP in years 4 and 5 are debt-financed. Debt financing assumes an interest rate of 5 percent, 20-year term, 2 percent cost of issuance, 10 percent bond reserve, and target coverage ratio of 1.5.
- PennVest Loans equal entire CIP for years 1 – 5. Assumes SWMF is used to repay the loan based on schedule provided in Attachment E.
- Growth in ERUs = 0.5 percent per year

4.4.2 Program Financial Cost Requirements

Table 4-12 summarizes the program financial cost requirements for the high LOS (Rate Scenario 3) based on the assumptions identified in Section 4.4.1. Under Rate Scenario 2, the net program financial cost requirement nearly doubles because loan/grant funding for CIP ends and decisions regarding the cost recovery of the increase in capital requirements will affect rates.

TABLE 4-12
Program Financial Cost Requirements for the High Level of Service Rate Scenario (Rate Scenario 3)

	Year 1	Year 2	Year 3	Year 4	Year 5
O&M	$1,749,000	$1,802,000	$1,856,000	$1,912,000	$1,969,000
Allowance Uncollectible Accounts	510,000	510,000	595,000	1,175,000	1,238,000
Allowance for SWMF Credits	-	415,000	484,000	955,000	1,007,000
Allowance for Operating Reserve	875,000	901,000	928,000	956,000	984,000
Debt Service	105,000	105,000	255,000	405,000	405,000
Stormwater CIP	4,647,000	5,537,000	6,158,000	7,283,000	7,735,000
Less: Non Rate Revenue					
Investment Income	(900)	(1,800)	(1,900)	(1,900)	(1,900)
PennVest Loan	(1,858,000)	(2,768,000)	(2,374,000)	-	-
Grants	(929,000)	(553,000)	(1,018,000)	-	-
Net Program Cost Financial Requirement	**$5,098,100**	**$5,947,200**	**$6,882,100**	**$12,684,100**	**$13,336,100**

4.4.3 Financial Summary

Table 4-13 provides a financial summary for the high LOS (Rate Scenario 3). Detailed rate model pro forma tables are provided in Attachment G. It is assumed that part of the stormwater CIP is cost recovered by the PennVest loan and grants (Table 4-14) and repayment is provided by the SWMF. Table 4-15 summarizes the rates for Rate Scenario 3.

TABLE 4-13
Financial Summary for the High Level of Service Rate Scenario (Service Rate Scenario 3)

	Year 1	Year 2	Year 3	Year 4	Year 5
SWU Fee ($/1,000 sf)	$60.89	$60.89	$71.00	$140.15	$147.58
ERUs	83,745	83,787	83,829	83,870	83,912
Operating Revenues					
SWMF	$5,099,218	$5,101,770	$5,951,830	$11,754,440	$12,383,790
less Allowance for Uncollectable Accounts	($509,922)	($510,177)	($595,183)	($1,175,444)	($1,238,379)
less Credits/Incentives	$0	($414,702)	($483,800)	($955,472)	($1,006,629)
Interest Income	$900	$1,800	$1,900	$1,900	$1,900
Total Program Costs	**$4,590,196**	**$4,178,691**	**$4,874,747**	**$9,625,424**	**$10,140,682**
Program Costs Covered					
O&M	$1,749,312	$1,801,791	$1,855,845	$1,911,520	$1,968,866
Non Operating	-	-	-	-	-
Debt Service	$104,700	$104,700	$255,000	$405,200	$405,200
Stormwater CIP (Pay-Go)	$1,860,000	$2,216,000	$2,766,000	$7,283,000	$7,735,000
Total Program Costs Covered	**$3,714,012**	**$4,122,491**	**$4,876,845**	**$9,599,720**	**$10,109,066**
Beginning Balance	$0	$876,184	$932,384	$930,285	$955,989
Ending Balance	**$876,184**	**$932,384**	**$930,285**	**$955,989**	**$987,606**

TABLE 4-14
Capital Requirements for the High Level of Service Rate Scenario (Service Rate Scenario 3)

Capital Requirements	Year 1	Year 2	Year 3	Year 4	Year 5
Total Stormwater CIP	$4,647,000	$5,537,000	$6,158,000	$7,283,000	$7,735,000
Less: PennVest Loan	$1,858,000	$2,768,000	$2,374,000	$-	$-
Less: Grants	$929,000	$553,000	$1,018,000	$-	$-
Amount to be funded by SWMF	$1,860,000	$2,216,000	$2,766,000	$7,283,000	$7,735,000
Percent Debt-Funded	0%	0%	0%	0%	0%
Percent Equity-Funded	100%	100%	100%	100%	100%
Amount Debt-Funded	$-	$-	$-	$-	$-
Amount Equity-Funded (Pay-Go)	$1,860,000	$2,216,000	$2,766,000	$7,283,000	$7,735,000

TABLE 4-15
Stormwater Utility Rate and Annual SWMF per Property by Tier
Medium Level of Service (Rate Scenario 2)

Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$60.89	$60.89	$71.00	$140.15	$147.58
Percent Increase		0.0%	16.6%	97.4%	5.3%
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$30.45	$30.45	$35.50	$70.08	$73.79
Tier 2 (>1,000 sf and <=2,000 sf)	$91.34	$91.34	$106.50	$210.23	$221.37
Tier 3 (>2,000 sf and <=3,000 sf)	$152.23	$152.23	$177.50	$350.38	$368.95
Tier 4 (>3,000)	*Properties pay based on total impervious area / SWMF.*				

4.4.4 Sensitivity Analysis

Similar to Rate Scenario 2, to test the rate sensitivity based on debt financing the CIP starting in Year 4, Table 4-16 summarizes the capital requirements assuming 80 percent of the CIP is debt financed for years 4 and 5. It was assumed bonds are issued in Year 4 to cover the CIP for years 4 and 5. Table 4-17 summarizes the estimate debt service for Rate Scenario 3. Table 4-18 summarize the rate sensitivity for Rate Scenario 3 based on debt financing.

TABLE 4-16
Capital Requirements and Debt Financing
High Level of Service (Rate Scenario 3)

Capital Requirements	Year 1	Year 2	Year 3	Year 4	Year 5
Total Stormwater CIP	$4,647,000	$5,537,000	$6,158,000	$7,283,000	$7,735,000
Less: Penn Vest Loan	$1,858,000	$2,768,000	$2,374,000	$-	$-
Less: Grants	$ 929,000	$553,000	$1,018,000	$-	$-
Amount to be funded by SWMF	$1,860,000	$2,216,000	$2,766,000	$ 7,283,000	$7,735,000

TABLE 4-16
Capital Requirements and Debt Financing
High Level of Service (Rate Scenario 3)

Capital Requirements	Year 1	Year 2	Year 3	Year 4	Year 5
Percent Debt-Funded	0%	0%	0%	80%	80%
Percent Equity-Funded	100%	100%	100%	20%	20%
Amount Debt-Funded	$-	$-	$-	$5,826,400	$6,188,000
Amount Equity-Funded (Pay-Go)	$1,860,000	$2,216,000	$2,766,000	$1,456,600	$1,547,000

TABLE 4-17
Estimated Debt Service
High Level of Service (Rate Scenario 3)

	Year 1	Year 2	Year 3	Year 4	Year 5
Projected Debt Issuance					
Capital Requirements	$0	$0	$0	$12,014,400	$0
Cost of Issuance	$0	$0	$0	$240,288	$0
Bond Reserve	$0	$0	$0	$1,201,440	$0
Estimated Bond Issue	**$0**	**$0**	**$0**	**$13,456,128**	**$0**
Projected Debt Service					
Series Year 1	**$0**	$0	$0	$0	$0
Series Year 2		**$0**	$0	$0	$0
Series Year 3			**$0**	$0	$0
Series Year 4				**$1,079,755**	$1,079,755
Series Year 5					**$0**
Total Projected Debt Service	**$0**	**$0**	**$0**	**$1,079,755**	**$1,079,755**

TABLE 4-18
Rate Sensitivity based on Debt Financed
High Level of Service (Rate Scenario 3)

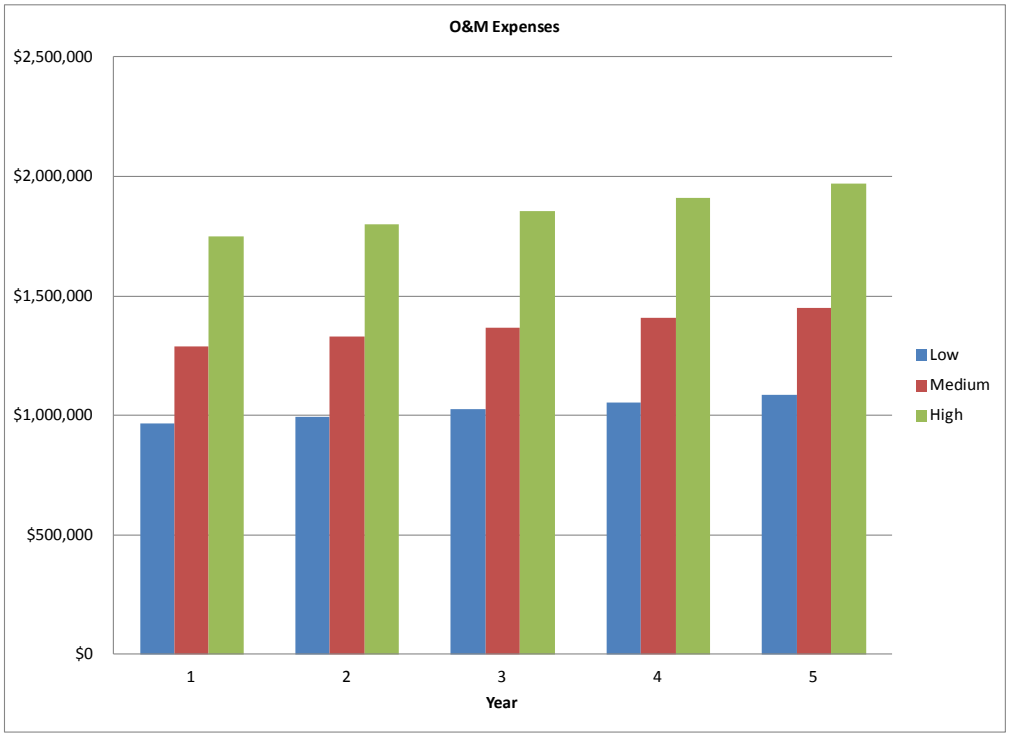
Low	Year 1	Year 2	Year 3	Year 4	Year 5
SWMF ($ per 1,000 sf)	$60.89	$60.89	$71.00	$71.07	$73.20
Percent Increase		0.0%	16.6%	0.1%	3.0%
Annual SWMF per Property					
Tier 1 (<=1,000 sf)	$30.45	$30.45	$35.50	$35.54	$36.60
Tier 2 (>1,000 sf and <=2,000 sf)	$91.34	$91.34	$106.50	$106.61	$109.80
Tier 3 (>2,000 sf and <=3,000 sf)	$152.23	$152.23	$177.50	$177.68	$183.00
Tier 4 (>3,000)	*Properties pay based on total impervious area / SWMF.*				

4.5 Scenario Comparison

The three rate scenarios were evaluated and sensitivity analyses regarding capital financing were considered for rate scenarios 2 and 3.

Operating expenses for Rate Scenario 2 are approximately $320,000 greater than for Rate Scenario 1. Operating expenses for Rate Scenario 3 are approximately $460,000 greater than for Rate Scenario 2. For the 5-year study period, operating expenses increase slightly due to an inflation assumption of 3 percent. Figure 4-1 compares the operating expense for each scenario.

FIGURE 4-1
Estimated Stormwater Operating and Maintenance Expenditures



One of the major cost items is the CIP, which for rate scenarios 2 and 3 is approximately three times operating expenses. Rate Scenario 1 is unlike scenarios 2 and 3 because it considers current stormwater functions/service provided by DPW. It does not consider the additional LOS needed to meet MS4 permit requirements and to address the City's stormwater needs. There are no capital requirements for Rate Scenario 1 because it is assumed that the PennVest loan will fund capital projects.

In contrast, rate scenarios 2 and 3 consider the additional programs and LOS needed to meet MS4 permit requirements and the City's stormwater needs. Loans and grants are assumed to fund the capital requirements in the early years, but the capital requirements increase dramatically in years 4 and 5.

Figure 4-2 compares the estimated stormwater CIP by rate scenario before consideration of grants and loans. The capital requirements for the SWMF after consideration of grants and loans is summarized in Figure 4-3. As shown, there is a significant increase in years 4 and 5 that would need to be cost recovered by additional grants/loans, current revenue from the SWMF (Pay Go), or bond proceeds.

FIGURE 4-2
Estimated Stormwater CIP (before grants and loans)

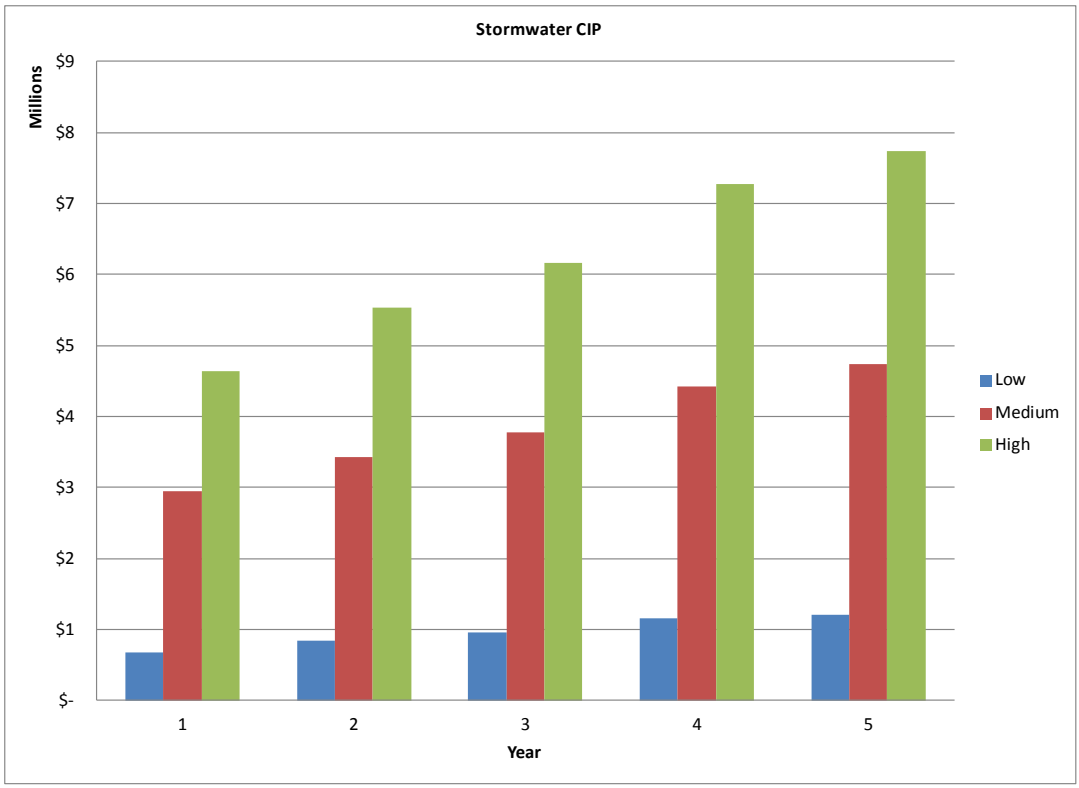


FIGURE 4-3
Estimated Stormwater CIP (after grants and loans)

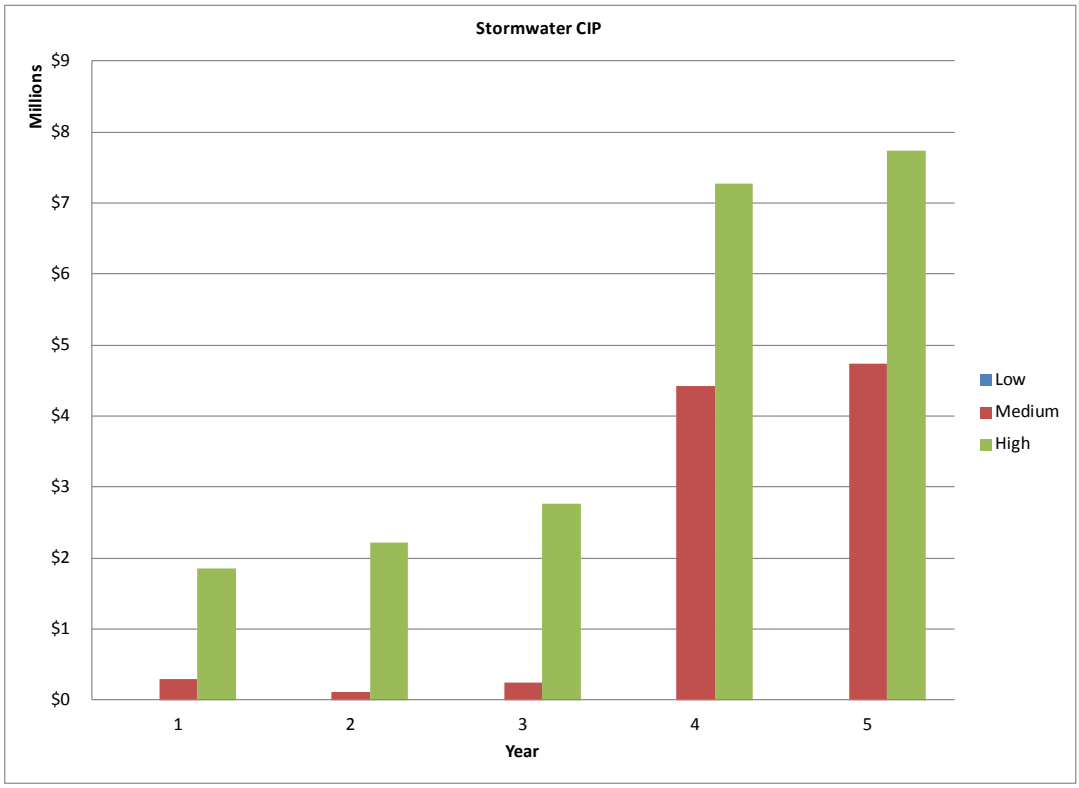
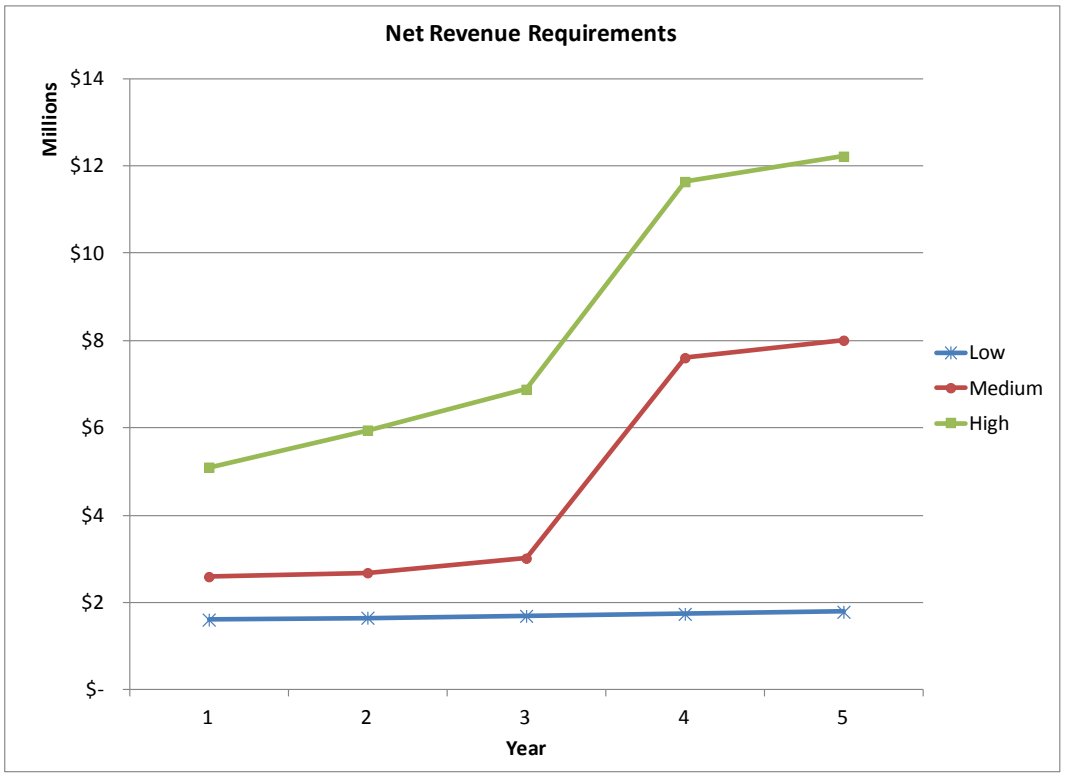


Figure 4-4 compares the net program financial cost requirements for each rate scenario, which also shows the significant increase associated with the capital requirements in years 4 and 5. There are a couple options for cost recovery of the capital requirements. Additional loans/grants would need to be identified to reduce the portion cost recoveredby the SWMF to a level that does not require significant rate increases. Assuming that no additional loans/grants are available, the SWMF would need to fund the capital requirements with current revenues (Pay-Go) or debt financing.

FIGURE 4-4
Estimated Net Revenue (Program Financial Cost Coverage) Requirements (after grants and loans)



To finance the net program cost requirements identified in Figure 4-4 and assuming Pay-Go for financing the CIP, Figure 4-5 summarizes the resulting SWMF by rate scenario. Figure 4-6 summarizes the program costs covered by rate scenario assuming Pay-Go financing. As shown, in order to fund the CIP starting in Year 4, the SWMF for rate scenarios 2 and 3 must increase by at least 100 percent. Consideration of cost recovery for the CIP in years 4 and 5 are important because the same level of capital expenditures may not extend beyond Year 5.

For rate scenarios 2 and 3, a sensitivity analysis of Pay-Go versus debt financing in Year 4 was evaluated. This is important because it helps illustrate how sensitive rates are to financing assumptions. Figure 4-7 summarizes the sensitivity analysis for Rate Scenario 2 and Figure 4-8 summarizes the sensitivity analysis for Rate Scenario 3. The SWMF under the debt financing analysis is lower because the bond proceeds provide the capital to design and construct projects. The annual debt service (to pay for principal and interests on the bond) helps keep the SWMF relatively low by spreading the costs over the useful life of the stormwater facilities.

FIGURE 4-5
Comparison of SWMF by Rate Scenario (Pay-Go financing)

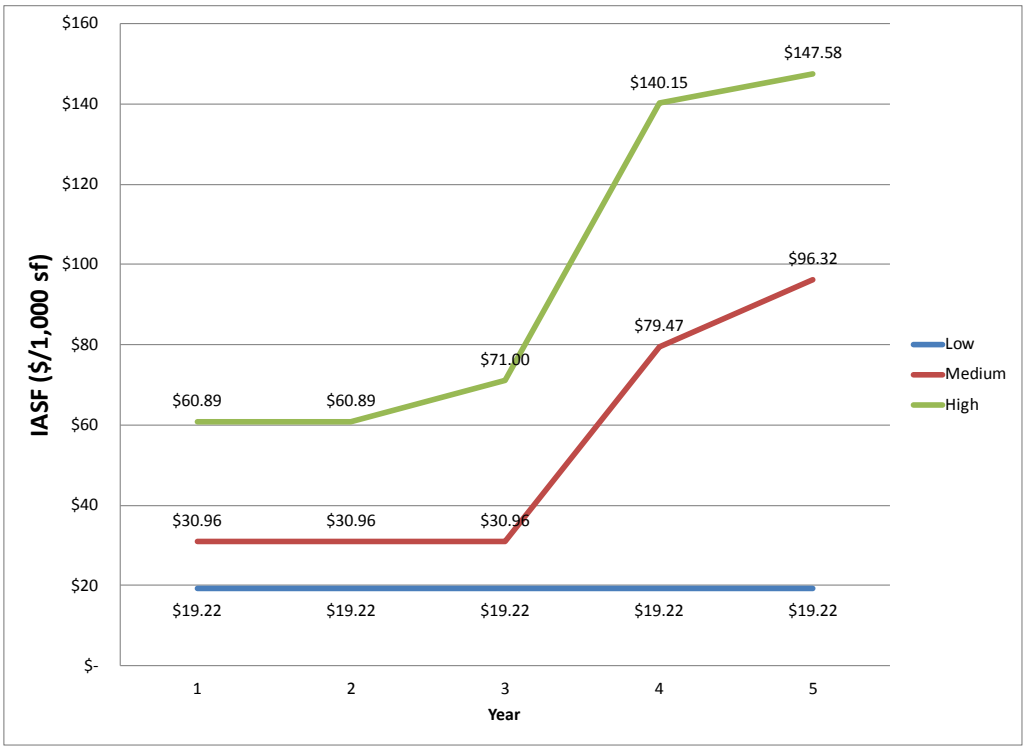


FIGURE 4-6
Comparison of Program Cost Covered by the SWMF by Rate Scenario (Pay-Go financing)

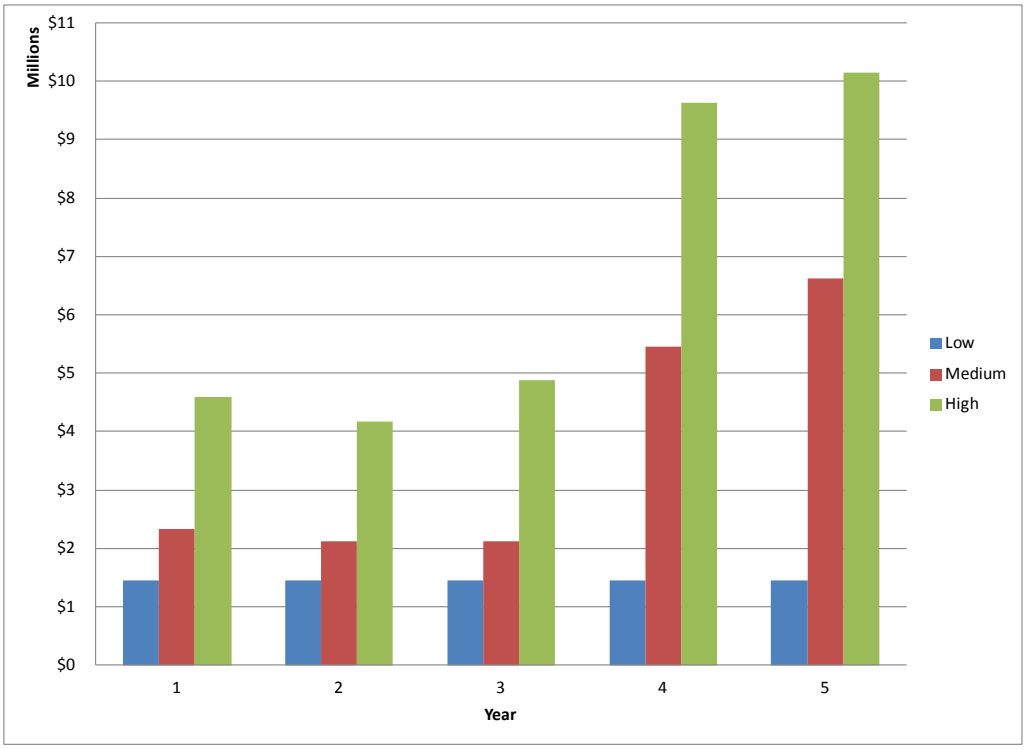


FIGURE 4-7
Sensitivity of Bond versus Pay-Go financing (Rate Scenario 2 – Medium Level of Service)

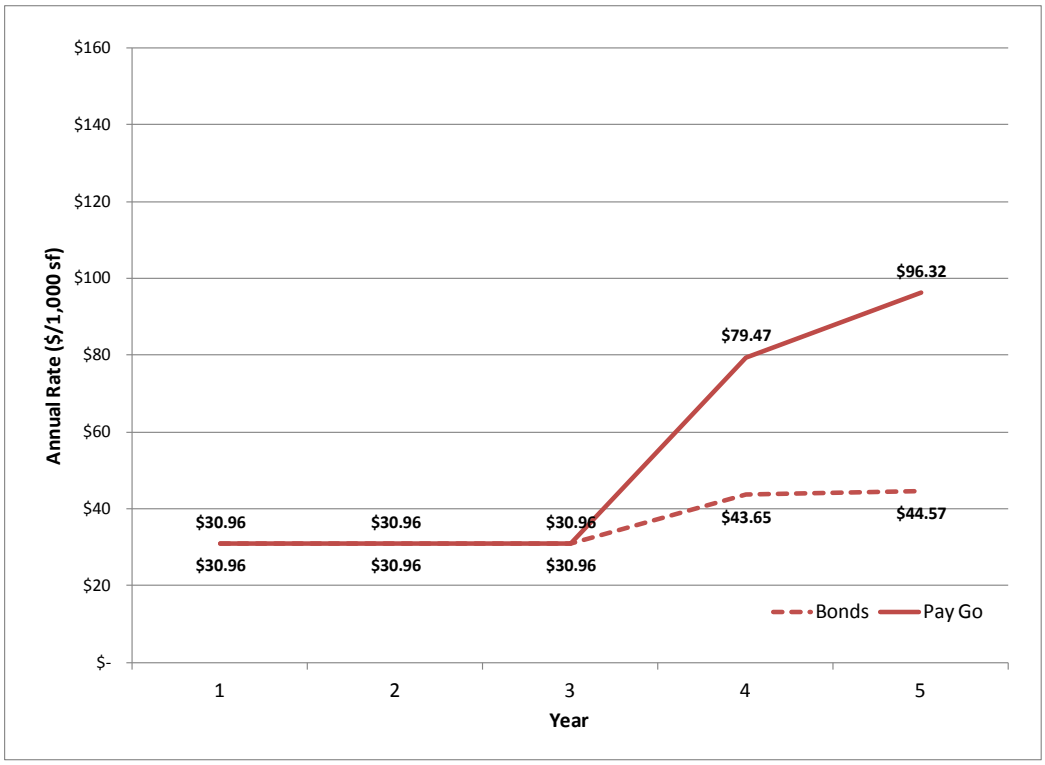
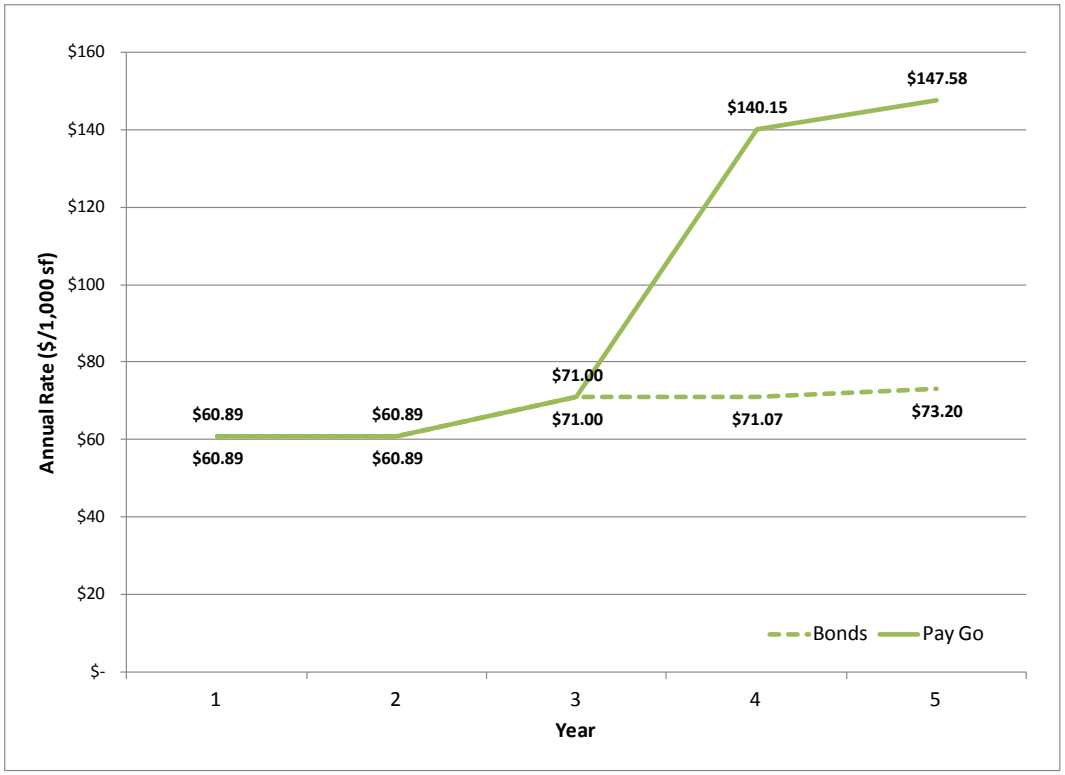


FIGURE 4-8
Sensitivity of Bond versus Pay-Go financing (Rate Scenario 3 – High Level of Service)



4.6 Alternatives to SWMF

For comparative purposes, a simple analysis of alternatives to the SWMF was prepared. This analysis evaluated Rate Scenario 2 – Medium Level of Service only. The alternatives include a dedicated portion of the millage rate (the City's property tax) and an incremental increase to the sewer rate. The alternatives were compared to the tiering method rate structure (Section 3.3.3). Table 4-19 and Figure 4-9 compare the alternatives and annual charges for example properties to generate $2,593,400 (i.e., net program financial cost requirements for Rate Scenario 2 - Medium Level of Service Pay-Go Year 1.). Based on the example presented in Table 4-19, some properties would pay less with the SWMF than a dedicated tax or sewer charge. For properties with large amount of IA, the SWMF could be higher than a dedicated tax or sewer charge. This underscores the equity and fairness principal of the SWMF. Because IA generates stormwater runoff that affects water quality and the environment, an IA- based fee is the most appropriate mechanism.

TABLE 4-19
Comparison of Alternatives to the SWMF

	Impervious Area Fee	Dedicated Tax	Sewer Charge
Rate to generate $2,593,400 (d)	$31	$1.329	$1.69
Units	$ / 1,000 sf (a)	$ per mil (b)	$ per 1,000 gal (c)
Single-Family Residential - Tier 1	$15	$73	$98
	668 sf	$55,200	58,000 gallons
Single-Family Residential - Tier 2	$46	$79	$144
	1,155 sf	$59,500	85,000 gallons
Single-Family Residential - Tier 3	$104	$216	$44
	3,373 sf	$162,900	26,000 gallons
Multi-Family Residential	$1,322	$439	$127
	28,578 sf	$330,000	819,000 gallons
Industrial	$10,603	$2,787	$499
	342,842 sf	$2,096,900	295,000 gallons
Commercial	$600	$321	$46
	19,389 sf	$241,700	27,000 gallons
Private Parking Lot	$1,822	$382	$0
	58,859 sf	$287,400	0 gallons

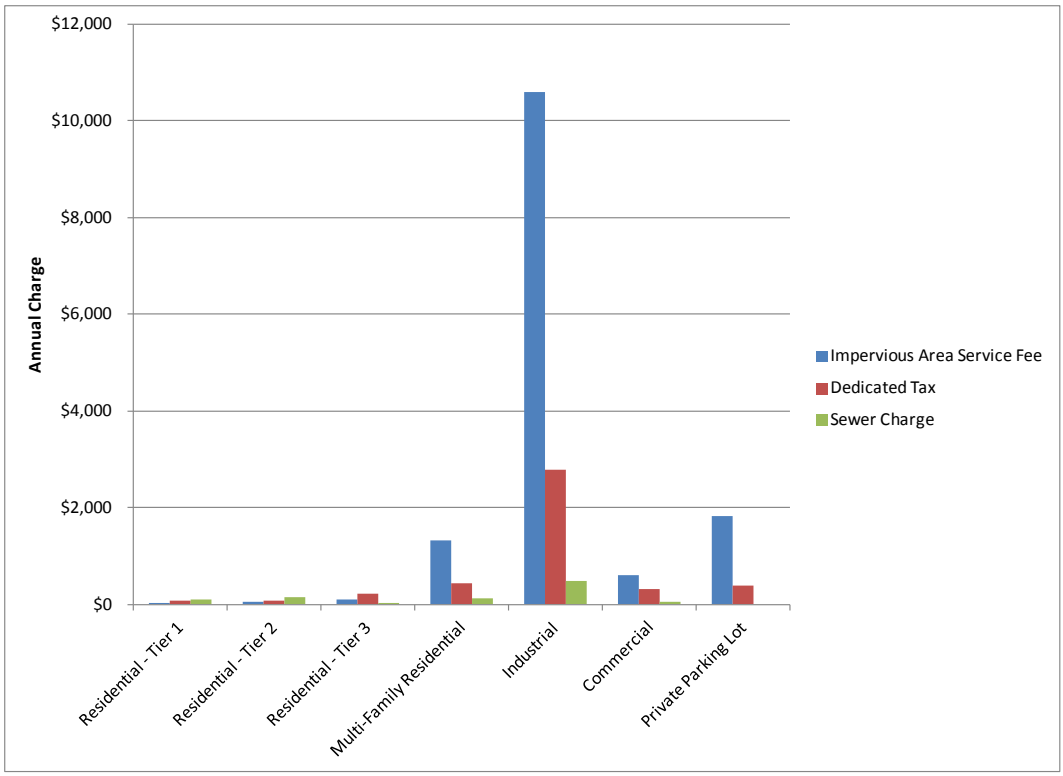
(a) assumes 83,745 ERUs based on tiering method (4 tiers).

(b) assumes FY 2011 $1,951,689,300 of total assessed property value. A mill is equal to $1 in taxation for every $1,000 of assessed value of the property. The 2011 millage rate for the City of Lancaster is 12.04 mils. This analysia is not based on an actual fiscal impact analysis and is provided for illustrative purposes.

(c) assumes FY 2011 1,532 million gallons for in-city water consumption, based on 247 gallons per day per account and 17,000 in-city accounts. Sewer bills are issued quarterly and based on declining block rate structure. The first 75,000 gallons is $3.7087 per 1,000 gallons; the next 925,000 gallons is $2.7966 per 1,000 gallons; and additional usage greater than 1,000,000 is $2.0844. This analysis is not based on an actual cost of service rate study and is provided for illustrative purposes.

(d) assumes Net Program Financial Cost Requirements for Rate Scenario 2 - Medium Level of Service Pay-Go Year 1.

FIGURE 4-9
Comparison of Annual Charge for Alternatives to the SWMF



SECTION 5

Summary Results and Recommendation

5.1 Summary Results

- The City of Lancaster is faced with recent regulatory requirements such as the MS4 permit and consent orders related to CSOs, both of which are associated with stormwater runoff.
- Several policy papers have been developed and presented to the GIAC in order to review aspects of the proposed SWMF. In addition, these policy papers also help inform the SWMF rate modeling.
- The SWMF Rate Model evaluated the program costs based on three LOS alternatives identified in Technical Memorandum #1. These were aligned with the three rate scenarios. The low LOS represents the current conditions and does not consider the program needs to meet all MS4 permit and other regulatory requirements. The high LOS considers program needs above and beyond MS4 permit and other regulatory requirements. The medium LOS represents the estimated program needs to stratify MS4 permit and other regulatory requirements.
- IA estimates were developed based on aerial photography and digitization of IAs included the City's geographic information system. The geographic information system data were analyzed to develop three rate structure options (ERU method, total IA method, and tiering method). The top 10 property owners based on total IA represents approximately 30 percent of the total IA in the city. Based on feedback from the GIAC, the tiering method was used in the three rate scenarios because it represents the most reasonable and equitable method.
- The program financial cost requirements include the program costs, debt service, and equity cost recovered CIP (Pay-Go) plus allowances for operating reserve, uncollectible accounts, and SWMF credits. Non-rate program financial costs (i.e., interest income, grants/loans) are subtracted from the costs and help to minimize the impacts on the SWMF. The net program financial cost requirements also represent the portion of the total program financial cost requirements that needs to be generated through the SWMF to cover stormwater management costs and other financial commitments.
- The capital requirements represent the largest expense item. The use of grants and loans in early years offset the CIP cost and help to keep the SWMF low. However, in years 4 and 5 the capital requirements increase significantly because available grants/loans are exhausted, which affects the SWMF.
- For rate scenarios 2 and 3, a sensitivity analysis of Pay-Go versus debt financing was considered. This is important because it helps illustrate how sensitive rates are to financing assumptions. For example, if a utility is facing a significant CIP, Pay-Go financing could result in high rates. If debt financing is possible, the utility can generate the necessary capital and the annual debt service payments help keep the rates relatively low.
- Alternatives to the SWMF include a dedicated portion of the millage rate or addition to the sewer charge. The equivalent rates to fund the Year 1 of Rate Scenario 2 (medium LOS) were evaluated. Although these alternative rates could cover the program costs, they do not address the equity and fairness principle in that the charge is not based on contribution to stormwater runoff.

5.2 Recommendation

Our recommendation is the cost recovery plan identified under Rate Scenario 2, including the following:

- Use the program costs for the medium LOS.
- Use of PennVest loan and other grants to fund capital requirements in years 1 -3.
- Use the tiering method (four tiers) rate structure, which is applied to all properties.

- To fund capital requirements in years 4 and 5, identify additional grants/loans or consider the use of debt financing.

Attachment A
Stormwater Utility Program Needs Policy Paper

Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*:

Policy Issue: What is funded by the proposed Stormwater Utility?

Overview

There are several types of funding sources, which may include one or a combination of *Ad valorem* taxes, grants, loans, and/or user charges. A stormwater utility is a funding mechanism that is dedicated for a variety of stormwater program elements, which may include conveyance, maintenance, and capital improvements. Currently, the City's General Fund and Sewer Fund are the source of funding for stormwater programs. In order to consider funding source, it is important to define the costs and level of service for stormwater programs. The purpose of this policy paper is to define what program elements (O&M and CIP) should be funded by the proposed stormwater utility fee pursuant to Pennsylvania law.

A stormwater utility can fund O&M and/or capital projects. O&M can include administrative costs, inspection/maintenance costs, billing/collection costs, and other stormwater related functions. Capital project costs can include rehabilitation and replacement of stormwater facilities. Program elements that could be funded by the stormwater utility fee include the following:

- Capital Improvement Projects
    - Green Infrastructure Program (tables 5.9 and 5.10 from GI plan)
    - CSO / wet weather related projects from wastewater CIP (funding source = sewer fund)
    - Catch Basin Rehabilitation and Replacement
    - Storm Drain Rehabilitation and Replacement
    - Stormwater / Drainage Master Plan CIP, for flood relief (not funded)
- Program Administration
    - Billing and Collection
    - Incentive/Credit Program (costs of administering program)
- Inspections and Maintenance
    - Green Infrastructure
    - Dry and Wet Ponds (inspection only, privately owned so not currently maintained by the City)
    - Street Sweeping
    - Catch Basin
    - Drainage Ditch
    - CSO / wet weather facilities (funded by sewer fund)
        - Diversion Chambers
        - Junction Chambers
        - Manholes
        - Outfalls
        - Pressure Junction
        - Pump Station
        - Force Main Sewer
        - Gravity Main Sewer
        - Flow Monitoring
- NPDES Phase II Implementation (MS4 Permit)
    - Public Education
    - Public Participation / Involvement
    - Illicit Discharge Detection / Elimination
    - Construction Site Runoff Control
    - Post-Construction Stormwater Management
    - Pollution Prevention
- Water Quality Monitoring (TMDL compliance)
- Floodplain Management (not funded)
- Wastewater Treatment (funding source = sewer fund)

Exhibits 1a- e provides summary tables of the level of service assumptions. Exhibit 2 shows the estimated maintenance costs by level of service. Exhibits 3a-c summarizes the estimated capital costs for the low, medium, and high level of service options. Exhibits 4a-b summarizes the estimated capital costs for the high level of service option. Exhibit 5a-b summarizes overall capital and maintenance costs for 3 levels of service options.

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Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*:

Policy Issue: What is funded by the proposed Stormwater Utility?

Consultant Recommendation

- _____

Policy Options

- Level of Service Alternative 1 – Current Level of Service and MS4 Permit Implementation
- Level of Service Alternative 2 – GI Plan Implementation (public only), MS4 Permit Implementation, Increased Maintenance and Customer Service
- Level of Service Alternative 3 – GI Plan Implementation, MS4 Permit Implementation, High Level of Maintenance and Customer Service

Issues, Concerns, Benefits

- Level of Service Alternative 3 would provide funding for a comprehensive program that includes preventive and corrective maintenance, inspection of facilities, additional CIP projects, drainage master planning. However, the rate per ERU may not be politically acceptable.
- Level of Service Alternative 1 provides only the bare bones program with very little advancement above the current program. The fee is nominal, but the services are not comprehensive.
- Level of Service Alternative 2 provides advancement above the current program, including implementation of GI Plan elements on public property
- Related policy issues include debt financing of CIP, payment of existing debt service for current CIP.
- A separate policy decision will need to be made on whether existing program elements funded by the sewer fund will be funded by an impervious area fee, or whether new program costs due to regulatory drivers would be paid by the fee.

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Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*:

Policy Issue: What is funded by the proposed Stormwater Utility?

Advisory Committee Comments

What is funded by the Program?

- The City clarified that currently the potable water usage is used to apportion costs for all sewer related city services including storm water
- Question: is the user fee going to just reapportion existing costs or will it also pay for the increase in program costs due to new elements and LOS increases? Response: it was clarified that this is a key decision that needs to be made. But the purpose of considering low, medium and high program costs in developing fees is to bracket likely choices in terms of what programs could be funded by the fee.
- It was indicated that there is an inequity in using the current water/sewer fee system (based on water usage) to pay for stormwater/CSO issues, that are based on volume of runoff from each property.
- It was recommended to add flood relief to clarify the result of a storm water/drainage master plan on the CIP list
- The City indicated that the CSO and treatment facility cost would remain in sewer fund
- Illicit discharge detection and elimination (IDDE) and cross-connections were discussed as a cost due to the need to inspect the system to determine presence of cross connected laterals, illegal connections, and sources of wet weather flow into the sanitary sewer system including sump pumps.
- It was suggested that we consider including a provision for expenses that we may not be thinking of (e.g. nutrient trading). The City clarified the role of the budget for nutrient credit purchase/sale in the sewer fund that provides the City with a cost benefit for its treatment of nutrients at the AWWTP beyond the level required in its current allocation.

What Level of Service (LOS) Scenarios should be included in rate structure analysis

- It was questioned if the LOS would result in EPA acceptance of programs. Response: EPA rarely goes on record approving programs, so there's no certainty in what LOS is acceptable to meet EPA goals.
- The regulatory drivers for the program were discussed including the uncertainties imposed by the EPA administrative order, the TMDL and future changes that are likely to occur in the City's MS4 permit
- It was suggested have a level of service between 2&3 to provide more granularity in options for LOS to help clarify the understanding of the potential acceptability of the various program components.
- It was suggested that LOS1 might be worth taking off the table. However, others pointed out that LOS1 illustrates the concept of the equity principle and is important to keep
- City indicated that the permit requirement is to clean once / year
- Action - Fix level of service for street sweeping (CH2MHILL)
- Need to clarify the pollutant removal benefits of Street sweeping (City has provided estimates for the WIP)
- It was noted that outreach could help reduce investments in ongoing street sweeping and inlet cleaning
- Action - Need to include more intuitive metrics (CH2M HILL)

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Stormwater Utility Program Needs **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 1** *Date Prepared*: April 25, 2012 *Date Revised*: May 9, 2012 *Date Final*:
Policy Issue: What is funded by the proposed Stormwater Utility?	
Decision/Action	

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Exhibit 1a

Catch Basin (n = 1,910)	Level of Service 1		Level of Service 2		Level of Service 3	
Activity	**Number/ Linear feet**	**Frequency**	**Number/ Linear feet**	**Frequency**	**Number/ Linear feet**	**Frequency**
Inlet Cleaning	2,747	1x per year	2,747	1x per year	2,747	2x per year
Rehabilitation / Replacement	72	Per year	72	Per year	72	Per year

Exhibit 1b

Street Sweeping (~300 miles)	Level of Service 1	Level of Service 2 (current funding)	Level of Service 3
Activity	**Frequency**	**Frequency**	**Frequency**
Routes 1-8	2 per month	2 per month	3 per month
Development Route	2 per month	2 per month	3 per month
Alleys	2 per month	2 per month	3 per month
Park City Route	2 per month	2 per month	3 per month
5th Week Route	2 per month	2 per month	3 per month
Downtown District	5 per week	5 per week	5 per week

Exhibit 1c

Storm Sewer (79 mi MS4, 26 mi CSS)	Level of Service 1		Level of Service 2		Level of Service 3	
Activity	**Number/ Linear feet**	**Frequency**	**Number/ Linear feet**	**Frequency**	**Number/ Linear feet**	**Frequency**
Maintenance	Current Funding Level					
Rehabilitation	None	N/A	80%	100 yrs	80%	75 yrs
Replacement	None	N/A	20%	100 yrs	20%	75 yrs

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Exhibit 1d

GI Infrastructure (O&M)	Level of Service 1		Level of Service 2		Level of Service 3	
Activity	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency	Number/ Linear feet	Frequency
Vegetated Roof						
Inspection						
Maintenance			30,300 sf	Per year	30,300 sf	Per year
Infiltration Trenches w/ Pretreatment Inlets						
Inspection						
Maintenance			115 ea	Per year	115 ea	Per year
Porous Pavement Systems						
Inspection						
Maintenance			142,900 sf	Per year	142,900 sf	Per year
Bioretention/Rain Gardens						
Inspection						
Maintenance			66,000 sf	Per year	66,000 sf	Per year
Tree Plantings/Trenches						
Inspection						
Maintenance			1,250 ea	Per year	1,250 ea	Per year
Cisterns						
Inspection						
Maintenance			5 ea	Per year	5 ea	Per year

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Exhibit 1e

MS4 Implementation (6 minimum controls)	Level of Service 1		Level of Service 2		Level of Service 3	
Activity	**Number/ Linear feet**	**Frequency**	**Number/ Linear feet**	**Frequency**	**Number/ Linear feet**	**Frequency**
Public Education **Public Participation / Involvement** **Illicit Discharge Detection / Elimination** **Construction Site Runoff Control** **Post-Construction Stormwater Management** **Pollution Prevention**						

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Exhibit 2

Maintenance	Estimated Annual Inspection/ Maintenance Costs		
	Low	Medium*	High*
Green Infrastructure			
Green Streets		$29,000	$36,250
Park Improvements / Greening		$24,000	$30,000
Disconnection, Porous Pavement		$16,000	$20,000
Porous Pavement, Bioretention		$3,000	$3,750
Vegetated Roofs / Disconnection		$10,000	$12,500
Disconnection/Rain Gardens		---	---
Enhanced Tree Planting		$50,000	$62,500
Green Schools		$30,000	$37,500
Sub-total Green Infrastructure		**$162,000**	**$202,500**
Dry and Wet Ponds (inspection only)	TBD	TBD	TBD
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	TBD	$112,000	$155,000
Storm Drainage	TDB	TBD	TBD
MS4 Implementation			
Public Education		$9,100	$9,100
Public Participation / Involvement		$11,250	$11,250
Illicit Discharge Detection / Elimination		$53,800	$53,800
Construction Site Runoff Control		$52,600	$52,600
Post-Construction Stormwater Management		$17,800	$17,800
Pollution Prevention		$305,212	$305,212
Program Administration			
Billing and Collection	TBD	TBD	TBD
Incentive/Credit Program	TBD	TBD	TBD
NPDES permit	$36,000	$36,000	$36,000
Plan Review	$23,000	$23,000	$23,000

*GI Plan Annual Maintenance Costs are for the 5th Year of GI Implementation

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Exhibit 3a

Capital Costs (Low LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$132,600	$132,600	$132,600	$132,600	$132,600
Park Improvements / Greening	$50,000	$50,000	$50,000	$50,000	$50,000
Disconnection, Porous Pavement	$58,200	$58,200	$58,200	$58,200	$58,200
Porous Pavement, Bioretention	$70,200	$70,200	$70,200	$70,200	$70,200
Vegetated Roofs / Disconnection	$93,600	$93,600	$93,600	$93,600	$93,600
Disconnection/Rain Gardens	$131,000	$131,000	$131,000	$131,000	$131,000
Enhanced Tree Planting	$143,800	$143,800	$143,800	$143,800	$143,800
Green Schools	$51,200	$51,200	$51,200	$51,200	$51,200
Storm Drainage					
MS4					
Rehabilitation					
Replacement					
Information Management					
CSS					
Rehabilitation					
Replacement					
Information Management					
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$894,600**	**$894,600**	**$894,600**	**$894,600**	**$894,600**

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Exhibit 3b

Capital Costs (Medium LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$530,000	$530,000	$530,000	$530,000	$530,000
Park Improvements / Greening	$199,800	$199,800	$199,800	$199,800	$199,800
Disconnection, Porous Pavement	$232,400	$232,400	$232,400	$232,400	$232,400
Porous Pavement, Bioretention	$28,100	$28,100	$28,100	$28,100	$28,100
Vegetated Roofs / Disconnection	$138,800	$138,800	$138,800	$138,800	$138,800
Disconnection/Rain Gardens	$0	$0	$0	$0	$0
Enhanced Tree Planting	$575,000	$575,000	$575,000	$575,000	$575,000
Green Schools	$205,000	$205,000	$205,000	$205,000	$205,000
Storm Drainage					
MS4					
Rehabilitation	$667,000	$667,000	$667,000	$667,000	$667,000
Replacement	$417,000	$417,000	$417,000	$417,000	$417,000
Information Management	$2,000	$2,000	$2,000	$2,000	$2,000
CSS					
Rehabilitation	$220,000	$220,000	$220,000	$220,000	$220,000
Replacement	$137,000	$137,000	$137,000	$137,000	$137,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$3,517,100**	**$3,517,100**	**$3,517,100**	**$3,517,100**	**$3,517,100**

Exhibit 3c

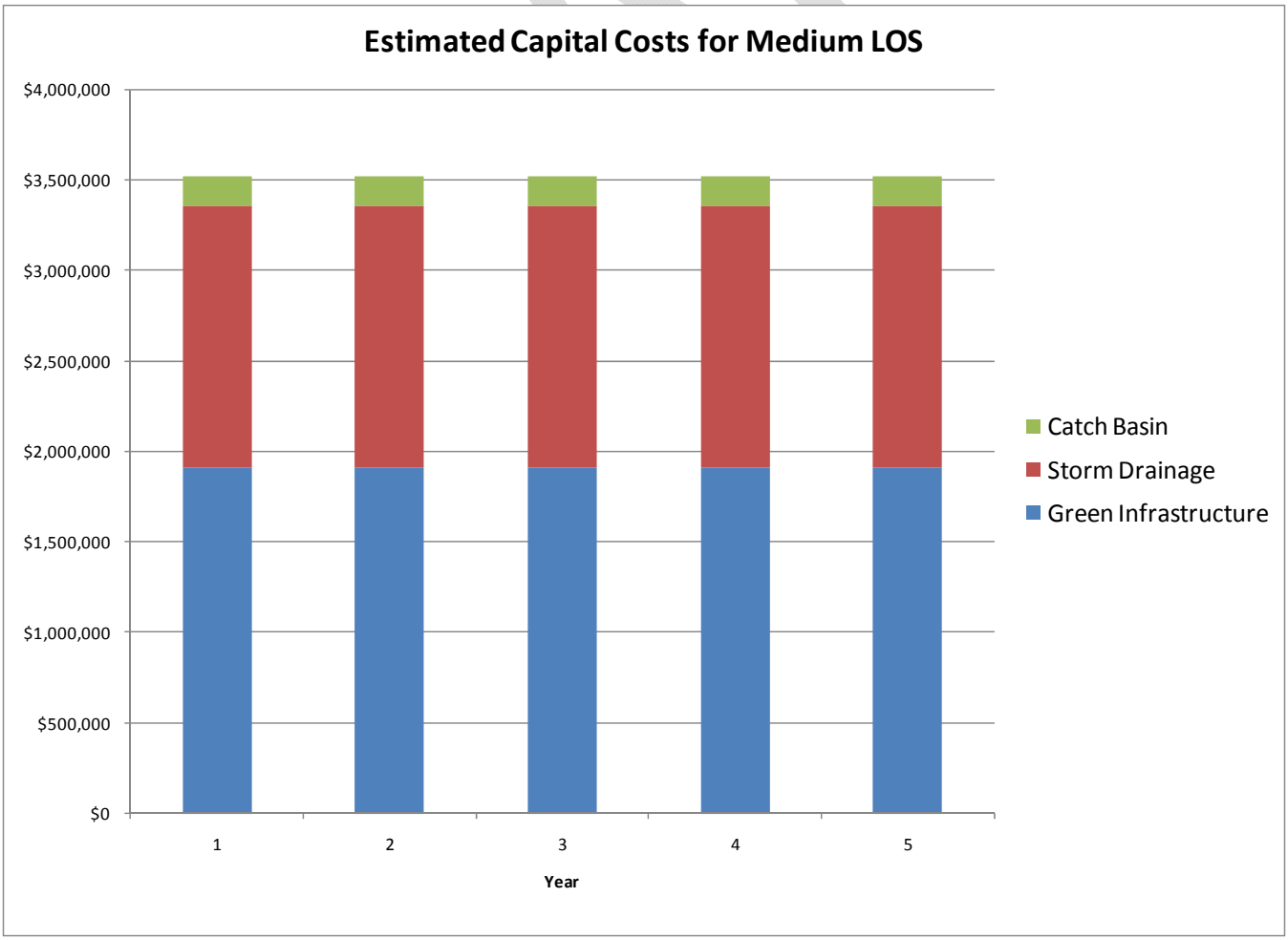

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Exhibit 4a

Capital Costs (High LOS)	Year 1	Year 2	Year 3	Year 4	Year 5
Green Infrastructure					
Green Streets	$662,600	$662,600	$662,600	$662,600	$662,600
Park Improvements / Greening	$249,800	$249,800	$249,800	$249,800	$249,800
Disconnection, Porous Pavement	$290,600	$290,600	$290,600	$290,600	$290,600
Porous Pavement, Bioretention	$351,200	$351,200	$351,200	$351,200	$351,200
Vegetated Roofs / Disconnection	$468,000	$468,000	$468,000	$468,000	$468,000
Disconnection/Rain Gardens	$655,200	$655,200	$655,200	$655,200	$655,200
Enhanced Tree Planting	$718,800	$718,800	$718,800	$718,800	$718,800
Green Schools	$256,200	$256,200	$256,200	$256,200	$256,200
Storm Drainage					
MS4					
Rehabilitation	$890,000	$890,000	$890,000	$890,000	$890,000
Replacement	$556,000	$556,000	$556,000	$556,000	$556,000
Information Management	$3,000	$3,000	$3,000	$3,000	$3,000
CSS					
Rehabilitation	$293,000	$293,000	$293,000	$293,000	$293,000
Replacement	$183,000	$183,000	$183,000	$183,000	$183,000
Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
Catch Basin					
Rehabilitation	$82,000	$82,000	$82,000	$82,000	$82,000
Replacement	$82,000	$82,000	$82,000	$82,000	$82,000
Total	**$5,637,400**	**$5,637,400**	**$5,637,400**	**$5,637,400**	**$5,637,400**

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Exhibit 4b

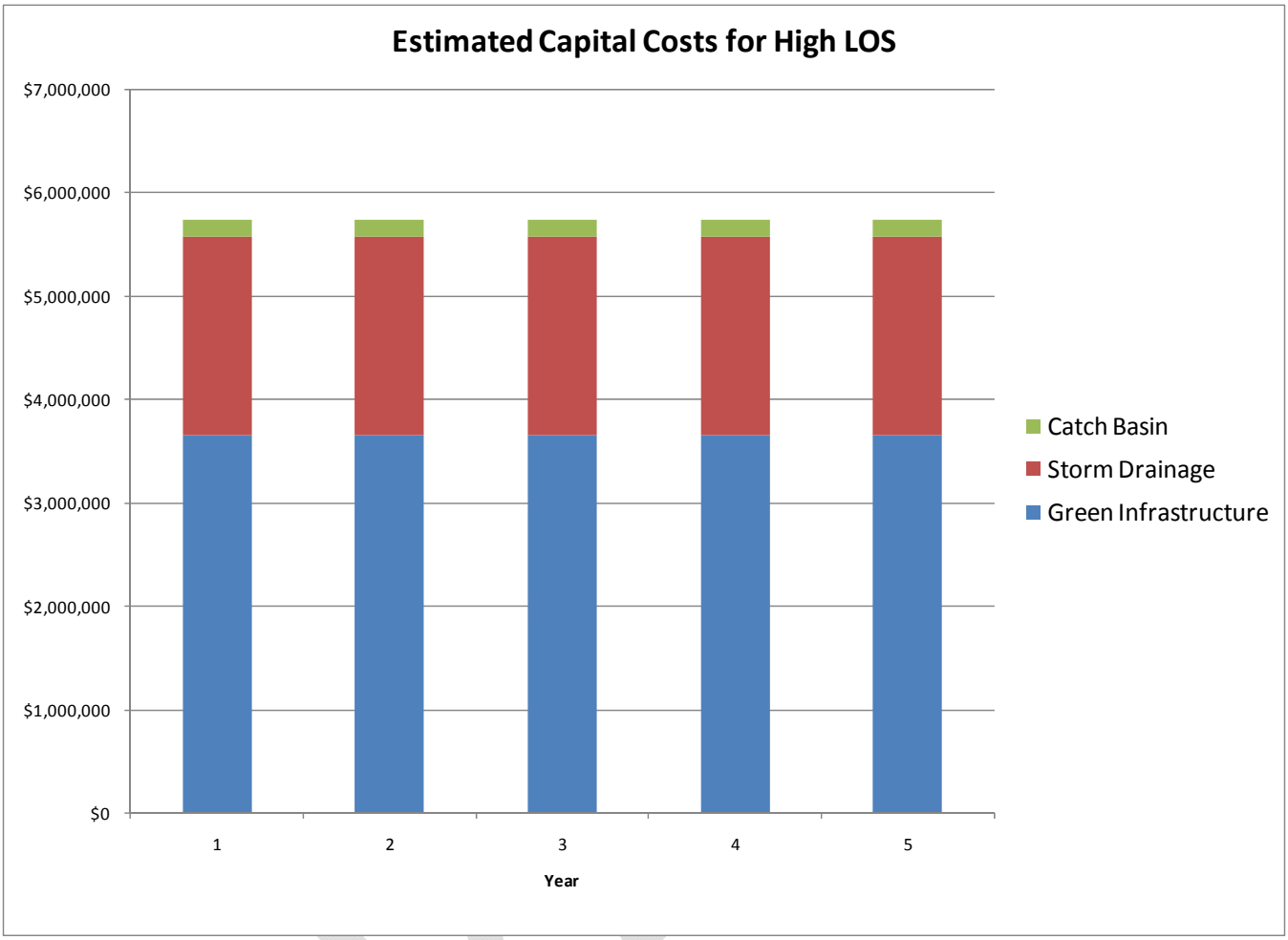

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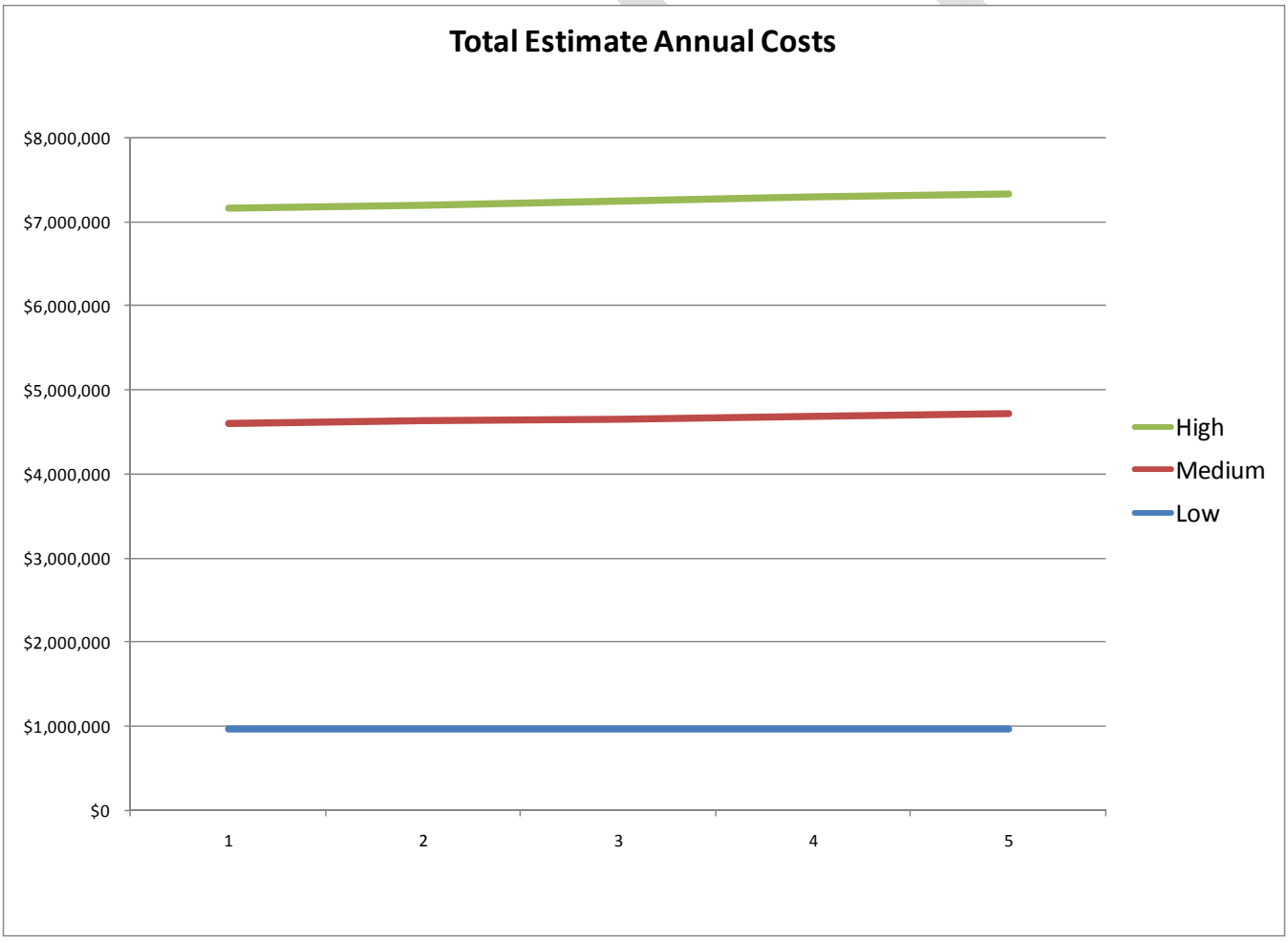
Exhibit 5a

	Estimated Annual Costs		
	Low	**Medium**	**High**
Operating and Maintenance			
Green Infrastructure*	TBD	$162,000	$202,500
Dry and Wet Ponds (inspection	TBD	TBD	TBD
Street Sweeping	$168,800	$168,800	$234,100
Catch Basin	TBD	$201,000	$402,000
Storm Drainage	TBD	TBD	TBD
MS4 Implementation	$449,762	$449,762	$449,762
Program Administration	$149,000	$226,000	$303,000
Capital Costs			
Green Infrastructure	$730,600	$1,909,100	$3,652,400
Storm Drainage		$1,444,000	$1,926,000
Catch Basin	$164,000	$164,000	$164,000
Total	**$1,662,162**	**$4,724,662**	**$7,333,762**

*GI Plan Annual Maintenance Costs are for the 5th Year of GI Implementation

Exhibit 5b



Attachment B
Stormwater Utility Rate Structure and Rates Policy Paper

Stormwater Utility Rate Structure and Rates **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 2** *Date Prepared*: May 10, 2012 *Date Revised*: May 24, 2012 *Date Final*:

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

The rate structure for most stormwater utilities is setup so that single-family residential properties pay 1 ERU (Equivalent Residential Unit) and multi-family or non-residential properties pay based on actual impervious area. The ERU is determined through statistical analysis of the imperviousness of single-family residential parcels. The number of ERUs (billing units) for multi-family or non-residential properties is based on total impervious area divided by the ERU or base unit.

In order to help with equity and fairness of the stormwater charge, municipalities are now starting to develop and implement tiered rate structures that break properties into tiers based on amount of impervious area. This could be applied for single-family properties or all properties. For example, there may be a statistical justification to break single-family residential properties into several categories (i.e., small, medium, large). Or, a tiered rate structure could be applied to all properties.

The total number of billing units, based on the rate structure, is then used to determine the rate. That is, the rate is set to recover total program costs, debt service, equity funded CIP, reserves (revenue requirements). The rate could be expressed as $/ERU or $/1,000 sf.

Policy Options

- Categories Based on Property Class —for this option, there would be multiple categories based on property class. For this option single-family residential (SFR) properties would be charged 1 ERU. All other property classed would be charged based on total impervious area. This method is perhaps the simplest and requires minimal analysis of the residential land use category. This method also has the lowest cost for billing system database implementation and maintenance. However, using 1 ERU for SFR properties is less equitable than ERU categories based size, or tiers.
- Categories Based on Size—for this option, there would be multiple categories, such as small-, medium-, and large sized properties. These categories could also be applied to all properties (commercial, institutional, industrial, faith and non-profit properties) if they fall within the impervious area tier ranges. Properties with impervious area greater than the largest tier would pay based on actual impervious area.

Issues, Concerns, Benefits

- A primary issue or concern involves equity issues. Does a smaller single family property (which contributes less stormwater) pay the same as a larger single family property (which contributes more stormwater), while each receive the same benefit(s) from the city-wide program. The benefits of breaking single family residential properties into several categories or tiers (i.e., more precision) needs to be weighed against the implementation costs of developing and maintaining a tiered rate structure. This method involves additional analysis for billing system implementation and maintenance of impervious area data. However, it more equitably links fees to impervious area size. The more tiers, the higher administrative cost and the greater likelihood of categorizing properties into the wrong tier, and therefore a possibly higher number of appeals of bills.
- Another related consideration is whether gathering and maintaining data for more detailed classification (more tiers) will result in noticeable differences in charges to customers.
- Based on existing GIS data and the property tax database, Figure 1 shows the distribution of impervious area for single-family residential properties, based on available impervious area data[1]. The median value is 1,165 sf and the average 1,368 sf with a 95 percent confidence of 16 sf. For purpose of this analysis, the rate is expressed as $/1,000 sf.

[1] Impervious area were adjusted based on review of 199 properties from 2008 aerials and 2011 parcel boundaries to estimate missing or incorrectly digitized impervious area mapping, and median deviation was applied to adjust the impervious of each property, by class: residential, multi-family, commercial, industrial, institutional, government, parking lot. Adjustment factors ranged from 9 percent for commercial, up to 45 percent for residential.

Stormwater Utility Rate Structure and Rates **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 2** *Date Prepared*: May 10, 2012 *Date Revised*: May 24, 2012 *Date Final*:

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

Table 1 provides a tabular summary of number properties, impervious area, and ERUs for three rate structures.

Figure 1 shows the frequency distribution of impervious area for single-family residential properties.

Figure 2 shows the frequency distribution of impervious for all properties based on a rate structure with 4 tiers. Figure 3 shows the distribution for all properties based on a rate structure with 7 tiers.

Figure 4 compares number of properties and ERUs by property class. This helps illustrate the equity and fairness of basing the stormwater charge on a measure of imperviousness.

A tiered rate structure can help maintain equity for properties with impervious area less than 3,000 sf. Properties with impervious area greater than 3,000 sf pay based on total impervious area.

For illustrative purposes, Tables 2 to 4 show the estimated stormwater charges for three rate structures, on both an annual or a quarterly basis. The rates assume a medium level of service program of $4,800,000.

Rates can increase overtime depending on the O&M programs, CIP, availability of grants/loans, debt service, credits/incentives, and collection rate. Figure 5 illustrates how rates could increase over time assuming the use of grants/loans, pay-go CIP, and repayment of Penn Vest debt service (loan to fund CIP). The low LOS does not assume grants/loans or debt service because the CIP is minimal compared to the medium and high LOS.

Consultant Recommendation

- Based on the analyses presented, it is evident that justification for multiple tiers exists. However, while the equity issue could be used to justify a tiered rate structure, these considerations need to be balanced against considerations of simplicity and implementation/ database maintenance costs. More tiers are recommended for equity reasons, but only if the quality of the impervious area data is high enough to have confidence in categorizing properties into more bins, i.e. smaller impervious area ranges. Current data probably not justify that, but the City expects to get new impervious area data based on a 2012 aerial flyover. Assuming these data are captured at a high resolution, the 7 tier option is recommended, applied to all property types.

Stormwater Utility Rate Structure and Rates **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 2** *Date Prepared*: May 10, 2012 *Date Revised*: May 24, 2012 *Date Final*:

Policy Issue: What type of rate structure should be used for the Stormwater Utility? What is the likely range for the initial rate for the stormwater utility fee?

Decision/Action

Reviewed Rate Structure Options and Preliminary Rates

- Properties pay based contribution to stormwater runoff as determined by a measure of impervious area.
  - There is agreement that Assessed Value of a property does not provide equity in determining the stormwater charge.
- To evaluate rate structure options, a statistical analysis of impervious area was conducted to determine the median and average impervious area for single-family residential properties.
- The typical measure of impervious area is the "equivalent residential unit" and is based on the median or average impervious area of single-family residential properties.
- A recent trend among stormwater utilities is to implement a tier rate structure based on impervious area. The tiers can be applied to single-family residential properties only or they can be applied to all properties.
  - A proposed rate structure with four tiers was presented.
- The number of tiers included depends on characteristics of the municipality. For the City of Lancaster, development can be characterized as urban, many mixed use buildings and attached row houses, and public/private alleys.
- Can a property owner have a stormwater charge of $0?
  - Some municipalities offer 100% credit for on-site stormwater facilities that a property owns and maintains.
  - Majority of municipalities offer partial credit because of off-site benefits received by property owners that the SWU funds.
  - The City is considering a system of credits that will provide property owners the ability to reduce their stormwater charge based on the amount of impervious area treated by eligible stormwater facilities. This is the subject of a separate Policy Paper.
- Based on feedback from the GIAC committee during the May 10, 2012 meeting:
  - There is agreement that a tiered rate structure will help achieve equity and fairness among all properties. This is true because of small non-residential / mixed-use buildings that would fall within the lower tiers.
  - There is an agreement that a tiered rate structure that is applied to all properties makes the most sense.
  - Evaluating a tiered rate structure with more than four tiers is recommended.

Should Quality of Runoff be Reflected in Rates?

- Properties pay based on contribution to stormwater runoff as determined by a measure of impervious area.
- Some properties are likely to be sources of pollutants that are picked up and washed away by stormwater runoff.
- The difficulty is making categorical limits based on property type because not all owners within a property type will be the source of pollutants.
- Some properties are required to have stormwater permits that identify stormwater facilities that treat stormwater runoff before being discharged into the system or waterway.
- As part of the City's MS4 permit there are requirements to help control pollutants

Need Public Outreach Plan to Prevent Politicizing New Fees

- There is concern about the proposed Stormwater Fee becoming politicized because it may be viewed as something the sewer charge already pays for or that this is just another tax.
- The Public Education Plan can help identify ways to gain support the stormwater charge.

TABLE 1
Number of properties and ERUs by stormwater class

Stormwater Class	Estimated Impervious Area (sf)	Number of Properties	ERUs		
			No Tiers*	4 Tiers	7 Tiers
Single Family	18,337,179	13,407	13,407	20,491	21,532
Multi-Family	9,909,174	1,976	9,909	9,942	10,299
Commercial	29,093,647	1,626	29,094	29,176	29,270
Industrial	15,205,021	111	15,205	15,206	15,207
Non-Profit	2,643,843	133	2,644	2,644	2,649
Institutional	4,824,416	44	4,824	4,826	4,826
Government	3,707,181	56	3,707	3,710	3,710
Total	83,720,461	17,353	78,790	85,993	87,491

*Assumes 1 ERU = 1,000 sf and single-family residential properties charge 1 ERU.

FIGURE 1
Impervious Area Distribution of Residential Properties

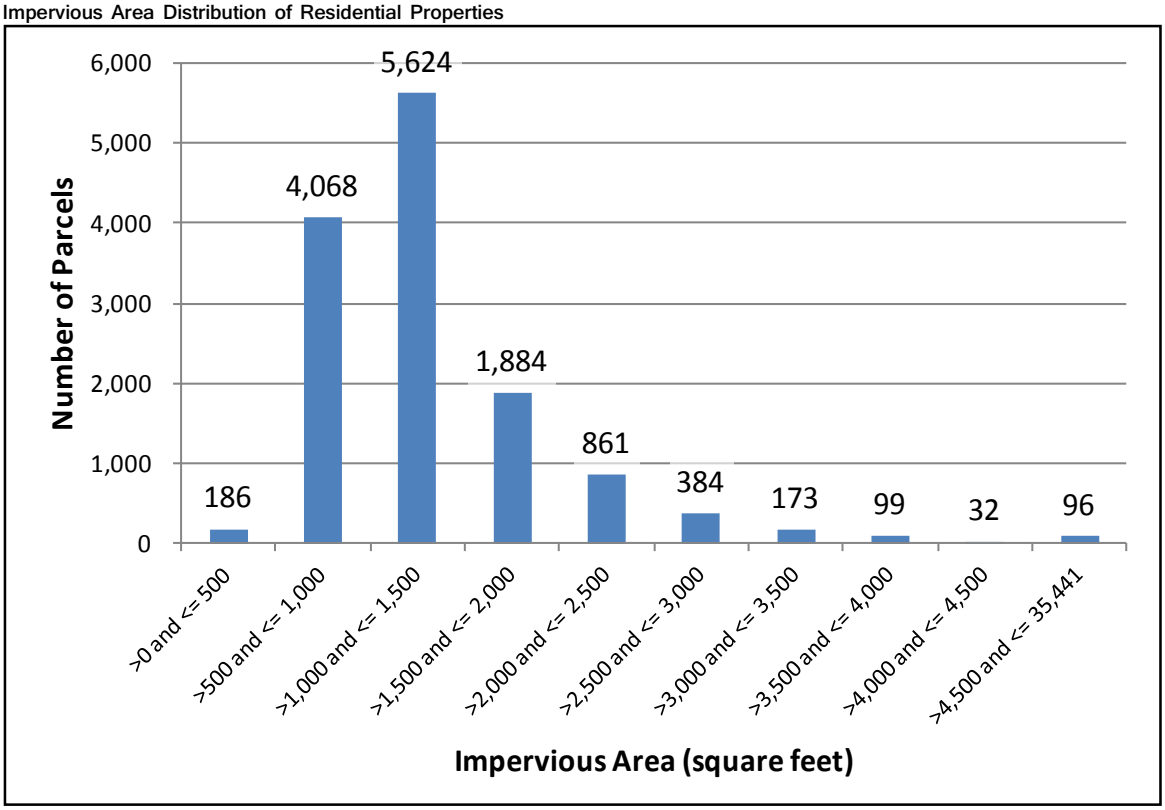


FIGURE 2
Impervious Area Distribution of All Properties and 4 Tier Rate Structure

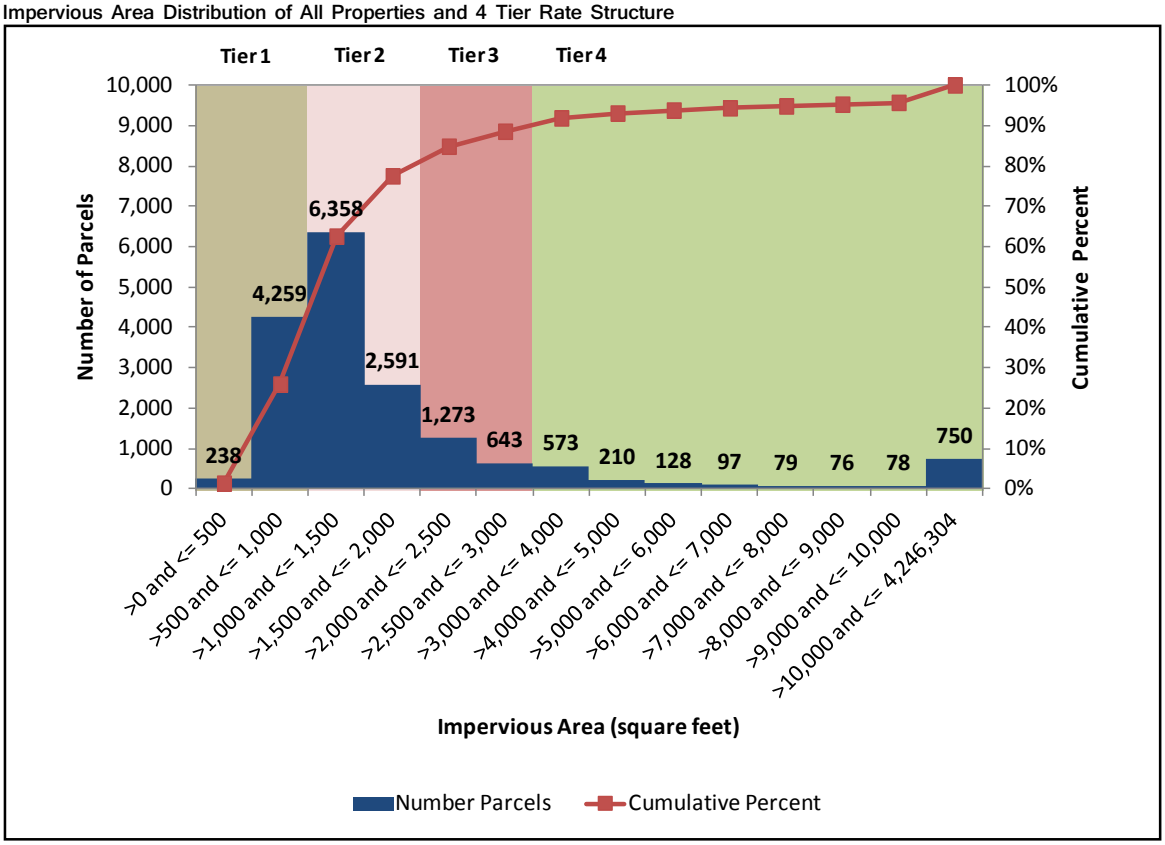


FIGURE 3
Impervious Area Distribution of All Properties and 4 Tier Rate Structure

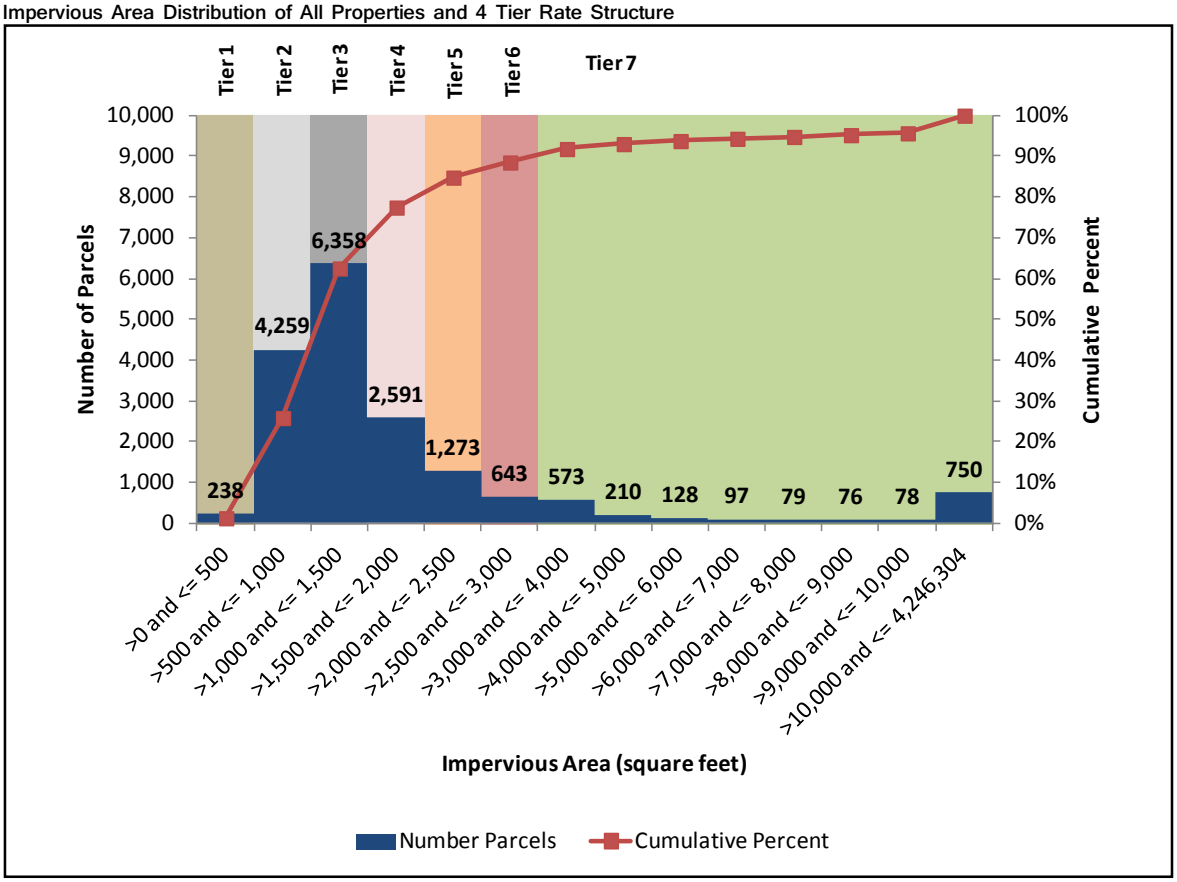


FIGURE 4
Number of properties and ERUs (no tier option) by stormwater class

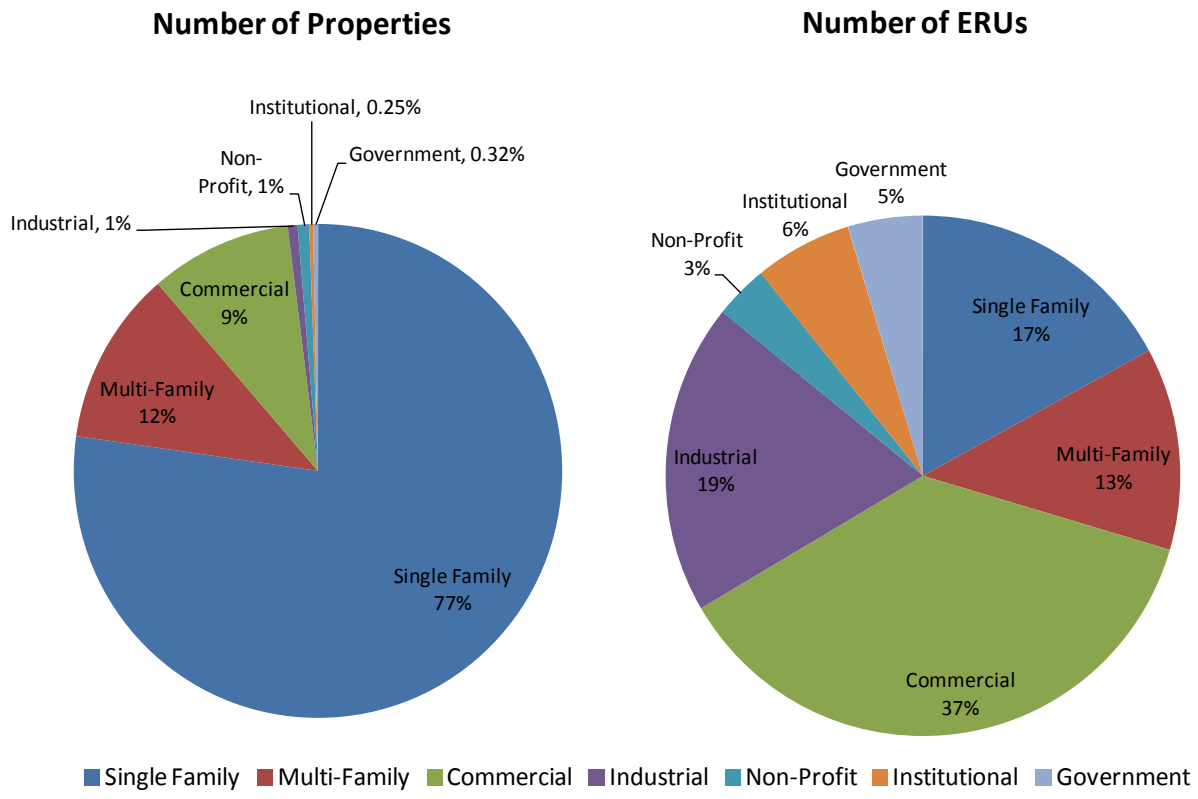


TABLE 2
Proposed No Tier Rate Structure

	Preliminary Stormwater Charge^	
	Annual	Quarterly
Single Family Residential	$61	$15.25
Non-Residential	Charge based on total impervious area $61/1,000 sf	$15.25/1,000 sf
Multi-Family	Charge based on total impervious area $61/1,000 sf	$15.25/1,000 sf

^Assumes medium level of service, a $4,800,000 stormwater program.

TABLE 3
Proposed 4 Tier Rate Structure*

Tier	Impervious Area Range	Preliminary Stormwater Charge^	
		Annual	Quarterly
1	<=1,000 sf	$56	$14
2	>1,000 sf and <=2,000 sf	$84	$21
3	>2,000 sf and <=3,000 sf	$140	$35
4	>3,000	Charge based on total impervious area $56/1,000 sf	$14/1,000 sf

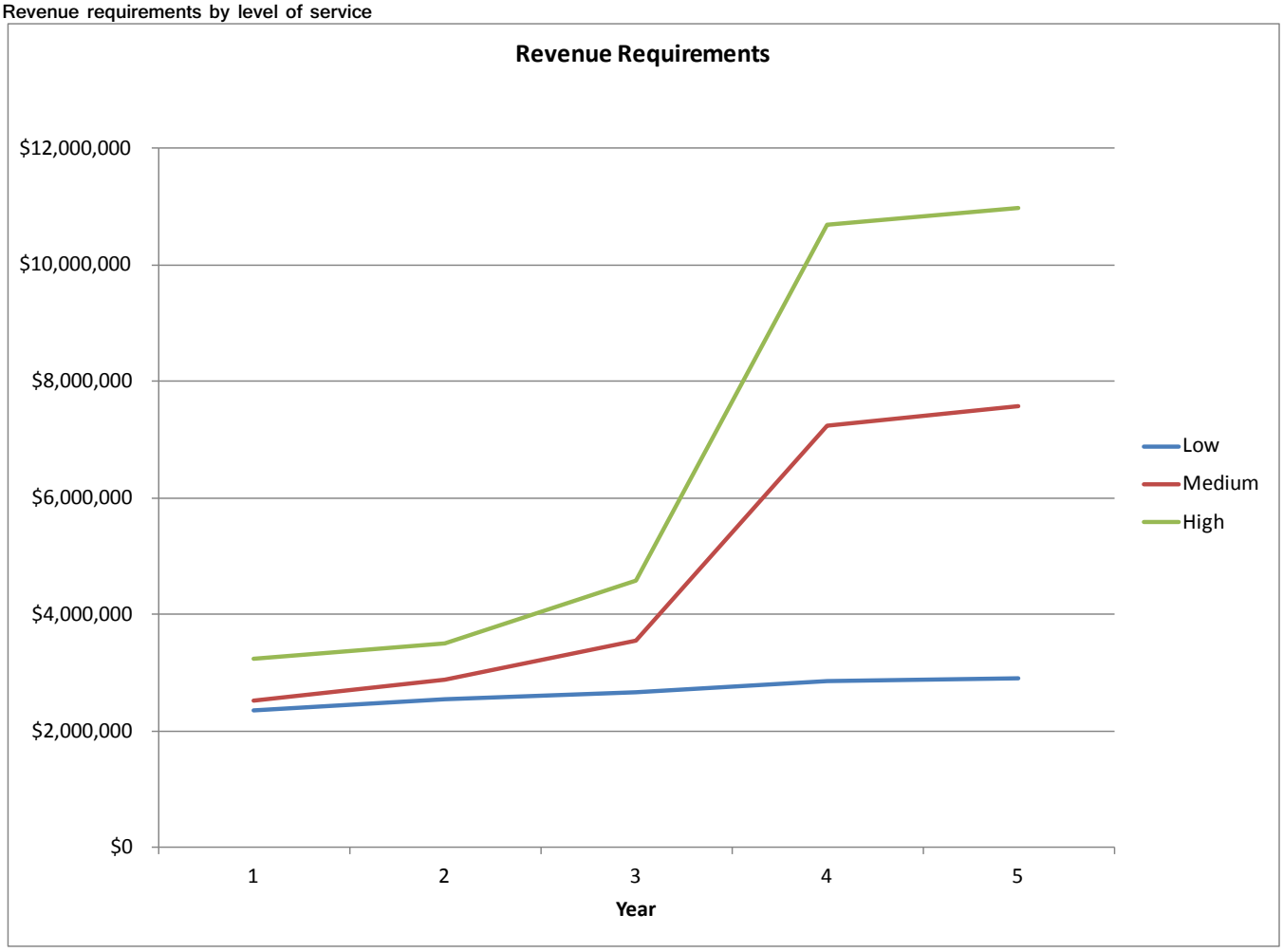
*Applies to all properties
^Assumes medium level of service, a $4,800,000 stormwater program.

TABLE 4
Proposed 7 Tier Rate Structure*

Tier	Impervious Area Range	Preliminary Stormwater Charge^	
		Annual	Quarterly
1	<=500 sf	$24	$6.00
2	>500 sf and <=1,000 sf	$55	$13.75
3	>1,000 sf and <=1,500 sf	$82	$20.50
4	>1,500 sf and <=2,000 sf	$110	$27.50
5	>2,000 sf and <=2,500 sf	$137	$34.25
6	>2,500 sf and <=3,000 sf	$165	$41.25
7	>3,000	Charge based on total impervious area $55/1,000 sf	$13.75/1,000 sf

*Applies to all properties
^Assumes medium level of service, a $4,800,000 stormwater program.

FIGURE 5
Revenue requirements by level of service



Assumes:
Penn Vest debt service, but no new debt service,
Use grants and Penn Vest loan to fund CIP

Attachment C
Stormwater Utility CIP Policy Paper

Stormwater User Charge Rate Structure
Policy Development Summary
City of Lancaster, PA

Policy Paper No. 3

Date Prepared: May 31, 2012
Date Revised:
Date Final:

Policy Issue: For CIP projects with a useful life greater than 20-30 years, should the stormwater utility fund the CIP through rates (i.e. pay-as-you-go), or should long-term financing be used?

Overview

Capital Improvement Program (CIP) projects are relatively major improvements that the City needs to maintain adequate stormwater management services. In addition, the CIP identifies projects related to the Green Infrastructure Plan. The activities involve development, design, scheduling, funding, permitting, and construction of the projects. These projects may include drainage improvements, storm sewer rehabilitation or replacement, catch basin rehabilitation and replacement, and/or drainage master planning studies.

Figure 1 shows the total CIP for the each level of service alternative considered. Figure 2 shows the net effect of using grants / loans to help reduce the capital costs funded by the stormwater utility. For the low level of service, the CIP is entirely funded by grants/loans. For the high level of service, only a portion of the CIP is funded by grants/loans. The difference would need to be fund by the stormwater utility (i.e., pay-go or long-term financing).

Assuming grants/loans are used to fund the CIP and the difference is bond funded starting in Year 4, Figure 3 shows the rate impacts. Figure 4 shows the rate impacts if bond financing is not used (i.e., pay go).

Based on feedback from City, the debt financing assumptions include:

- GO Bonds (using full faith and credit of the City and pledge of stormwater utility revenues)
- Next likely bond issue would be 2015-16.
- 5.5% interest rate (subject to change based on market conditions)
- 20 year term (subject to change based on average useful live of projects being financed)
- As a starting point, assume a target debt service coverage ratio of 1.5.

Policy Options

- Option 1 – Do not fund CIP with Stormwater Utility
- Option 2 – Pay As You Go through rates
- Option 3 – Long Term Financing and/or Pay As You Go

Issues, Concerns, Benefits

- Issues may include overseeing the administration of the debt service payments. As a stormwater utility startup, revenue bonds would not likely be an option since under-writing agencies would require an established track record of stormwater utility fee revenues. Nonetheless, General Obligation bonds could be used, while using the full faith and credit of the City and/or the revenue from the utility fee.
- Concerns may include the City's Fiscal Policy regarding debt financing and any established caps on debt financing.
- Debt financing significant CIP projects could be a benefit because the capital costs are spread out over time. In addition, long-term financing provides a form of fairness in the sense that exiting residents do not pay for all of the costs up-front and new resident will share some of the costs.

Consultant Recommendation

- _____

Decision/Action

FIGURE 1
Summary of Stormwater CIP by Levels of Service

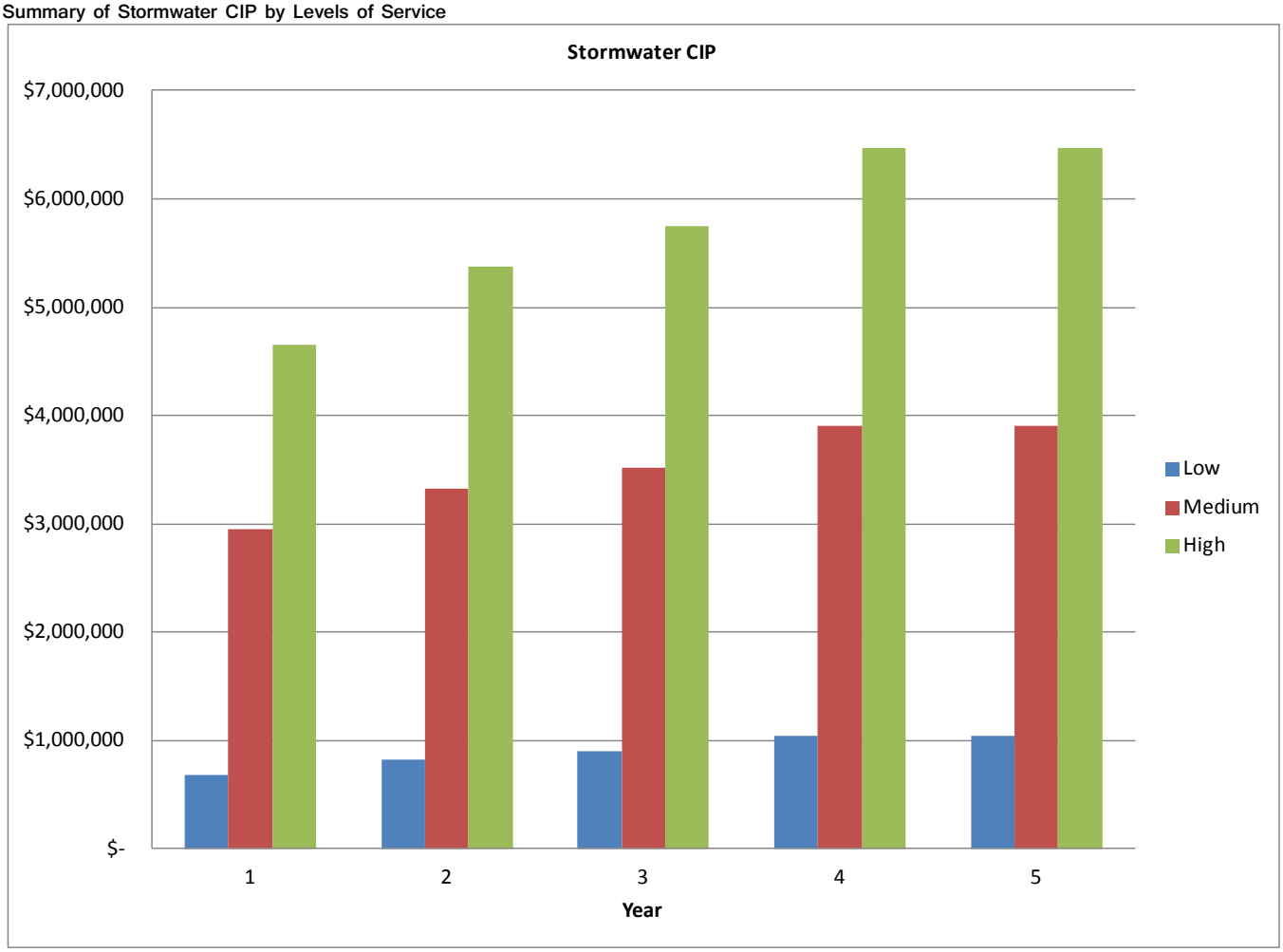


FIGURE 2
Summary of Stormwater CIP by Levels of Service Net of Grants and Loans

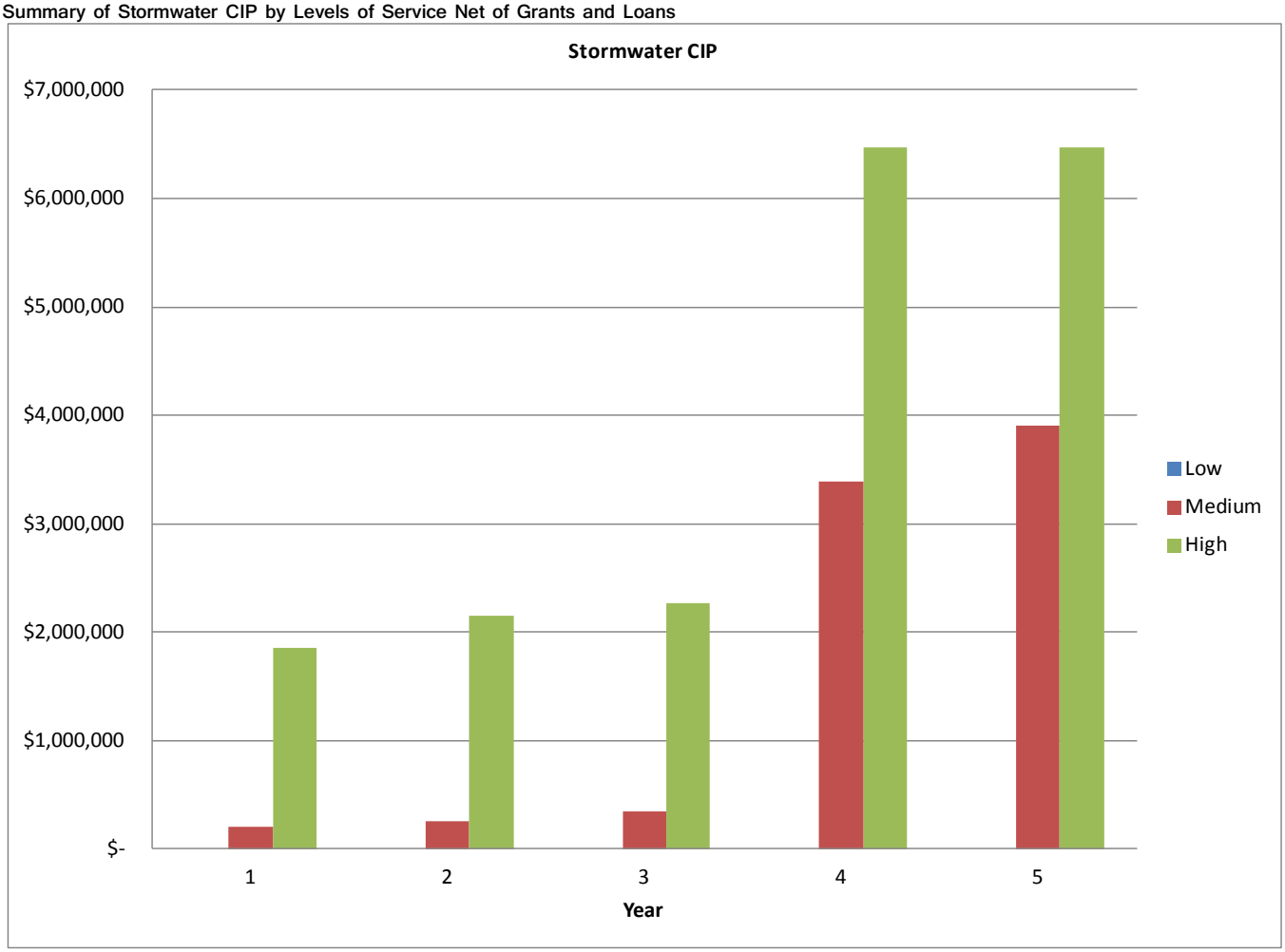


FIGURE 3

Rate impact of using bond financing (Net of Grants and Loans)

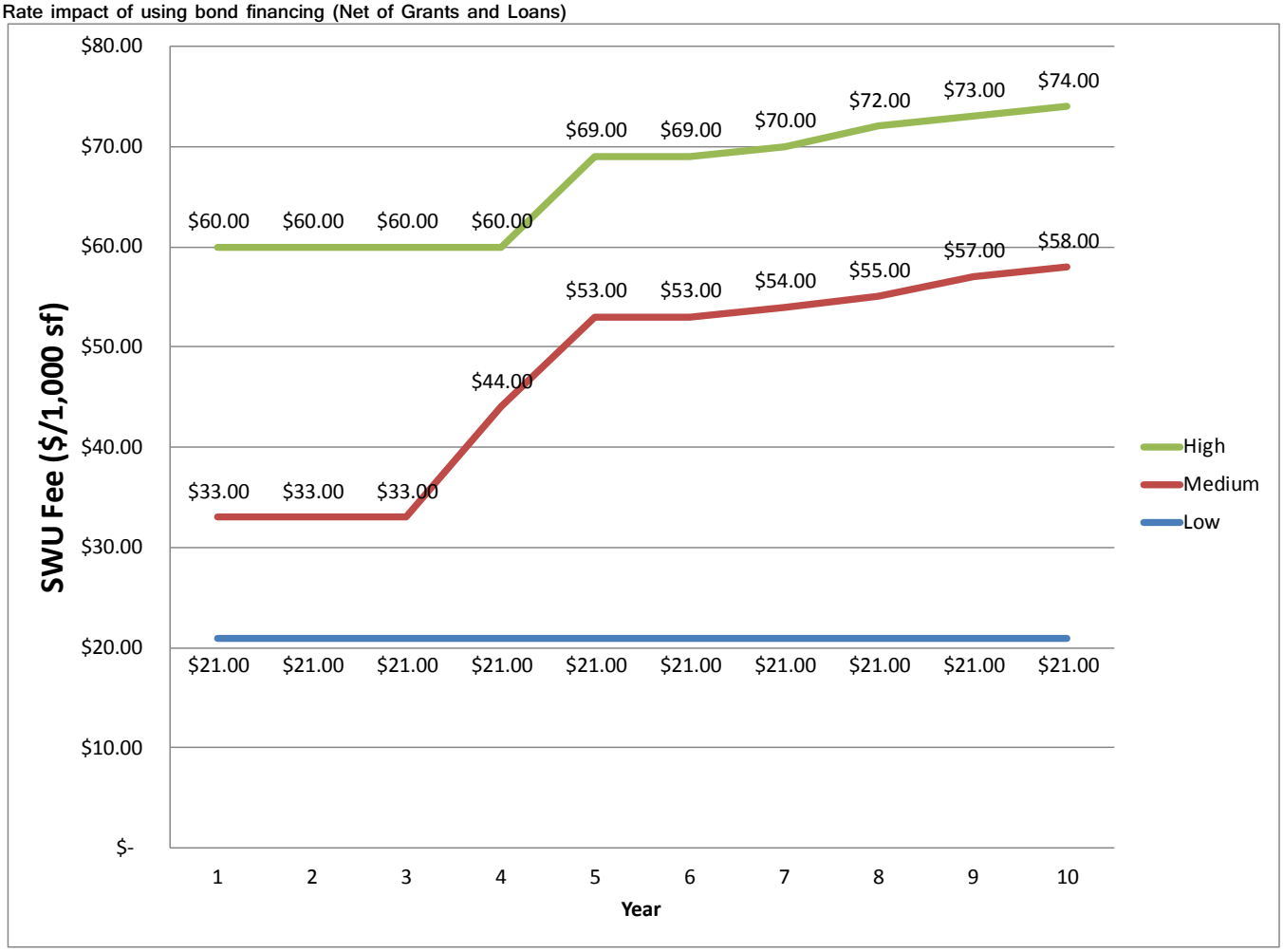
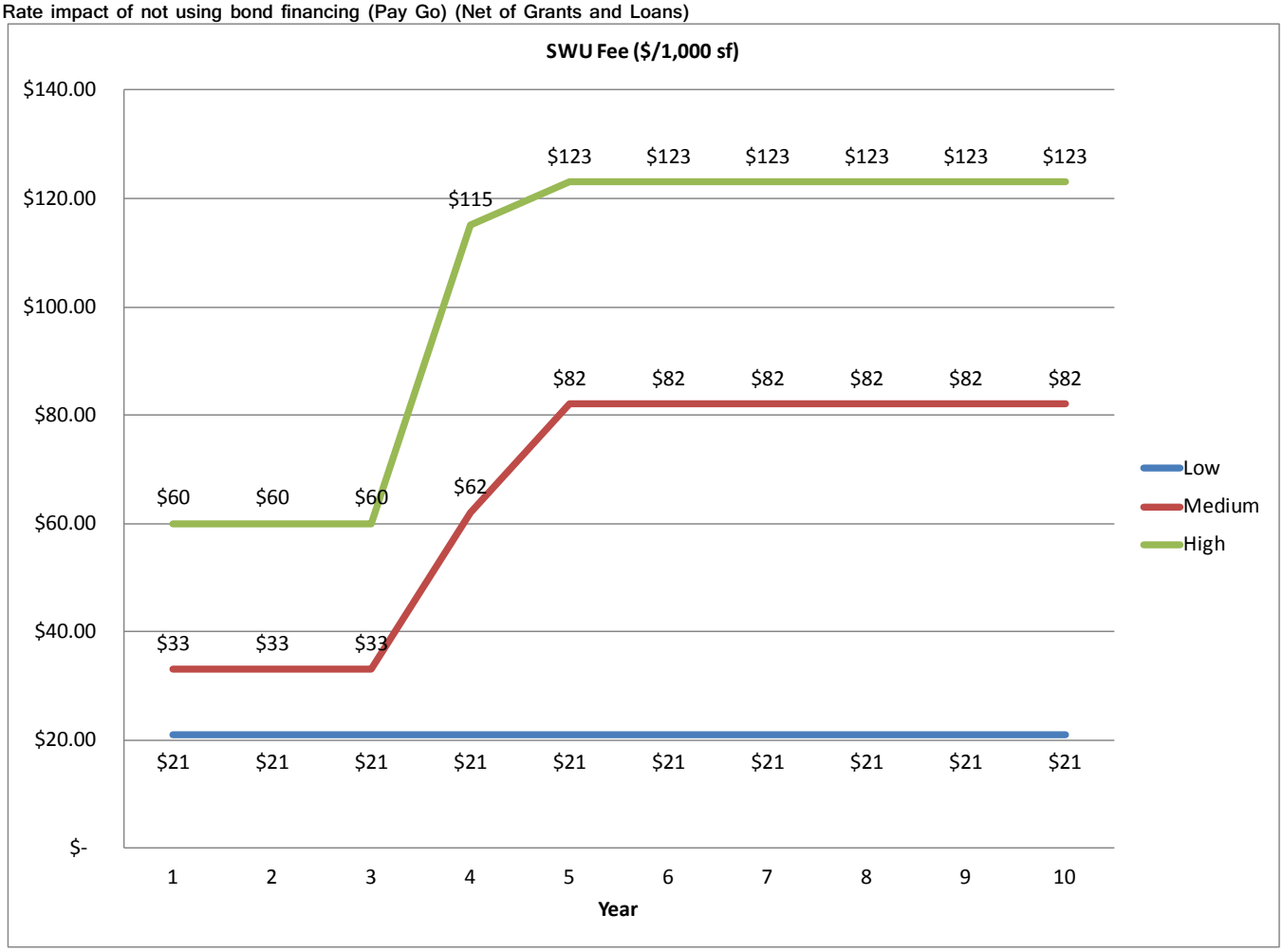


FIGURE 4

Rate impact of not using bond financing (Pay Go) (Net of Grants and Loans)



Attachment D
Stormwater Utility SWU Fee Credits / Incentives Policy Paper

Stormwater Utility SWU Fee Credits / Incentives **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: May 24, 2012 *Date Revised*: *Date Final*:

Policy Issue: What type of type of credits or incentives should be provided to property owners for on-site facilities or green infrastructure? What is the likely impact on the range for the initial rate for the stormwater utility fee?

Many stormwater utilities provide incentives to properties that have on-site stormwater facilities that treat stormwater runoff. There are two types of incentive programs typically considered:

- Rebates or grants
- Credits

The purpose of grants or rebates is to provide one-time subsidy to reduce construction costs associated with installation of stormwater facilities on private property. This sort of program is fairly uncommon, but is growing in popularity among jurisdictions with CSO and MS4 permit mandates. Examples include Montgomery County, Maryland's RainScapes program, DC's RiverSmart Homes, and Portland, Oregon's (links are provided at end of this section, below). For example, RainScapes provides grants up to $1,200 for residential property and up to $5000 for Commercial, multi-family, or institutional property, depending on project type. Eligible practices include but are not limited to rain gardens, tree canopy, permeable pavers, green roofs and rain barrels. RainScapes is funded by the County's stormwater utility. Similarly, DC's RiverSmart Homes program funds up to $1,200 for similar project types, but is restricted to private residences.

The purpose of credits is to help properties reduce their stormwater charge, thus providing an incentive for implementation of stormwater facilities. Historically, credits have been offered to commercial properties but recent trends show that single-family properties are now eligible for certain types of credits. The credit amount that a property can receive varies among stormwater utilities. Most utilities provide only a partial credit while others provide a full credit. The criteria for determining the credit amount typically are based on type of facility, and percent of impervious area treated (usually just the onsite impervious area). Some utilities provide credits to properties that do not have qualifying facilities but agree to participate in public education or outreach programs. Exhibit 1 provides a summary of credit programs around the US. Exhibit 2 provides a list of potential credit amounts by stormwater project type being considered by Montgomery County, Maryland.

As part of a grant to evaluate green infrastructure, the City has identified possible credit scenario case studies based on implementation of green infrastructure. These case studies consider residential and commercial facilities and are summarized in Exhibit 3.

Links to Sample Rebate/Grant Programs:

http://www.montgomerycountymd.gov/dectmpl.asp?url=/content/dep/water/rainscapes.asp

http://ddoe.dc.gov/service/riversmart-homes-overview

http://www.pidc-pa.org/development-and-contract-opportunties/rfp-rfq-opportunities/43

Links to Sample Credit Programs:

http://www.portlandonline.com/bes/index.cfm?c=43444&

Stormwater Utility SWU Fee Credits / Incentives **Policy Development Summary** **Lancaster, PA**	**Policy Paper No. 5** *Date Prepared*: May 24, 2012 *Date Revised*: *Date Final*:

Policy Issue: What type of type of credits or incentives should be provided to property owners for on-site facilities or green infrastructure? What is the likely impact on the range for the initial rate for the stormwater utility fee?

Policy Options

1) Rebates or grants:
   a) Property Eligibility for Credits
      i) Provide credits to only commercial properties
      ii) Provide credits to all properties
   b) Amount of Credit
      i) $ limits by project type
      ii) $ limits by property type
   c) Qualifying Facilities / Activities
      i) Approved BMPs, green infrastructure
2) Credits:
   a) Property Eligibility for Credits
      i) Provide credits to only commercial properties
      ii) Provide credits to all properties
   b) Amount of Credit
      i) Partial (less than 100% reduction in charge)
      ii) Full (complete waiver of charge)
   c) Qualifying Facilities / Activities
      i) Approved BMPs, green infrastructure
      ii) Participation in activities (i.e., public education, adopt-a-highway)

Issues, Concerns, Benefits

Both rebates and credit programs represent a policy option to increase stormwater treatment and improve compliance with permit requirements by incentivizing property owners to build stormwater facilities on private property. But these programs represent a cost (in the case of rebates) or a reduction in revenue, in the case of credits. Both types of programs have administrative costs that should be considered. All credit programs typically require some sort of maintenance agreement between the property owner and the utility to insure that the facility is built appropriately and maintained in proper working order according to established design standards. The City of Portland's Clean River Rewards, stormwater credit program required 2 full time staff, one to administer and promote the program, the other to conduct inspections to be sure facilities are being maintained. Credits typically require an application be submitted to be eligible for the credit, with residential programs typically being granted without inspection of more than a small sample of properties, and nonresidential facility credits requiring a site inspection. The period for which credits are kept in place varies, with some utilities requiring annual re-application, and some granting credits for longer periods (3-5 years), and some granting credits indefinitely without reapplying.

The question of what is the maximum level of credit is a policy question. Few jurisdictions grant 100% credit (essentially a waiver). Often these are situations where the facility is an industial facility with its own stormwater permit, or they discharge entirely directly to "waters of the US" without passing through the MS4 system. More often only partial credits are allowed (25%, 35% or 50% reduction, for example), with the rationale being that even if the property controls 100% of stormwater on-site, the municipality still has costs to manage stormwater offsite that everyone benefits from (for example, program administration for the permit, drainage from public roads).

Consultant Recommendation

- The consultant recommends developing both a credit and a rebate program to support MS4 and CSO LTCP compliance, with credits of not more than 50%. These programs could be phased in after initial implementation of a stormwater fee, largely to allow time to set up administrative systems and outreach programs to support them.

Decision/Action

EXHIBIT 1

Example Credit Programs

Municipality	Single Family Residential?	Non-residential and Multi-Family residential?	Types of Credits	Maximum Credit Allowed
Chesapeake, VA	No	Yes	Application of onsite BMPs that provide water quality or water quantity benefits..	Water quality (20%) Water quantity (20%) Maximum of 40%
Prince William County, VA	No	Yes	Control stormwater on-site; non-structural program participation	50% for structural control; 30% for non-structural controls compiled as follows: 30% for nutrient mgmt. plan 30% for public education program 10% for attending workshop 10% site cleanup
Virginia Beach, VA	No	Yes	Manage stormwater quality on-site	30% for management to pre-developed condition 20% for management to Chesapeake Bay standards
Portland, OR	Yes	Yes	LID (ecoroof, rainbarrel, rain garden) Tree Canopy Downspout disconnect Stormwater Quality Stormwater Quantity Stormwater Planters	35% of total stormwater charges Credit for tree canopy based on number of trees greater than 15 feet.
Philadelphia, PA	No	Yes, must have >500 sf impervious area	Impervious Area (IA) Gross Area (GA) NPDES Credit Application and renewal fee apply	Except monthly minimum charge. Up to 100% of stormwater charge for IA and GA credit 7% for NPDES Credit
NEORSD, Cleveland, OH	Yes	Yes	Stormwater Quality Credit (25%) Stormwater Quantity Credit (50%) Education Credit (25%)	Up to 75% Up to 100% for public/private schools

EXHIBIT 2

Example of Stormwater Facility Classifications for Credits (Montgomery County MD)

Pretreatment 10% credit	Water Quality (WQ) 25% credit	Water Quantity (QN) 25% credit	Both (B) 50% credit	Green Infrastructure (LID, ESD, etc) 25% credit	Programmatic 15% credit (regardless of impervious area treated)
AQSW – aquaswirl	AQFIL – aquafilter	PDQN – Dry Pond	DS – dry swale	RG – rain garden	Adopt-a-Stream
BAYSAV – baysaver	BF – Bayfilter	PDQNED – Dry Pond with extended detention	BR – bioretention	PP – permeable pavement	Adopt-a-Road
BSFS – baysaver flow splitter	INF – Infiltration Trench	UG – underground storage facility	BRQN – bioretention	Rainbarrel	Integrated Pest Management
SEP –oil/grit separator	INFIL – Infiltrator	UGINF – underground storage facility with infiltration	BS – bioswale	Cistern	*Other DEP-approved program participation
SNOUT	INFU – Infiltration Trench, buried by design		INFQN – infiltration with quality and quantity control	Micro – bioretention	Industrial Permit
STC – stormceptor	PDIB – Infiltration basin		INFUQN – underground infiltration with quality and quantity control	Submerged gravel wetlands	
V2B1	PSF – Peat sand filter		PDQNSF – dry pond with sand filter base	Landscape Infiltration	
VORTEC - vortechnics	SC – stormchamber		PDIBQN – infiltration basin with quantity control	Infiltration Berm	
	SEPSF – separator sand filter		PDWD – constructed wetland	Swales	
	SF – surface sand filter		PDWDED – constructed wetland with extended detention	Green Roofs	
	SFU – underground sand filter		PDWT – Wet pond	Reinforced Turf	
	STFIL – stormfilter		PDWTED – wet pond with extended detention	Disconnection	
			SFQN – surface sand filter with quantity control	Sheet Flow	
			TB – tree box	Dry well	

EXHIBIT 3

Summary of Case Studies from Keith Campbell Grant Study Report (CH2M HILL, 2011)

Property ID	Property Name	Land Use Category	Annual Stormwater Charge	Charge after Credits	Payback (Years)	Median Impervious Area (sf) for Group	Impervious Area (sf) for Property
P-21	Two Dudes Painting	Commercial	$1,600	$900	105	2,800	19,900
P-82	Sundown Lounge	Commercial	$200	$100	190	2,800	2,600
P-111	Ace Rents	Industrial	$21,300	$10,650	85	31,200	265,800
P-25	Novelty Brush	Industrial	$2,600	$1,906	244	31,200	32,600
P-47	Lancaster County Library	Institutional	$2,300	$1,693	196	29,400	29,000
P-100	Water Street Mission	Institutional	$9,400	$8,623	131	29,400	117,100
P-34	Public Parking: Dauphin St	Local Govt.	$1,700	$850	77	8,300	21,750
P-84	Apts at Mulberry Ct	Multi-Family	$1,000	$692	455	1,200	12,900
P-51	Private Parking Water St	Parking	$5,100	$2,550	78	2,800	63,200
P-85	James St Mennonite Church	Religious	$2,300	$1,693	160	8,600	28,800
P-99	Trinity Lutheran Church	Religious	$3,500	$2,287	150	8,600	43,500
SFR-01	600 block Ocean Ave	Single Family	$40	$30	10	900	400
SFR-02	500 Poplar St	Single Family	$80	$40	53	900	800
SFR-03	900 Block Lehigh Ave	Single Family	$120	$72	31	900	4,800
P-106	Green Alley at Alley 7 (Option #1)	Single Family	$80	$40	57	900	22,300
P-106	Green Alley at Alley 7 (Option #2)	Single Family	$80	$49	34	900	51,340

Note: Charges assume $5/month/1000 sf of impervious area.

Attachment E
PennVest Loan Repayment Schedule

Concord Public Finance

City of Lancaster
Guaranteed Sewer Revenue Bond
Series of 2012
PennVest Loan ME _____

Loan is a Drawdown Note with Interest Only Period for up to 36 Months
Interest shown is presented as "Not to Exceed"

Highlighted section includes 36 month "not to exceed" interest period.

	1	2	3	4	5	6	7	8	9
	Payment Number	P&I #	Balance After Payment	Date	Principal Installment	Rate	Interest	Debt Service	Annual Debt Service
						1.495	*3 Years Interest Only and 5 Years of Repayment*		
						2.965	*Years 6-20 or Principal Repayment*		
			7,000,000.00	6/1/2012					
	1		7,000,000.00	7/1/2012		1.495	8,720.83	8,720.83	
	2		7,000,000.00	8/1/2012		1.495	8,720.83	8,720.83	
	3		7,000,000.00	9/1/2012		1.495	8,720.83	8,720.83	
	4		7,000,000.00	10/1/2012		1.495	8,720.83	8,720.83	
	5		7,000,000.00	11/1/2012		1.495	8,720.83	8,720.83	
	6		7,000,000.00	12/1/2012		1.495	8,720.83	8,720.83	52,324.98
	7		7,000,000.00	1/1/2013		1.495	8,720.83	8,720.83	
	8		7,000,000.00	2/1/2013		1.495	8,720.83	8,720.83	
	9		7,000,000.00	3/1/2013		1.495	8,720.83	8,720.83	
	10		7,000,000.00	4/1/2013		1.495	8,720.83	8,720.83	
	11		7,000,000.00	5/1/2013		1.495	8,720.83	8,720.83	
	12		7,000,000.00	6/1/2013		1.495	8,720.83	8,720.83	
	13		7,000,000.00	7/1/2013		1.495	8,720.83	8,720.83	
	14		7,000,000.00	8/1/2013		1.495	8,720.83	8,720.83	
	15		7,000,000.00	9/1/2013		1.495	8,720.83	8,720.83	
	16		7,000,000.00	10/1/2013		1.495	8,720.83	8,720.83	
	17		7,000,000.00	11/1/2013		1.495	8,720.83	8,720.83	
	18		7,000,000.00	12/1/2013		1.495	8,720.83	8,720.83	104,649.96
	19		7,000,000.00	1/1/2014		1.495	8,720.83	8,720.83	
	20		7,000,000.00	2/1/2014		1.495	8,720.83	8,720.83	
	21		7,000,000.00	3/1/2014		1.495	8,720.83	8,720.83	
	22		7,000,000.00	4/1/2014		1.495	8,720.83	8,720.83	
	23		7,000,000.00	5/1/2014		1.495	8,720.83	8,720.83	
	24		7,000,000.00	6/1/2014		1.495	8,720.83	8,720.83	
	25		7,000,000.00	7/1/2014		1.495	8,720.83	8,720.83	
	26		7,000,000.00	8/1/2014		1.495	8,720.83	8,720.83	
	27		7,000,000.00	9/1/2014		1.495	8,720.83	8,720.83	
	28		7,000,000.00	10/1/2014		1.495	8,720.83	8,720.83	
	29		7,000,000.00	11/1/2014		1.495	8,720.83	8,720.83	
	30		7,000,000.00	12/1/2014		1.495	8,720.83	8,720.83	104,649.96
	31		7,000,000.00	1/1/2015		1.495	8,720.83	8,720.83	
	32		7,000,000.00	2/1/2015		1.495	8,720.83	8,720.83	
	33		7,000,000.00	3/1/2015		1.495	8,720.83	8,720.83	
	34		7,000,000.00	4/1/2015		1.495	8,720.83	8,720.83	
Est Completion	35		7,000,000.00	5/1/2015		1.495	8,720.83	8,720.83	
	36		7,000,000.00	6/1/2015		1.495	8,720.83	8,720.83	
Begin Repayment	37	1	6,974,958.75	7/1/2015	25,041.25	1.495	8,720.83	33,762.08	
	38	2	6,949,886.31	8/1/2015	25,072.44	1.495	8,689.64	33,762.08	
	39	3	6,924,782.63	9/1/2015	25,103.68	1.495	8,658.40	33,762.08	
	40	4	6,899,647.68	10/1/2015	25,134.95	1.495	8,627.13	33,762.08	
	41	5	6,874,481.41	11/1/2015	25,166.27	1.495	8,595.81	33,762.08	
	42	6	6,849,283.79	12/1/2015	25,197.62	1.495	8,564.46	33,762.08	254,897.46
	43	7	6,824,054.78	1/1/2016	25,229.01	1.495	8,533.07	33,762.08	
	44	8	6,798,794.33	2/1/2016	25,260.45	1.495	8,501.63	33,762.08	
	45	9	6,773,502.41	3/1/2016	25,291.92	1.495	8,470.16	33,762.08	
	46	10	6,748,178.99	4/1/2016	25,323.42	1.495	8,438.66	33,762.08	
	47	11	6,722,824.02	5/1/2016	25,354.97	1.495	8,407.11	33,762.08	
	48	12	6,697,437.46	6/1/2016	25,386.56	1.495	8,375.52	33,762.08	
	49	13	6,672,019.27	7/1/2016	25,418.19	1.495	8,343.89	33,762.08	
	50	14	6,646,569.41	8/1/2016	25,449.86	1.495	8,312.22	33,762.08	
	51	15	6,621,087.85	9/1/2016	25,481.56	1.495	8,280.52	33,762.08	
	52	16	6,595,574.54	10/1/2016	25,513.31	1.495	8,248.77	33,762.08	
	53	17	6,570,029.45	11/1/2016	25,545.09	1.495	8,216.99	33,762.08	
	54	18	6,544,452.53	12/1/2016	25,576.92	1.495	8,185.16	33,762.08	405,144.96
	55	19	6,518,843.75	1/1/2017	25,608.78	1.495	8,153.30	33,762.08	
	56	20	6,493,203.06	2/1/2017	25,640.69	1.495	8,121.39	33,762.08	
	57	21	6,467,530.43	3/1/2017	25,672.63	1.495	8,089.45	33,762.08	
	58	22	6,441,825.81	4/1/2017	25,704.62	1.495	8,057.46	33,762.08	

10	11
Annual Summary	
2012	52,324.98
2013	104,649.96
2014	104,649.96
Begin Repayment	
2015	254,897.46
2016	405,144.96
2017	405,144.96
2018	405,144.96
2019	405,144.96
Rate Change - Year 6	
2020	427,468.62
2021	449,792.28
2022	449,792.28
2023	449,792.28
2024	449,792.28
2025	449,792.28
2026	449,792.28
2027	449,792.28
2028	449,792.28
2029	449,792.28
2030	449,792.28
2031	449,792.28
2032	449,792.28
2033	449,792.28
2034	449,792.28
2035	224,897.56
2036	0.00
Total	9,086,560.30
	9,086,560.30

	59	23	6,416,089.17	5/1/2017	25,736.64	1.495	8,025.44	33,762.08	
	60	24	6,390,320.47	6/1/2017	25,768.70	1.495	7,993.38	33,762.08	
	61	25	6,364,519.66	7/1/2017	25,800.81	1.495	7,961.27	33,762.08	
	62	26	6,338,686.71	8/1/2017	25,832.95	1.495	7,929.13	33,762.08	
	63	27	6,312,821.58	9/1/2017	25,865.13	1.495	7,896.95	33,762.08	
	64	28	6,286,924.22	10/1/2017	25,897.36	1.495	7,864.72	33,762.08	
	65	29	6,260,994.60	11/1/2017	25,929.62	1.495	7,832.46	33,762.08	
	66	30	6,235,032.68	12/1/2017	25,961.92	1.495	7,800.16	33,762.08	405,144.96
	67	31	6,209,038.41	1/1/2018	25,994.27	1.495	7,767.81	33,762.08	
	68	32	6,183,011.76	2/1/2018	26,026.65	1.495	7,735.43	33,762.08	
	69	33	6,156,952.68	3/1/2018	26,059.08	1.495	7,703.00	33,762.08	
	70	34	6,130,861.14	4/1/2018	26,091.54	1.495	7,670.54	33,762.08	
	71	35	6,104,737.09	5/1/2018	26,124.05	1.495	7,638.03	33,762.08	
	72	36	6,078,580.49	6/1/2018	26,156.60	1.495	7,605.48	33,762.08	
	73	37	6,052,391.31	7/1/2018	26,189.18	1.495	7,572.90	33,762.08	
	74	38	6,026,169.50	8/1/2018	26,221.81	1.495	7,540.27	33,762.08	
	75	39	5,999,915.02	9/1/2018	26,254.48	1.495	7,507.60	33,762.08	
	76	40	5,973,627.83	10/1/2018	26,287.19	1.495	7,474.89	33,762.08	
	77	41	5,947,307.89	11/1/2018	26,319.94	1.495	7,442.14	33,762.08	
	78	42	5,920,955.16	12/1/2018	26,352.73	1.495	7,409.35	33,762.08	405,144.96
	79	43	5,894,569.60	1/1/2019	26,385.56	1.495	7,376.52	33,762.08	
	80	44	5,868,151.17	2/1/2019	26,418.43	1.495	7,343.65	33,762.08	
	81	45	5,841,699.83	3/1/2019	26,451.34	1.495	7,310.74	33,762.08	
	82	46	5,815,215.53	4/1/2019	26,484.30	1.495	7,277.78	33,762.08	
	83	47	5,788,698.24	5/1/2019	26,517.29	1.495	7,244.79	33,762.08	
	84	48	5,762,147.91	6/1/2019	26,550.33	1.495	7,211.75	33,762.08	
	85	49	5,735,564.51	7/1/2019	26,583.40	1.495	7,178.68	33,762.08	
	86	50	5,708,947.99	8/1/2019	26,616.52	1.495	7,145.56	33,762.08	
	87	51	5,682,298.31	9/1/2019	26,649.68	1.495	7,112.40	33,762.08	
	88	52	5,655,615.43	10/1/2019	26,682.88	1.495	7,079.20	33,762.08	
	89	53	5,628,899.30	11/1/2019	26,716.13	1.495	7,045.95	33,762.08	
	90	54	5,602,149.89	12/1/2019	26,749.41	1.495	7,012.67	33,762.08	405,144.96
	91	55	5,575,367.16	1/1/2020	26,782.73	1.495	6,979.35	33,762.08	
	92	56	5,548,551.06	2/1/2020	26,816.10	1.495	6,945.98	33,762.08	
	93	57	5,521,701.55	3/1/2020	26,849.51	1.495	6,912.57	33,762.08	
	94	58	5,494,818.59	4/1/2020	26,882.96	1.495	6,879.12	33,762.08	
	95	59	5,467,902.14	5/1/2020	26,916.45	1.495	6,845.63	33,762.08	
End of 5 Years	96	60	5,440,952.15	6/1/2020	26,949.99	1.495	6,812.09	33,762.08	
	97	61	5,416,913.15	7/1/2020	24,039.00	2.965	13,443.69	37,482.69	
	98	62	5,392,814.75	8/1/2020	24,098.40	2.965	13,384.29	37,482.69	
	99	63	5,368,656.81	9/1/2020	24,157.94	2.965	13,324.75	37,482.69	
	100	64	5,344,439.18	10/1/2020	24,217.63	2.965	13,265.06	37,482.69	
	101	65	5,320,161.71	11/1/2020	24,277.47	2.965	13,205.22	37,482.69	
	102	66	5,295,824.25	12/1/2020	24,337.46	2.965	13,145.23	37,482.69	427,468.62
	103	67	5,271,426.66	1/1/2021	24,397.59	2.965	13,085.10	37,482.69	
	104	68	5,246,968.79	2/1/2021	24,457.87	2.965	13,024.82	37,482.69	
	105	69	5,222,450.49	3/1/2021	24,518.30	2.965	12,964.39	37,482.69	
	106	70	5,197,871.60	4/1/2021	24,578.89	2.965	12,903.80	37,482.69	
	107	71	5,173,231.98	5/1/2021	24,639.62	2.965	12,843.07	37,482.69	
	108	72	5,148,531.48	6/1/2021	24,700.50	2.965	12,782.19	37,482.69	
	109	73	5,123,769.95	7/1/2021	24,761.53	2.965	12,721.16	37,482.69	
	110	74	5,098,947.24	8/1/2021	24,822.71	2.965	12,659.98	37,482.69	
	111	75	5,074,063.20	9/1/2021	24,884.04	2.965	12,598.65	37,482.69	
	112	76	5,049,117.67	10/1/2021	24,945.53	2.965	12,537.16	37,482.69	
	113	77	5,024,110.51	11/1/2021	25,007.16	2.965	12,475.53	37,482.69	
	114	78	4,999,041.56	12/1/2021	25,068.95	2.965	12,413.74	37,482.69	449,792.28
	115	79	4,973,910.67	1/1/2022	25,130.89	2.965	12,351.80	37,482.69	
	116	80	4,948,717.68	2/1/2022	25,192.99	2.965	12,289.70	37,482.69	
	117	81	4,923,462.45	3/1/2022	25,255.23	2.965	12,227.46	37,482.69	
	118	82	4,898,144.82	4/1/2022	25,317.63	2.965	12,165.06	37,482.69	
	119	83	4,872,764.63	5/1/2022	25,380.19	2.965	12,102.50	37,482.69	
	120	84	4,847,321.73	6/1/2022	25,442.90	2.965	12,039.79	37,482.69	
	121	85	4,821,815.96	7/1/2022	25,505.77	2.965	11,976.92	37,482.69	
	122	86	4,796,247.17	8/1/2022	25,568.79	2.965	11,913.90	37,482.69	
	123	87	4,770,615.21	9/1/2022	25,631.96	2.965	11,850.73	37,482.69	
	124	88	4,744,919.92	10/1/2022	25,695.29	2.965	11,787.40	37,482.69	
	125	89	4,719,161.14	11/1/2022	25,758.78	2.965	11,723.91	37,482.69	
	126	90	4,693,338.71	12/1/2022	25,822.43	2.965	11,660.26	37,482.69	449,792.28
	127	91	4,667,452.48	1/1/2023	25,886.23	2.965	11,596.46	37,482.69	
	128	92	4,641,502.29	2/1/2023	25,950.19	2.965	11,532.50	37,482.69	
	129	93	4,615,487.98	3/1/2023	26,014.31	2.965	11,468.38	37,482.69	
	130	94	4,589,409.39	4/1/2023	26,078.59	2.965	11,404.10	37,482.69	
	131	95	4,563,266.37	5/1/2023	26,143.02	2.965	11,339.67	37,482.69	
	132	96	4,537,058.75	6/1/2023	26,207.62	2.965	11,275.07	37,482.69	
	133	97	4,510,786.38	7/1/2023	26,272.37	2.965	11,210.32	37,482.69	
	134	98	4,484,449.09	8/1/2023	26,337.29	2.965	11,145.40	37,482.69	

135	99	4,458,046.73	9/1/2023	26,402.36	2.965	11,080.33	37,482.69	
136	100	4,431,579.13	10/1/2023	26,467.60	2.965	11,015.09	37,482.69	
137	101	4,405,046.13	11/1/2023	26,533.00	2.965	10,949.69	37,482.69	
138	102	4,378,447.57	12/1/2023	26,598.56	2.965	10,884.13	37,482.69	449,792.28
139	103	4,351,783.29	1/1/2024	26,664.28	2.965	10,818.41	37,482.69	
140	104	4,325,053.13	2/1/2024	26,730.16	2.965	10,752.53	37,482.69	
141	105	4,298,256.93	3/1/2024	26,796.20	2.965	10,686.49	37,482.69	
142	106	4,271,394.52	4/1/2024	26,862.41	2.965	10,620.28	37,482.69	
143	107	4,244,465.73	5/1/2024	26,928.79	2.965	10,553.90	37,482.69	
144	108	4,217,470.41	6/1/2024	26,995.32	2.965	10,487.37	37,482.69	
145	109	4,190,408.39	7/1/2024	27,062.02	2.965	10,420.67	37,482.69	
146	110	4,163,279.50	8/1/2024	27,128.89	2.965	10,353.80	37,482.69	
147	111	4,136,083.58	9/1/2024	27,195.92	2.965	10,286.77	37,482.69	
148	112	4,108,820.46	10/1/2024	27,263.12	2.965	10,219.57	37,482.69	
149	113	4,081,489.98	11/1/2024	27,330.48	2.965	10,152.21	37,482.69	
150	114	4,054,091.97	12/1/2024	27,398.01	2.965	10,084.68	37,482.69	449,792.28
151	115	4,026,626.27	1/1/2025	27,465.70	2.965	10,016.99	37,482.69	
152	116	3,999,092.70	2/1/2025	27,533.57	2.965	9,949.12	37,482.69	
153	117	3,971,491.10	3/1/2025	27,601.60	2.965	9,881.09	37,482.69	
154	118	3,943,821.30	4/1/2025	27,669.80	2.965	9,812.89	37,482.69	
155	119	3,916,083.14	5/1/2025	27,738.16	2.965	9,744.53	37,482.69	
156	120	3,888,276.44	6/1/2025	27,806.70	2.965	9,675.99	37,482.69	
157	121	3,860,401.03	7/1/2025	27,875.41	2.965	9,607.28	37,482.69	
158	122	3,832,456.75	8/1/2025	27,944.28	2.965	9,538.41	37,482.69	
159	123	3,804,443.42	9/1/2025	28,013.33	2.965	9,469.36	37,482.69	
160	124	3,776,360.88	10/1/2025	28,082.54	2.965	9,400.15	37,482.69	
161	125	3,748,208.95	11/1/2025	28,151.93	2.965	9,330.76	37,482.69	
162	126	3,719,987.46	12/1/2025	28,221.49	2.965	9,261.20	37,482.69	449,792.28
163	127	3,691,696.24	1/1/2026	28,291.22	2.965	9,191.47	37,482.69	
164	128	3,663,335.12	2/1/2026	28,361.12	2.965	9,121.57	37,482.69	
165	129	3,634,903.92	3/1/2026	28,431.20	2.965	9,051.49	37,482.69	
166	130	3,606,402.47	4/1/2026	28,501.45	2.965	8,981.24	37,482.69	
167	131	3,577,830.60	5/1/2026	28,571.87	2.965	8,910.82	37,482.69	
168	132	3,549,188.13	6/1/2026	28,642.47	2.965	8,840.22	37,482.69	
169	133	3,520,474.89	7/1/2026	28,713.24	2.965	8,769.45	37,482.69	
170	134	3,491,690.71	8/1/2026	28,784.18	2.965	8,698.51	37,482.69	
171	135	3,462,835.41	9/1/2026	28,855.30	2.965	8,627.39	37,482.69	
172	136	3,433,908.81	10/1/2026	28,926.60	2.965	8,556.09	37,482.69	
173	137	3,404,910.74	11/1/2026	28,998.07	2.965	8,484.62	37,482.69	
174	138	3,375,841.02	12/1/2026	29,069.72	2.965	8,412.97	37,482.69	449,792.28
175	139	3,346,699.47	1/1/2027	29,141.55	2.965	8,341.14	37,482.69	
176	140	3,317,485.92	2/1/2027	29,213.55	2.965	8,269.14	37,482.69	
177	141	3,288,200.18	3/1/2027	29,285.74	2.965	8,196.95	37,482.69	
178	142	3,258,842.08	4/1/2027	29,358.10	2.965	8,124.59	37,482.69	
179	143	3,229,411.45	5/1/2027	29,430.63	2.965	8,052.06	37,482.69	
180	144	3,199,908.10	6/1/2027	29,503.35	2.965	7,979.34	37,482.69	
181	145	3,170,331.85	7/1/2027	29,576.25	2.965	7,906.44	37,482.69	
182	146	3,140,682.52	8/1/2027	29,649.33	2.965	7,833.36	37,482.69	
183	147	3,110,959.93	9/1/2027	29,722.59	2.965	7,760.10	37,482.69	
184	148	3,081,163.90	10/1/2027	29,796.03	2.965	7,686.66	37,482.69	
185	149	3,051,294.25	11/1/2027	29,869.65	2.965	7,613.04	37,482.69	
186	150	3,021,350.80	12/1/2027	29,943.45	2.965	7,539.24	37,482.69	449,792.28
187	151	2,991,333.36	1/1/2028	30,017.44	2.965	7,465.25	37,482.69	
188	152	2,961,241.76	2/1/2028	30,091.60	2.965	7,391.09	37,482.69	
189	153	2,931,075.80	3/1/2028	30,165.96	2.965	7,316.73	37,482.69	
190	154	2,900,835.31	4/1/2028	30,240.49	2.965	7,242.20	37,482.69	
191	155	2,870,520.10	5/1/2028	30,315.21	2.965	7,167.48	37,482.69	
192	156	2,840,129.99	6/1/2028	30,390.11	2.965	7,092.58	37,482.69	
193	157	2,809,664.79	7/1/2028	30,465.20	2.965	7,017.49	37,482.69	
194	158	2,779,124.31	8/1/2028	30,540.48	2.965	6,942.21	37,482.69	
195	159	2,748,508.37	9/1/2028	30,615.94	2.965	6,866.75	37,482.69	
196	160	2,717,816.79	10/1/2028	30,691.58	2.965	6,791.11	37,482.69	
197	161	2,687,049.37	11/1/2028	30,767.42	2.965	6,715.27	37,482.69	
198	162	2,656,205.93	12/1/2028	30,843.44	2.965	6,639.25	37,482.69	449,792.28
199	163	2,625,286.28	1/1/2029	30,919.65	2.965	6,563.04	37,482.69	
200	164	2,594,290.23	2/1/2029	30,996.05	2.965	6,486.64	37,482.69	
201	165	2,563,217.60	3/1/2029	31,072.63	2.965	6,410.06	37,482.69	
202	166	2,532,068.19	4/1/2029	31,149.41	2.965	6,333.28	37,482.69	
203	167	2,500,841.82	5/1/2029	31,226.37	2.965	6,256.32	37,482.69	
204	168	2,469,538.29	6/1/2029	31,303.53	2.965	6,179.16	37,482.69	
205	169	2,438,157.42	7/1/2029	31,380.87	2.965	6,101.82	37,482.69	
206	170	2,406,699.01	8/1/2029	31,458.41	2.965	6,024.28	37,482.69	
207	171	2,375,162.87	9/1/2029	31,536.14	2.965	5,946.55	37,482.69	
208	172	2,343,548.81	10/1/2029	31,614.06	2.965	5,868.63	37,482.69	
209	173	2,311,856.64	11/1/2029	31,692.17	2.965	5,790.52	37,482.69	
210	174	2,280,086.16	12/1/2029	31,770.48	2.965	5,712.21	37,482.69	449,792.28

211	175	2,248,237.18	1/1/2030	31,848.98	2.965	5,633.71	37,482.69	
212	176	2,216,309.51	2/1/2030	31,927.67	2.965	5,555.02	37,482.69	
213	177	2,184,302.95	3/1/2030	32,006.56	2.965	5,476.13	37,482.69	
214	178	2,152,217.31	4/1/2030	32,085.64	2.965	5,397.05	37,482.69	
215	179	2,120,052.39	5/1/2030	32,164.92	2.965	5,317.77	37,482.69	
216	180	2,087,808.00	6/1/2030	32,244.39	2.965	5,238.30	37,482.69	
217	181	2,055,483.94	7/1/2030	32,324.06	2.965	5,158.63	37,482.69	
218	182	2,023,080.01	8/1/2030	32,403.93	2.965	5,078.76	37,482.69	
219	183	1,990,596.01	9/1/2030	32,484.00	2.965	4,998.69	37,482.69	
220	184	1,958,031.75	10/1/2030	32,564.26	2.965	4,918.43	37,482.69	
221	185	1,925,387.03	11/1/2030	32,644.72	2.965	4,837.97	37,482.69	
222	186	1,892,661.65	12/1/2030	32,725.38	2.965	4,757.31	37,482.69	449,792.28
223	187	1,859,855.41	1/1/2031	32,806.24	2.965	4,676.45	37,482.69	
224	188	1,826,968.11	2/1/2031	32,887.30	2.965	4,595.39	37,482.69	
225	189	1,793,999.55	3/1/2031	32,968.56	2.965	4,514.13	37,482.69	
226	190	1,760,949.53	4/1/2031	33,050.02	2.965	4,432.67	37,482.69	
227	191	1,727,817.85	5/1/2031	33,131.68	2.965	4,351.01	37,482.69	
228	192	1,694,604.31	6/1/2031	33,213.54	2.965	4,269.15	37,482.69	
229	193	1,661,308.70	7/1/2031	33,295.61	2.965	4,187.08	37,482.69	
230	194	1,627,930.83	8/1/2031	33,377.87	2.965	4,104.82	37,482.69	
231	195	1,594,470.49	9/1/2031	33,460.34	2.965	4,022.35	37,482.69	
232	196	1,560,927.47	10/1/2031	33,543.02	2.965	3,939.67	37,482.69	
233	197	1,527,301.57	11/1/2031	33,625.90	2.965	3,856.79	37,482.69	
234	198	1,493,592.59	12/1/2031	33,708.98	2.965	3,773.71	37,482.69	449,792.28
235	199	1,459,800.32	1/1/2032	33,792.27	2.965	3,690.42	37,482.69	
236	200	1,425,924.55	2/1/2032	33,875.77	2.965	3,606.92	37,482.69	
237	201	1,391,965.08	3/1/2032	33,959.47	2.965	3,523.22	37,482.69	
238	202	1,357,921.70	4/1/2032	34,043.38	2.965	3,439.31	37,482.69	
239	203	1,323,794.21	5/1/2032	34,127.49	2.965	3,355.20	37,482.69	
240	204	1,289,582.39	6/1/2032	34,211.82	2.965	3,270.87	37,482.69	
241	205	1,255,286.04	7/1/2032	34,296.35	2.965	3,186.34	37,482.69	
242	206	1,220,904.95	8/1/2032	34,381.09	2.965	3,101.60	37,482.69	
243	207	1,186,438.91	9/1/2032	34,466.04	2.965	3,016.65	37,482.69	
244	208	1,151,887.71	10/1/2032	34,551.20	2.965	2,931.49	37,482.69	
245	209	1,117,251.14	11/1/2032	34,636.57	2.965	2,846.12	37,482.69	
246	210	1,082,528.99	12/1/2032	34,722.15	2.965	2,760.54	37,482.69	449,792.28
247	211	1,047,721.05	1/1/2033	34,807.94	2.965	2,674.75	37,482.69	
248	212	1,012,827.10	2/1/2033	34,893.95	2.965	2,588.74	37,482.69	
249	213	977,846.94	3/1/2033	34,980.16	2.965	2,502.53	37,482.69	
250	214	942,780.35	4/1/2033	35,066.59	2.965	2,416.10	37,482.69	
251	215	907,627.11	5/1/2033	35,153.24	2.965	2,329.45	37,482.69	
252	216	872,387.02	6/1/2033	35,240.09	2.965	2,242.60	37,482.69	
253	217	837,059.85	7/1/2033	35,327.17	2.965	2,155.52	37,482.69	
254	218	801,645.40	8/1/2033	35,414.45	2.965	2,068.24	37,482.69	
255	219	766,143.44	9/1/2033	35,501.96	2.965	1,980.73	37,482.69	
256	220	730,553.76	10/1/2033	35,589.68	2.965	1,893.01	37,482.69	
257	221	694,876.15	11/1/2033	35,677.61	2.965	1,805.08	37,482.69	
258	222	659,110.38	12/1/2033	35,765.77	2.965	1,716.92	37,482.69	449,792.28
259	223	623,256.24	1/1/2034	35,854.14	2.965	1,628.55	37,482.69	
260	224	587,313.51	2/1/2034	35,942.73	2.965	1,539.96	37,482.69	
261	225	551,281.97	3/1/2034	36,031.54	2.965	1,451.15	37,482.69	
262	226	515,161.41	4/1/2034	36,120.56	2.965	1,362.13	37,482.69	
263	227	478,951.60	5/1/2034	36,209.81	2.965	1,272.88	37,482.69	
264	228	442,652.32	6/1/2034	36,299.28	2.965	1,183.41	37,482.69	
265	229	406,263.35	7/1/2034	36,388.97	2.965	1,093.72	37,482.69	
266	230	369,784.47	8/1/2034	36,478.88	2.965	1,003.81	37,482.69	
267	231	333,215.46	9/1/2034	36,569.01	2.965	913.68	37,482.69	
268	232	296,556.09	10/1/2034	36,659.37	2.965	823.32	37,482.69	
269	233	259,806.14	11/1/2034	36,749.95	2.965	732.74	37,482.69	
270	234	222,965.39	12/1/2034	36,840.75	2.965	641.94	37,482.69	449,792.28
271	235	186,033.61	1/1/2035	36,931.78	2.965	550.91	37,482.69	
272	236	149,010.58	2/1/2035	37,023.03	2.965	459.66	37,482.69	
273	237	111,896.07	3/1/2035	37,114.51	2.965	368.18	37,482.69	
274	238	74,689.86	4/1/2035	37,206.21	2.965	276.48	37,482.69	
275	239	37,391.72	5/1/2035	37,298.14	2.965	184.55	37,482.69	
276	240	0.00	6/1/2035	37,391.72	2.965	92.39	37,484.11	
277	241	0.00	7/1/2035	0.00	2.965	0.00		
278	242	0.00	8/1/2035	0.00	2.965	0.00		
279	243	0.00	9/1/2035	0.00	2.965	0.00		
280	244	0.00	10/1/2035	0.00	2.965	0.00		
281	245	0.00	11/1/2035	0.00	2.965	0.00		
282	246	0.00	12/1/2035	0.00	2.965	0.00		224,897.56
			Totals	7,000,000.00		2,086,560.30	9,086,560.30	9,086,560.30

Attachment F
Impervious Area and Billing Units

Lancaster Utility GIS IAQC

Executive Summary

This TM documents a QC assessment of the accuracy of IAs found in the existing Lancaster geographic information system (GIS) dataset prepared by CH2M HILL for the 2011 GI Plan. These data are critical in supporting rate-structure analysis, policy setting and ultimately, the billing master account file. The QC assessment began with review and streamlining of the existing GI file [Section 1]. Exploratory analyses of the resulting file were used to identify a subset of representative parcel accounts to be redigitized [Section 2]. The IA of the sample set was updated using the best available aerial photography [2008 imagery] to supplement original IA estimates in the original GIS [Section 3]. Results [Section 4] indicate that updated total IAs exceed results from the original file in 92 percent of the sampled accounts; the remaining 8 percent of accounts exhibited no difference in IA. Adjustments considered to account for changes in the remaining IAs of accounts from the original file that were not updated by redigitizing included: regression analyses, class-specific factors, and substitution of updated IAs. Although adjustments have been applied to the final database used in the rate-structure evaluation and development of proposed rates per account, the QC indicates that IAs have changed sufficiently to require a system-wide redigitizing process to support developing the billing master account.

1 Data Processing

The parcel GIS data and attribute information received from Lancaster County Information Technology/GIS Department was exported to an Excel worksheet consisting of 18,407 account records. Included in the attribute table was a field denoted LANDUSECD, which defined the assessment land use for every parcel. The 119 land use codes were classified into 7 land use classifications to simplify the data. Before the factors potentially affecting selection of a representative file could be evaluated, two major data processing issues—record uniqueness and definition of stormwater class based on the land use class—required resolution.

Resolutions to these two primary data processing issues are summarized as follows:

- **Record Uniqueness** In the GIS parcel file received, units within condominium complexes were assigned individual unit account numbers by the County Board of Assessment. 'Parent' and 'subunit' accounts for condominium properties could be distinguished from account number suffixes but aggregation into a single account was required before exploratory analyses and rate development could take place. Resolution of the condominium issue is exhibited in Table 1, in which 619 subunit accounts have been consolidated into 28 condominium parent-specific accounts. Resolution of the condominium multiple records and additional non-unique records resulted in a final GIS database consisting of 17,361 unique accounts.
- **Stormwater Class | Land Use Class** Stormwater utility rate development is a function of both stormwater and land use classifications [SW|LU]. The original file received included three distinct variables containing use classifications with multiple codes, resulting in the 119 different class combinations listed in Table 2. As designated in the table below, the 119 codes have been simplified into the following 7 classes of land use:

Class	SW|LU Combinations	Accounts
Commercial	60	1,625
Government	20	56
Industrial	4	111
Institutional	11	44
Multi-Family Residential	14	1,976
Not For Profit	5	133
Residential	5	13,416
	119	17,361

2 Sample Selection

The primary objective behind QC of the existing GIS data was to ensure that the IA metric is as accurate and representative of on-ground conditions as possible, without committing to a complete and costly survey of the existing accounts. Selecting a 'representative' subset of accounts to be redigitized requires understanding of the quantitative relationships between factors potentially affecting the value and/or quantitation of IA on individual account parcels. If factors covary with the existing measure of IA, then distributing the samples across the range of values of the factor (for example, parcel size) would ensure representative coverage of the metric without depending upon the metric itself in selecting the subset of accounts to redigitize. Additionally, distributing samples throughout the utility network ensures that any systematic differences within the system are sufficiently covered to develop a reasonable estimate of incremental differences in IA resulting from additional development since the maps used to estimate the original IA were created.

Relationships of the main response variable, IA, and numeric and categorical factors with respect to system accounts were examined using the set of 17,361 records where the reported IA exceeds zero (excluding 328 accounts with 'zero' IA). Results from the exploratory evaluations that established the criteria and process for selecting the subset of accounts to be redigitized are summarized as follows:

Numeric Variables

- The Lancaster system includes 17,361 unique accounts with IAs ranging between 0.0014 and 3,900,000 square feet (ft^2), averaging 3,989 ft^2. Total records surface area (DEED_ACRES) for the corresponding accounts range between 0.01 to 152 acres, averaging 0.22 acres (or, between 150 and 4,277,327 ft^2, averaging 8,922 ft^2). Total acreage from an independent source is the sum of the GIS-digitized shape areas per account, ranging between 150 and 6,614,240 ft^2, averaging 9,570 ft^2. Total account assessment values for the 17,361 accounts based on the 2005 countywide assessment range between zero and $130 million, averaging $139,200.
- Relationships among all paired measures are all positively correlated, as shown in the graphical display of scatterplot matrix panels in Figure 1. 'Fuzzier,' less-linear angled patterns (such as the assessment and year built plots) suggest more 'noise' in the relationship. Supplementing the graphical display, the explicit Spearman rank correlation coefficients, adjusted for the number of paired comparisons evaluated, indicate that all the measures are significantly, positively correlated.

Categorical Factors

Categorical levels of the SW|LU class and spatial location of accounts within the utility network neighborhoods and/or districts represent factors that could affect the representativeness of accounts in the sample selected for redigitizing. Potential effects have been examined using box plots, graphical displays that compare subset of values (as described in Attachment Figure 1), and analysis of variance, which is an explicit comparison of the same variable within different subsets. Figure 2 exhibits the distributions of IA (ft^2) across the SW|LU class, 52 neighborhoods and 12 districts within the utility network, and the range of year-built from 1700 through 2011.

Factor effects on IA are summarized as follows:

- **NEIGHBORHOOD|DISTRICT|YEAR BUILT:** The variability across different spatial and temporal classes is wide, with numerous outliers occurring within levels of each of the three variables. However, levels within each of the variables exhibit broad overlap, indicating no obviously distinguishable subsets requiring particular attention in sample selection.
- **CLASS:** In contrast to the spatial and temporal factors above, the distribution of IAs within SW|LU classes differ substantively as apparent in both box plots and the probability plot (Figure 2) of IAs across the seven SW|LU classes. Although surface areas range broadly within class, residential and multi-family units contain comparatively less IA than the group of non-for-profit, institutional, government, and industrial accounts which are comparable overall. The distribution of commercial IAs lies midway between the residential and remaining non-residential classes.

The above exploratory results support selecting accounts for redigitizing (1) within SW|LU class and (2) systematically across the full range of observed account surface areas. The final consideration in defining the sample requires specification of sample sizes per SW|LU class. The proposed sample selection represents a compromise between the two approaches and is summarized in the following steps:

- Assign 10 percent of the accounts, limiting the sample size to at least 15 but no more than 60 accounts within each of the 6 classes, distributed as follows:

Class	Accounts	Sample Size
Commercial	1625	60
Government	56	15
Industrial	111	15
Institutional	44	15
Multi-Family	1976	20
Not For Profit	133	15
Residential		60

- Within class, sort by deed_acre, decreasing.
- Randomly establish a start point in the ranked accounts, then select every n-th record where n is approximated by the total number of accounts divided by the desired sample size.

Application of this process results in the 199 samples, which have been plotted in plan view in Figure 4. Figures 5.1-5.3 display the distribution of IA and deed_acre within SW|LU classes, highlighting the accounts assigned to the sample for redigitization as blue 'X's. The displays indicate that the selection process was effective in selecting over the range of surface areas within classes as well as giving reasonable spatial coverage of the entire Lancaster utility network.

3 IA Update GIS Processing

The 199 sample parcels and overlaid onto the IA layer created for the Green Infrastructure Plan and 2008 aerials. The IA update process involved two steps: first, classify the types of mistakes into one of seven categories of errors. Results are shown below.

	Error Class	Number of Parcels	Percent of Total Number
1	No Issues	12	6.0
2	Missing impervious classification	162	81.0
3	Impervious shape conflict with imagery	1	0.5
4	Cannot determine from image	3	1.5
5	Building impervious not entirely within parcel		
6	Impervious does not exist	5	2.5
7	Multiple issues	17	8.5
	Total	**200**	**100.0**

Secondly, for parcels showing any error (classes 2 through 7) the IA linework was adjusted to correct the mistake using the 2008 aerials as the source. A "new" IA was calculated for the sample set.

4 Evaluation of Redigitized Sample Impervious Surface Areas

Statistical evaluation of redigitized accounts focused on differences between the original 'old' IA and the 'new' IA resulting from the 199 redigitized parcels. Table 3 lists the results from the 199 redigitized accounts, sorted by SW|LU class, then by decreasing percent difference, where percent difference has been calculated as the difference between old and new so that positive differences indicate an increase resulting from the 2008 aerial photographs. Table 4 gives summary statistics for both differences in square footage of IA (new minus old square footaget) and percent difference (difference, divided by original IA), across the seven classes. Figure 6 plots old IA against new IA, color-coding by SW|LU class, and Figure 7 presents the box plots of percent difference for the 199 parcels redigitized, by classes. These summaries support the following conclusions with respect to the redigitized IA accounts:

- With the exception of 17 cases where 'old' and 'new' IA are the same; differences are consistently positive. This is most clearly indicated in Figure 6, where all points lie either on or above the diagonal line of zero difference, regardless of SW|LU class.
- Graphical comparisons (within classes) are corroborated with explicit statistical tests, the paired t-test and the non-parametric analogue, the Wilcoxon signed rank. Both tests indicate statistically significant differences between paired 'old' and 'new' IA within accounts, with the difference clearly positive; indicating increases in IA between the original data and the redigitized sample accounts based on 2008 aerial photography.
- All classes exhibit an overall increase in IA when comparing redigitized accounts with a median value of ~20 percent. However, median values that are most robust to extremes within the class range from a low of 8.9 percent for commercial accounts to a high of 45 percent for residential accounts.

Results from the comparison of 199 accounts support the conclusion that a redigitized file including IA for the network accounts is needed to support a final master billing accounting structure.

In the interim, for purposes of rate structure analyses, the issue remains as to how to adjust the IA of existing accounts that were not redigitized. Different options for adjusting IA for accounts were evaluated. The first option was to apply regression analyses per class, based upon a best-fit equation, which predicts updated IA based on the account surface area. The sample data within the seven classes were sufficient to support the regression models and exhibited extremely high adjusted r-square values (measure of model fit) with the exception of the more 'noisy' residential accounts. However, the regression is a linear equation that includes an intercept in all cases which, by definition, establishes a minimum account area for which IA is zero. Consequently, application of the regression models was eliminated as a method to adjust un-redigitized accounts.

The alternative approach selected was to apply the median (robust) estimate of percent increment (per Table 4) by class to the accounts not redigitized to conservatively adjust the old IA upward to a reasonable expected value of current IA. The process involved simple multiplication of the original IA by 1 plus the median percent difference; so, for example, a commercial account with original IA of 426 ft^2 would be adjusted upward to an expected IA of 464 ft^2 (8.9 percent increase). This adjustment was applied to all 17,162 accounts that were not redigitized. Accounts randomly selected for redigitizing were adjusted by the actual measured 'new' IA. Table 5 compares actual redigitized IA with projected IA using the percent difference method applied to accounts not redigitized. Discrepancies range broadly, further supporting the conclusion that the optimal approach to a final master billing account requires an updated, redigitized IA for all accounts.

5 Summary and Recommendation

IAs have changed sufficiently to require a system-wide redigitizing process to support developing the billing master account. Lancaster County has flown 2012 leaf-off, high-resolution aerials for the entire county and indicated the aerials would be available by the December 2012, barring any schedule issues. The County would ultimately use the aerials to update its GIS dataset (components of the impervious surface layer, such as parking lots, buildings, roadways, etc.). However, the County's schedule for that effort is unknown at this time.

Tables

TABLE 1

LANCASTER UTILITY GIS DB: CONDOMINIUM RESOLUTION

DB REPLACEMENT VALUES: AGGREGATED DEED_ACRES | IMPERVIOUS AREA_SF

			CUMULATIVE IMPERVIOUS AREA SF			CUMULATIVE SURFACE AREA sft -> acre				
COUNT SUBUNITS	ACCOUNT PREFIX	ACCOUNT SUFFIX	**SUMMED CONDO IMP AREA _SF[1]**	DB IMP AREA _SF[2]	IMPparent-IMPcum[3]	DB DEED_ACRES	**SUMMED CONDO ACRES**	SHAPE AREAacre	CONDO CUMULATIVE SHAPE AREA sqft	Shape_Area SQFT
8	33986292	00000	**11246.4**	17.8	0.002	0.36	**0.38**	0.12	16397	5136
3	33990073	00000	**31493.1**	289.2	0.01	0.89	**0.81**	0.03	35460	1336
114	33416888	00000	**24046.9**	241.1	0.01	0	**0.59**	0.01	25781	267
5	33130827	00000	**50063.2**	1961.0	0.04	1.48	**1.40**	0.22	61029	9460
3	33535736	00000	**3197.9**	208.9	0.07	0.19	**0.20**	0.10	8615	4159
31	33832565	00000	**7321.3**	577.3	0.08	0	**0.60**	0.42	26021	18419
12	33932561	00000	**7200.5**	627.9	0.09	0.18	**0.18**	0.01	8036	628
3	33310198	00000	**86526.6**	10684.3	0.12	2.75	**2.75**	0.35	119674	15324
19	33231266	00000	**7881.7**	1091.9	0.14	0	**0.30**	0.03	12852	1242
14	33275597	00000	**7830.8**	1277.3	0.16	0.18	**0.18**	0.00	7785	196
	~~**33275597**~~	~~**00000**~~	~~**7830.8**~~	~~**1277.3**~~	~~0.16~~	~~**0.18**~~	~~**0.18**~~	~~0.04~~	~~**7785**~~	~~**1639**~~
9	33929616	00000	**7106.2**	1200.7	0.17	0.31	**0.31**	0.11	13688	4688
6	33609389	00000	**21042.7**	3567.8	0.17	0.53	**0.54**	0.13	23446	5796
4	33713139	00000	**4280.0**	805.3	0.19	0.21	**0.22**	0.13	9369	5707
11	33295030	00000	**9285.5**	2285.6	0.25	0.21	**0.21**	0.05	9333	2334
19	33991309	00000	**40378.4**	13052.7	0.32	0.94	**0.94**	0.31	40746	13420
5	33118343	00000	**10037.8**	3716.6	0.37	0	**0.25**	0.11	10959	4623
79	33941501	00000	**118720.9**	60680.7	0.51	2.72	**2.73**	1.39	118721	60681
136	33558696	00000	**128819.0**	77993.8	0.61	6.19	**6.19**	4.92	269522	214355
15	33991417	00000	**1499590.6**	1013971.2	0.68	53.04	**51.58**	39.45	2246858	1718365
3	33795890	00000	**39148.0**	27320.9	0.70	0	**1.04**	0.75	45325	32789
45	33154689	00000	**15827.0**	11045.8	0.70	0	**0.38**	0.27	16498	11716
15	33670094	00000	**37494.4**	26864.4	0.72	0.27	**1.02**	0.77	44453	33694
50	33658984	00000	**37705.2**	28601.7	0.76	1.01	**1.05**	0.78	45761	33925
10	33929901	00000	**42295.9**	32493.5	0.77	1.05	**1.11**	0.88	48255	38452
11	33528285	00000	**31971.7**	25351.5	0.79	0	**0.80**	0.64	34711	27718
4	33328554	00000	**6806.7**	5442.1	0.80	0	**0.23**	0.19	9818	8357
5	33943402	00000	**40070.3**	32765.3	0.82	1.01	**1.01**	0.84	43905	36544
9	33238281	00000	**9395.0**	8187.7	0.87	0.22	**0.23**	0.20	10121	8913
619										

TABLE 2

LANCASTER UTILITY GIS DB

7 CLASS DEFINITIONS: STORM WATER & LAND USE CLASS DESCRIPTIONS

COMMERCIAL CLASS: 60 DESCRIPTIONS [1625 ACCOUNTS]

		STORM WATER	*LAND USE*
2	AG - VACANT	Non-Residential	Vacant
33	AUTO BODY/TIRE SHOP	Non-Residential	Commercial
7	AUTO DEALERSHIP	Non-Residential	Commercial
7	AUTO PARKING GARAGE	Non-Residential	Parking
119	AUTO PARKING LOT	Non-Residential	Parking
2	AUTO&SELF CAR WASH	Non-Residential	Commercial
4	BANK COMPLEX/OFFICE	Non-Residential	Commercial
1	BANKS&OFFICES	Non-Residential	Commercial
17	BARS	Non-Residential	Commercial
52	COMMERCIAL VACANT LAND	Non-Residential	Vacant
25	COMMUNITY SERVICE-VACANT	Non-Residential	Vacant
2	CULTURAL - VACANT	Non-Residential	Vacant
15	STORE	Non-Residential	Commercial
6	DINERS/LUNCHEONETTES	Non-Residential	Commercial
67	DOWNTOWN DETACHED	Non-Residential	Commercial
237	DOWNTOWN ROW	Non-Residential	Commercial
2	DRIVE IN BRANCH BANK	Non-Residential	Commercial
9	FRATERNAL/CIVIC ORGANIZATIONS	Non-Residential	Commercial
1	FUEL STORAGE/DISTRIBUTION	Non-Residential	Commercial
4	FUNERAL HOMES	Non-Residential	Commercial
1	GAS FACILITIES	Non-Residential	Commercial
2	HISTORICAL SITES	Non-Residential	Commercial
3	HOTEL	Non-Residential	Commercial
15	INDUSTRIAL -VACANT	Non-Residential	Vacant
1	LUMBER YARD/SAWMILL	Non-Residential	Commercial
1	MOTEL, INN, LODGE	Non-Residential	Commercial
1	MOTOR VEHICLE SERVICES	Non-Residential	Commercial
1	MOVIE THEATERS	Non-Residential	Commercial
14	MULTI/MIXED USE	Non-Residential	Commercial
5	MUSEUMS&ART GALLERYS	Non-Residential	Commercial
3	NBHD SHPPING CENTER	Non-Residential	Commercial
1	NIGHT CLUBS	Non-Residential	Commercial
130	OFFICE/PROFFESSIONAL BUILDING	Non-Residential	Commercial
59	ONE STORY MIXED	Non-Residential	Commercial
30	OTHER AUTO PARKING	Non-Residential	Parking
9	OTHER BANK&OFFICE	Non-Residential	Commercial
1	OTHER DINING ESTABLISHMENTS	Non-Residential	Commercial
6	OTHER LIVING ACCOMODATION	Non-Residential	Commercial
119	OTHER MULTI USE	Non-Residential	Commercial
9	OTHER RECREATION/SPORTS FACILITIES	Non-Residential	Commercial
68	OTHER RETAIL SERVICE	Non-Residential	Commercial
129	OTHER STORAGE/DISTRIBUTION	Non-Residential	Commercial
6	OTHER TOURIST ACTIVITES	Non-Residential	Commercial
27	OTHER VEHICLE SERVICES	Non-Residential	Commercial
155	PART COMM/RES	Non-Residential	Commercial
1	PRIVATE FOREST LAND	Non-Residential	Agricultural
1	RECREATIONAL AND SPORTS ACTIVITIES	Non-Residential	Commercial
3	REGIONAL SHOPPING CENTER	Non-Residential	Commercial
31	RESTAURANTS	Non-Residential	Commercial
13	RETAIL SERVICES	Non-Residential	Commercial
22	SERVICE&GAS STATIONS	Non-Residential	Commercial
133	SMALL PARKING GARAGE	Non-Residential	Parking
5	SNACK BARS	Non-Residential	Commercial
2	STADIUM/AUDITIORIUM	Non-Residential	Commercial
6	STANDARD BANK	Non-Residential	Commercial
2	STORAGE/DISTRIBUTION CENTER	Non-Residential	Commercial
2	SUPERMARKET	Non-Residential	Commercial
2	TOURIST/CULTURAL ACTIVITES	Non-Residential	Commercial
11	TOURIST/ROOMING HOUSES	Non-Residential	Commercial
36	TRANS/UTILITY VACANT	Non-Residential	Vacant

GOVERNMENT CLASS: 20 DESCRIPTIONS [56 ACCOUNTS]

		STORM WATER	*LAND USE*
1	BUS TRANSPORTATION	Non-Residential	Transportation
5	COUNTY	Non-Residential	County Govt.
5	COUNTY PARK	Non-Residential	County Govt.
7	ELECTRIC UTILITY	Non-Residential	Utility
1	FEDERAL/STATE	Non-Residential	Federal / State Govt.
1	FEDERAL/STATE PARK	Non-Residential	Government
1	GAS UTILITY	Non-Residential	Utility
8	LOCAL MUNICIPALITY	Non-Residential	Local Govt.
1	TRANSPORTATION	Non-Residential	Transportation
10	MUNICIPAL PARK	Non-Residential	Local Govt.
1	OTHER COMMUNICATIONS	Non-Residential	Utility
7	SERVICES	Non-Residential	Other Govt.
1	OTHER PARKS	Non-Residential	Other Govt.
4	TRANSPORTATION	Non-Residential	Transportation
5	POLICE&FIRE PROTECTION	Non-Residential	Police / Fire
2	RAILROAD RIGHT OF WAY	Non-Residential	Transportation
2	RAILROAD TERMINAL	Non-Residential	Transportation
2	SEWAGE DISPOSAL	Non-Residential	Utility
1	TELEPHONE&TELEGRAPH	Non-Residential	Utility
1	WATER UTILITY	Non-Residential	Utility

INDUSTRIAL CLASS: 4 DESCRIPTIONS [111 ACCOUNTS]

31	HEAVY INDUSTRIAL	Non-Residential	Industrial
78	LIGHT INDUSTRIAL	Non-Residential	Industrial
1	OTHER INDUSTRIAL	Non-Residential	Industrial
1	QUARRY/LANDFILL	Non-Residential	Industrial

INSTITUTIONAL CLASS: 11 DESCRIPTIONS [44 ACCOUNTS]

5	COLLEGES&UNIVERSITIES	Non-Residential	Institutional
1	HEALTH SERVICES	Non-Residential	Institutional
4	HOME FOR THE AGED	Non-Residential	Institutional
2	HOSPITALS	Non-Residential	Institutional
1	LIBRARY	Non-Residential	Institutional
5	OTHER EDUCATION SERVICES	Non-Residential	Institutional
2	OTHER HEALTH SERVICES	Non-Residential	Institutional
2	OTHER WELFARE SERVICES	Non-Residential	Institutional
19	SCHOOL-ELEMENTARY/SECONDARY	Non-Residential	Institutional
3	VOCATIONAL/TRADE SCHOOLS	Non-Residential	Institutional
1	WELFARE SERVICES	Non-Residential	Institutional

MULTIFAMILY CLASS: 14 DESCRIPTIONS [1976 ACCOUNTS]

8			
265	APARTMENTS	Non-Residential	Multi-Family
16	COMMERCIAL VACANT LAND	Non-Residential	Vacant
1	CONDO - COMMERCIAL	Non-Residential	Commercial
8	EIGHT FAMILY DWELLING	Multi-Family	Multi-Family
50	FIVE FAMILY DWELLING	Multi-Family	Multi-Family
117	FOUR FAMILY DWELLING	Multi-Family	Multi-Family
7	MOBILE HOME ON LAND	Multi-Family	Multi-Family
2	OFFICE/PROFFESSIONAL BUILDING	Non-Residential	Commercial
1	RETAIL SERVICES	Non-Residential	Commercial
7	SEVEN FAMILY DWELLING	Multi-Family	Multi-Family
26	SIX FAMILY DWELLING	Multi-Family	Multi-Family
369	THREE FAMILY DWELLING	Multi-Family	Multi-Family
1101	TWO FAMILY DWELLING	Multi-Family	Multi-Family

NOT FOR PROFIT CLASS: 5 DESCRIPTIONS [133 ACCOUNTS]

22	BENEVOLENT ASSOCIATION	Non-Residential	Religious
10	CEMETERIES	Non-Residential	Religious
22	CHURCH - COMPLEX	Non-Residential	Religious
63	CHURCH - STRUCTURE	Non-Residential	Religious
18	OTHER RELIGIOUS SERVICES	Non-Residential	Religious

RESIDENTIAL CLASS: 5 DESCRIPTIONS [13416 ACCOUNTS]

2	ESTATES	Residential	Single Family
18	IMPROV UNDER CONST	Residential	Single Family
98	OTHER RESIDENTIAL	Residential	Single Family
13279	SINGLE FAMILY DWELLING	Residential	Single Family
377	VACANT LAND	Residential	Vacant

TABLE 3
LANCASTER GIS: REDIGITIZED ACCOUNTS [N=199]
SORT: CLASS | PERCENT ORIGINAL IA

ACCOUNT	IA_ORIGINAL	IA_REDIGITIZED	IA_TOTAL	PERCENT ORIGINAL IA
COMMERCIAL				
3399636900000	25936	0	25936	0
3375077700000	202	0	202	0
3345144800000	28425	0	28425	0
3391170100000	27092	0	27092	0
3312880600000	5296	0	5296	0
3331283500000	2749	0	2749	0
3367137400000	7578	0	7578	0
3385679800000	4833	0	4833	0
3394486500000	57487	0	57487	0
3391321500000	15551	0	15551	0
3332779400000	5815	7	5821	0
3359805500000	9678	59	9737	1
3360921600000	13942	88	14029	1
3382845700000	6971	58	7029	1
3317195200000	3072	37	3109	1
3325538200000	2436	61	2497	3
3360719700000	1706	49	1755	3
3348566000000	4182	135	4317	3
3376703100000	3935	138	4073	4
3392877000000	333922	12593	346516	4
3363586700000	24360	938	25298	4
3382903900000	5757	227	5984	4
3372064700000	14937	659	15595	4
3319510100000	7705	350	8054	5
3315782100000	9645	483	10128	5
3390873800000	1946	107	2054	6
3361620700000	1201	69	1271	6
3385380900000	16566	1026	17592	6
3395627400000	113507	7790	121297	7
3329093000000	44620	3842	48461	9
3311333200000	1396	127	1523	9
3395399300000	65491	7329	72820	11
3384405600000	1464	166	1630	11
3349770300000	4492	527	5019	12
3385241900000	866	107	972	12
3341600600000	7855	1060	8916	13
3372404100000	3986	564	4550	14
3369824700000	6189	886	7075	14
3336345700000	1537	241	1778	16
3329463800000	3709	645	4354	17
3321533800000	4720	822	5542	17
3333474000000	901	161	1062	18
3363802200000	5307	964	6272	18
3351738100000	8871	1617	10488	18
3377579900000	3134	748	3882	24
3318041000000	2824	674	3497	24
3364456100000	1209	312	1521	26
3350027600000	808	322	1130	40
3368959100000	398	173	571	43
3398093000000	6038	2962	9000	49
3399645200000	2729	1662	4391	61
3393565500000	1267	848	2115	67
3373601100000	3049	2064	5113	68
3378145700000	1017	802	1820	79
3314140800000	1597	1284	2881	80
3368861600000	1894	1626	3520	86
3388870700000	969	958	1927	99
3340076100000	715	803	1519	112
3385089200000	1475	2129	3604	144
3348577900000	1490	4747	6237	319
GOVERNMENT				
3399443100000	142031	0	142031	0
3312463300000	16330	64	16394	0
3356159700000	27022	856	27878	3
3366978500000	14713	847	15560	6

3378288700000	324276	35018	359294	11
3323204600000	9414	1105	10518	12
3376810400000	81512	9875	91387	12
3381804900000	16265	2196	18460	14
3392822700000	169504	30915	200419	18
3317672000000	1694	324	2018	19
3323750400000	19910	54031	73941	271
3363930900000	2875	13935	16811	485
3316603500000	2673	17539	20212	656
3380602700000	2447	44641	47088	1825
INDUSTRIAL				
3395085700000	35055	0	35055	0
3396636000000	13245	0	13245	0
3398544700000	53147	0	53147	0
3363554800000	61986	294	62280	0
8109040400000	324492	5306	329798	2
3361014900000	2381550	90817	2472367	4
3357185800000	15662	1768	17430	11
3318386600000	18486	3355	21841	18
3348796200000	3445	662	4107	19
3388923800000	102722	22265	124987	22
3314928400000	41182	11487	52669	28
3315431800000	2588	1140	3729	44
3326376600000	4754	2240	6994	47
3390717700000	107675	53923	161598	50
INSTITUTIONAL				
3378132000000	4978	118	5096	2
3398856500000	36695	1069	37764	3
3361774900000	21714	804	22518	4
3394407800000	3079	120	3199	4
3354194800000	240368	10369	250738	4
3399515600000	56245	4003	60249	7
3349732200000	2451	225	2675	9
3311473900000	20376	2196	22572	11
3366030100000	25607	3374	28981	13
3343662000000	10124	1693	11817	17
3380747400000	31643	6894	38537	22
3360429400000	1093868	293702	1387570	27
3377574600000	146210	49870	196080	34
3385977900000	87415	40177	127592	46
3315913500000	33984	17042	51026	50
MULTIFAMILY				
3357357900000	1417	37	1454	3
8100804000000	424937	36239	461176	9
3394659000000	772	83	855	11
3362858500000	1449	197	1647	14
3360943000000	1318	194	1511	15
3323435200000	1203	186	1388	15
3376973000000	1362	265	1627	19
3352257300000	4831	1089	5920	23
3396406600000	1069	255	1325	24
3353277200000	1618	388	2006	24
3383004100000	781	344	1125	44
3371812400000	657	307	964	47
3398400700000	1327	636	1963	48
3384352000000	635	334	969	53
3395760600000	1557	992	2548	64
3366892000000	1223	791	2014	65
3396853500000	1602	1282	2883	80
3399482000000	1841	1671	3512	91
3375758100000	1114	1040	2155	93
3372148200000	1349	2149	3498	159
3372255800000	890	1505	2394	169
NON PROFIT				
3375753000000	16570	424	16994	3
3336954000000	22684	902	23585	4
3398751400000	16372	908	17281	6
3358774700000	1871	127	1998	7
3387092500000	5459	678	6137	12
3383966600000	12170	2174	14344	18
3332210200000	58228	12395	70623	21
3357450200000	8201	1770	9971	22

3394646600000	3765	988	4753	26
3323281900000	3425	1333	4757	39
3376531800000	983	411	1394	42
3362459800000	18278	7659	25937	42
3394150400000	4719	2272	6992	48
3376339000000	3800	2577	6377	68
3387361000000	2384	2433	4817	102
RESIDENTIAL				
3376717900000	4	0	4	0
3364086200000	1059	0	1059	0
3380612700000	855	0	855	0
3380027700000	1014	58	1072	6
3370878300000	1270	87	1357	7
3389623700000	1078	85	1163	8
3367489800000	818	69	887	8
3361665500000	980	121	1100	12
3350037800000	836	105	941	13
3383803600000	605	77	682	13
3373679900000	890	116	1006	13
3392999000000	925	153	1078	17
3375180900000	620	107	727	17
3363632400000	1115	210	1325	19
3389832300000	664	130	794	20
3376263100000	616	137	753	22
3369875200000	892	201	1092	22
3322113500000	611	138	748	23
3368117700000	948	225	1172	24
3362503500000	730	176	906	24
3378980800000	799	204	1003	26
3319005500000	759	194	953	26
7804876800000	1701	444	2146	26
3372191900000	1018	268	1285	26
7809108900000	1951	574	2526	29
3318029000000	1707	577	2284	34
3392809300000	1791	652	2442	36
3357602000000	725	272	997	38
3386976800000	672	301	973	45
3386483600000	879	396	1275	45
3365241600000	677	307	984	45
3379307800000	1231	571	1801	46
3384001400000	786	380	1167	48
3399586500000	941	460	1401	49
3382097000000	934	485	1419	52
3368127400000	928	509	1437	55
3386605600000	956	533	1489	56
3361134300000	584	331	914	57
3388794300000	753	428	1181	57
3342882400000	1670	1008	2678	60
3380799200000	670	412	1082	61
7902660600000	1931	1355	3285	70
3385284700000	1638	1176	2815	72
3365762000000	972	705	1676	73
3340465600000	719	525	1244	73
3380022000000	2420	1805	4225	75
3360051300000	798	641	1439	80
3385931300000	436	370	806	85
3362574600000	911	777	1688	85
3396593400000	2444	2200	4644	90
3387362500000	847	814	1661	96
3381808100000	613	602	1215	98
3363146700000	1173	1336	2509	114
3315909400000	562	643	1205	114
3336208300000	695	881	1576	127
3392013700000	998	1294	2292	130
3383610400000	583	790	1374	136
3388453400000	699	984	1683	141
3374993700000	505	1024	1529	203
3329686200000	398	1837	2235	462

TABLE 4

LANCASTER REDIGITIZATION RESULTS

SUMMARY BY ACCOUNT CLASS

				SUMMARY STATISTICS					
	N	MINIMUM	MAXIMUM	MEDIAN	MEAN	SD	CV	95LCL	95UCL
DIFFERENCE: CRITIGEN REDIGITIZED IMPERVIOUS SF									
POOLED	*199*	*0.0*	*293702.0*	*602.0*	*5129.0*	*23257.0*	*4.54*	*1877.0*	*8380.0*
COMMERCIAL	60	0.0	12593.4	335.6	1100.8	2164.9	1.97	541.5	1660.0
GOVERNMENT	14	0.0	54030.7	6035.3	15096.1	18627.0	1.23	4341.2	25851.0
INDUSTRIAL	14	0.0	90816.7	2003.6	13804.0	26551.4	1.92	-1526.3	29134.4
INSTITUTIONAL	15	118.2	293702.2	3374.1	28777.1	74844.0	2.60	-12670.2	70224.3
MULTIFAMILY	21	36.5	36238.9	387.9	2380.0	7780.2	3.27	-1161.5	5921.5
NONPROFIT	15	126.7	12395.2	1332.8	2470.0	3290.5	1.33	647.8	4292.2
RESIDENTIAL	60	0.0	2200.3	403.8	521.0	483.0	0.93	396.2	645.7
PERCENT DIFFERENCE: DIFFERENCE/ORIGINAL IMPERVIOUS SF									
POOLED	*199*	*0.0*	*1825.0*	*19.5*	*52.6*	*147.7*	*2.81*	*31.9*	*73.2*
COMMERCIAL	60	0.0	318.6	8.9	26.6	49.8	1.87	13.8	39.5
GOVERNMENT	14	0.0	1824.7	12.8	238.0	502.1	2.11	-51.9	527.9
INDUSTRIAL	14	0.0	50.1	14.7	17.5	18.5	1.06	6.8	28.2
INSTITUTIONAL	15	2.4	50.1	10.8	16.9	15.8	0.94	8.1	25.6
MULTIFAMILY	21	2.6	169.1	44.1	50.8	46.6	0.92	29.6	72.0
NONPROFIT	15	2.6	102.1	21.6	30.6	27.4	0.89	15.4	45.7
RESIDENTIAL	60	0.0	461.8	45.2	58.4	67.5	1.15	41.0	75.9

TABLE 5
REDIGITIZED | ADJUSTED FINAL IA COMPARISON

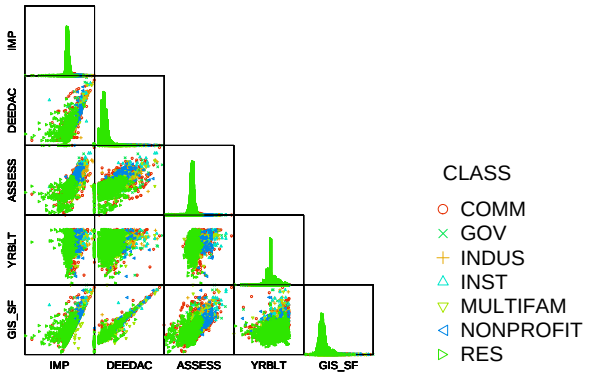
OBJCTID	ACCOUNT	CLASS	ORIGINAL IA	CRITIGEN IA	ORIGINAL PLUS CRITIGEN IA	ORIGINAL IA * MEDIAN PERCENT DIFFERENCE/CLASS	ADJUSTED MINUS OBSERVED [CRITIGEN + ORIGINAL]	PRCNT DIF/OBSERVED IA
120	3380602700000	GOV	2447	44641	47088	2760	-44328	**-94.1**
15	3316603500000	GOV	2673	17539	20212	3015	-17197	**-85.1**
79	3363930900000	GOV	2875	13935	16811	3243	-13567	**-80.7**
28	3329686200000	RES	398	1837	2235	578	-1657	**-74.2**
43	3348577900000	COMM	1490	4747	6237	1622	-4614	**-74.0**
23	3323750400000	GOV	19910	54031	73941	22458	-51482	**-69.6**
39	3385089200000	COMM	1475	2129	3604	1606	-1998	**-55.4**
102	3374993700000	RES	505	1024	1529	733	-796	**-52.1**
35	3340076100000	COMM	715	803	1519	779	-740	**-48.7**
98	3372255800000	MULTIFAM	890	1505	2394	1282	-1112	**-46.4**
157	3388870700000	COMM	969	958	1927	1055	-872	**-45.3**
96	3372148200000	MULTIFAM	1349	2149	3498	1944	-1554	**-44.4**
89	3368861600000	COMM	1894	1626	3520	2063	-1457	**-41.4**
153	3387361000000	NONPROFIT	2384	2433	4817	2899	-1918	**-39.8**
155	3388453400000	RES	699	984	1683	1014	-669	**-39.7**
9	3314140800000	COMM	1597	1284	2881	1739	-1142	**-39.6**
114	3378145700000	COMM	1017	802	1820	1108	-712	**-39.1**
129	3383610400000	RES	583	790	1374	847	-527	**-38.3**
169	3392013700000	RES	998	1294	2292	1449	-843	**-36.8**
32	3336208300000	RES	695	881	1576	1009	-567	**-36.0**
100	3373601100000	COMM	3049	2064	5113	3321	-1792	**-35.1**
174	3393565500000	COMM	1267	848	2115	1379	-736	**-34.8**
166	3399645200000	COMM	2729	1662	4391	2972	-1419	**-32.3**
13	3315909400000	RES	562	643	1205	817	-389	**-32.2**
74	3363146700000	RES	1173	1336	2509	1703	-806	**-32.1**
104	3376339000000	NONPROFIT	3800	2577	6377	4621	-1756	**-27.5**
183	3398093000000	COMM	6038	2962	9000	6575	-2425	**-26.9**
124	3381808100000	RES	613	602	1215	890	-325	**-26.8**
14	3315913500000	INST	33984	17042	51026	37654	-13371	**-26.2**
154	3387362500000	RES	847	814	1661	1230	-431	**-26.0**
106	3375758100000	MULTIFAM	1114	1040	2155	1606	-549	**-25.5**
163	3399482000000	MULTIFAM	1841	1671	3512	2653	-859	**-24.5**
140	3385977900000	INST	87415	40177	127592	96856	-30736	**-24.1**
90	3368959100000	COMM	398	173	571	434	-137	**-24.0**
181	3396593400000	RES	2444	2200	4644	3549	-1096	**-23.6**
167	3390717700000	INDUS	107675	53923	161598	123503	-38095	**-23.6**
47	3350027600000	COMM	808	322	1130	880	-250	**-22.1**
25	3326376600000	INDUS	4754	2240	6994	5453	-1541	**-22.0**
72	3362574600000	RES	911	777	1688	1323	-365	**-21.6**
139	3385931300000	RES	436	370	806	633	-172	**-21.4**
11	3315431800000	INDUS	2588	1140	3729	2969	-760	**-20.4**
182	3396853500000	MULTIFAM	1602	1282	2883	2308	-575	**-20.0**
60	3360051300000	RES	798	641	1439	1159	-280	**-19.5**
175	3394150400000	NONPROFIT	4719	2272	6992	5739	-1253	**-17.9**
111	3377574600000	INST	146210	49870	196080	162001	-34080	**-17.4**
118	3380022000000	RES	2420	1805	4225	3514	-711	**-16.8**
36	3340465600000	RES	719	525	1244	1044	-200	**-16.1**
82	3365762000000	RES	972	705	1676	1411	-266	**-15.8**
136	3385284700000	RES	1638	1176	2815	2379	-436	**-15.5**
189	7902660600000	RES	1931	1355	3285	2803	-482	**-14.7**
70	3362459800000	NONPROFIT	18278	7659	25937	22226	-3711	**-14.3**
107	3376531800000	NONPROFIT	983	411	1394	1196	-198	**-14.2**
80	3364456100000	COMM	1209	312	1521	1317	-204	**-13.4**
61	3360429400000	INST	1093868	293702	1387570	1212005	-175564	**-12.7**
21	3323281900000	NONPROFIT	3425	1333	4757	4164	-593	**-12.5**
84	3366892000000	MULTIFAM	1223	791	2014	1763	-251	**-12.5**
2	3318041000000	COMM	2824	674	3497	3075	-423	**-12.1**
112	3377579900000	COMM	3134	748	3882	3413	-469	**-12.1**
179	3395760600000	MULTIFAM	1557	992	2548	2243	-305	**-12.0**
10	3314928400000	INDUS	41182	11487	52669	47236	-5433	**-10.3**
122	3380799200000	RES	670	412	1082	973	-109	**-10.1**
40	3342882400000	RES	1670	1008	2678	2425	-253	**-9.4**

121	3380747400000	INST	31643	6894	38537	35060	-3476	**-9.0**
49	3351738100000	COMM	8871	1617	10488	9660	-828	**-7.9**
78	3363802200000	COMM	5307	964	6272	5780	-492	**-7.8**
31	3333474000000	COMM	901	161	1062	981	-81	**-7.7**
156	3388794300000	RES	753	428	1181	1093	-87	**-7.4**
66	3361134300000	RES	584	331	914	847	-67	**-7.3**
18	3321533800000	COMM	4720	822	5542	5140	-402	**-7.2**
27	3329463800000	COMM	3709	645	4354	4040	-315	**-7.2**
138	3386605600000	RES	956	533	1489	1388	-100	**-6.7**
88	3368127400000	RES	928	509	1437	1347	-90	**-6.3**
33	3336345700000	COMM	1537	241	1778	1674	-104	**-5.8**
158	3388923800000	INDUS	102722	22265	124987	117822	-7165	**-5.7**
133	3384352000000	MULTIFAM	635	334	969	915	-54	**-5.5**
17	3317672000000	GOV	1694	324	2018	1911	-107	**-5.3**
41	3343662000000	INST	10124	1693	11817	11218	-600	**-5.1**
92	3369824700000	COMM	6189	886	7075	6740	-336	**-4.7**
99	3372404100000	COMM	3986	564	4550	4341	-209	**-4.6**
171	3392822700000	GOV	169504	30915	200419	191200	-9219	**-4.6**
125	3382097000000	RES	934	485	1419	1356	-63	**-4.4**
37	3341600600000	COMM	7855	1060	8916	8554	-361	**-4.1**
44	3348796200000	INDUS	3445	662	4107	3951	-156	**-3.8**
161	3394646600000	NONPROFIT	3765	988	4753	4578	-174	**-3.7**
135	3385241900000	COMM	866	107	972	943	-30	**-3.0**
3	3318386600000	INDUS	18486	3355	21841	21203	-638	**-2.9**
184	3398400700000	MULTIFAM	1327	636	1963	1912	-50	**-2.6**
46	3349770300000	COMM	4492	527	5019	4892	-127	**-2.5**
165	3399586500000	RES	941	460	1401	1367	-34	**-2.5**
134	3384405600000	COMM	1464	166	1630	1595	-36	**-2.2**
132	3384001400000	RES	786	380	1167	1142	-25	**-2.1**
83	3366030100000	INST	25607	3374	28981	28372	-609	**-2.1**
177	3395399300000	COMM	65491	7329	72820	71319	-1501	**-2.1**
94	3371812400000	MULTIFAM	657	307	964	947	-17	**-1.7**
117	3379307800000	RES	1231	571	1801	1787	-14	**-0.8**
123	3381804900000	GOV	16265	2196	18460	18346	-114	**-0.6**
6	3311333200000	COMM	1396	127	1523	1521	-3	**-0.2**
81	3365241600000	RES	677	307	984	983	-1	**-0.1**
56	3357450200000	NONPROFIT	8201	1770	9971	9972	1	**0.0**
128	3383004100000	MULTIFAM	781	344	1125	1126	0	**0.0**
7	3311473900000	INST	20376	2196	22572	22577	4	**0.0**
141	3386483600000	RES	879	396	1275	1277	2	**0.1**
29	3332210200000	NONPROFIT	58228	12395	70623	70805	182	**0.3**
26	3329093000000	COMM	44620	3842	48461	48591	129	**0.3**
142	3386976800000	RES	672	301	973	976	3	**0.3**
109	3376810400000	GOV	81512	9875	91387	91945	559	**0.6**
20	3323204600000	GOV	9414	1105	10518	10619	100	**1.0**
45	3349732200000	INST	2451	225	2675	2715	40	**1.5**
115	3378288700000	GOV	324276	35018	359294	365784	6490	**1.8**
178	3395627400000	COMM	113507	7790	121297	123609	2312	**1.9**
137	3385380900000	COMM	16566	1026	17592	18040	448	**2.5**
67	3361620700000	COMM	1201	69	1271	1308	38	**3.0**
54	3357185800000	INDUS	15662	1768	17430	17964	535	**3.1**
131	3383966600000	NONPROFIT	12170	2174	14344	14799	455	**3.2**
168	3390873800000	COMM	1946	107	2054	2120	66	**3.2**
164	3399515600000	INST	56245	4003	60249	62320	2071	**3.4**
12	3315782100000	COMM	9645	483	10128	10503	375	**3.7**
5	3319510100000	COMM	7705	350	8054	8390	336	**4.2**
95	3372064700000	COMM	14937	659	15595	16266	671	**4.3**
127	3382903900000	COMM	5757	227	5984	6269	285	**4.8**
76	3363586700000	COMM	24360	938	25298	26528	1230	**4.9**
172	3392877000000	COMM	333922	12593	346516	363641	17126	**4.9**
108	3376703100000	COMM	3935	138	4073	4285	212	**5.2**
42	3348566000000	COMM	4182	135	4317	4555	238	**5.5**
57	3357602000000	RES	725	272	997	1053	55	**5.5**
62	3360719700000	COMM	1706	49	1755	1858	103	**5.9**
52	3354194800000	INST	240368	10369	250738	266328	15590	**6.2**
24	3325538200000	COMM	2436	61	2497	2653	155	**6.2**
170	3392809300000	RES	1791	652	2442	2600	158	**6.5**
176	3394407800000	INST	3079	120	3199	3412	213	**6.7**
85	3366978500000	GOV	14713	847	15560	16596	1036	**6.7**
69	3361774900000	INST	21714	804	22518	24059	1541	**6.8**

16	3317195200000	COMM	3072	37	3109	3345	237	**7.6**
186	3398856500000	INST	36695	1069	37764	40658	2894	**7.7**
126	3382845700000	COMM	6971	58	7029	7591	562	**8.0**
152	3387092500000	NONPROFIT	5459	678	6137	6638	501	**8.2**
63	3360921600000	COMM	13942	88	14029	15182	1153	**8.2**
113	3378132000000	INST	4978	118	5096	5515	419	**8.2**
59	3359805500000	COMM	9678	59	9737	10539	802	**8.2**
1	3318029000000	RES	1707	577	2284	2478	194	**8.5**
30	3332779400000	COMM	5815	7	5821	6332	511	**8.8**
192	3399636900000	COMM	25936	0	25936	28245	2308	**8.9**
148	3375077700000	COMM	202	0	202	220	18	**8.9**
145	3345144800000	COMM	28425	0	28425	30955	2530	**8.9**
193	3391170100000	COMM	27092	0	27092	29504	2411	**8.9**
143	3312880600000	COMM	5296	0	5296	5768	471	**8.9**
144	3331283500000	COMM	2749	0	2749	2994	245	**8.9**
147	3367137400000	COMM	7578	0	7578	8253	674	**8.9**
151	3385679800000	COMM	4833	0	4833	5264	430	**8.9**
196	3394486500000	COMM	57487	0	57487	62603	5116	**8.9**
194	3391321500000	COMM	15551	0	15551	16935	1384	**8.9**
53	3356159700000	GOV	27022	856	27878	30481	2603	**9.3**
65	3361014900000	INDUS	2381550	90817	2472367	2731638	259271	**10.5**
188	7809108900000	RES	1951	574	2526	2833	308	**12.2**
8	3312463300000	GOV	16330	64	16394	18420	2026	**12.4**
199	3399443100000	GOV	142031	0	142031	160211	18180	**12.8**
191	8109040400000	INDUS	324492	5306	329798	372193	42395	**12.9**
58	3358774700000	NONPROFIT	1871	127	1998	2275	277	**13.9**
75	3363554800000	INDUS	61986	294	62280	71098	8818	**14.2**
195	3395085700000	INDUS	35055	0	35055	40208	5153	**14.7**
197	3396636000000	INDUS	13245	0	13245	15192	1947	**14.7**
198	3398544700000	INDUS	53147	0	53147	60959	7813	**14.7**
97	3372191900000	RES	1018	268	1285	1477	192	**15.0**
187	7804876800000	RES	1701	444	2146	2470	325	**15.1**
185	3398751400000	NONPROFIT	16372	908	17281	19909	2628	**15.2**
4	3319005500000	RES	759	194	953	1102	149	**15.6**
116	3378980800000	RES	799	204	1003	1160	157	**15.7**
51	3353277200000	MULTIFAM	1618	388	2006	2332	326	**16.2**
180	3396406600000	MULTIFAM	1069	255	1325	1541	216	**16.3**
34	3336954000000	NONPROFIT	22684	902	23585	27583	3998	**17.0**
71	3362503500000	RES	730	176	906	1060	154	**17.0**
87	3368117700000	RES	948	225	1172	1376	204	**17.4**
50	3352257300000	MULTIFAM	4831	1089	5920	6962	1042	**17.6**
19	3322113500000	RES	611	138	748	887	139	**18.5**
93	3369875200000	RES	892	201	1092	1295	203	**18.5**
105	3375753000000	NONPROFIT	16570	424	16994	20149	3155	**18.6**
38	3376263100000	RES	616	137	753	894	142	**18.8**
110	3376973000000	MULTIFAM	1362	265	1627	1963	336	**20.6**
160	3389832300000	RES	664	130	794	964	171	**21.5**
77	3363632400000	RES	1115	210	1325	1619	294	**22.2**
103	3375180900000	RES	620	107	727	901	173	**23.8**
173	3392999000000	RES	925	153	1078	1343	265	**24.6**
22	3323435200000	MULTIFAM	1203	186	1388	1733	345	**24.8**
64	3360943000000	MULTIFAM	1318	194	1511	1899	387	**25.6**
73	3362858500000	MULTIFAM	1449	197	1647	2088	442	**26.8**
101	3373679900000	RES	890	116	1006	1293	286	**28.5**
130	3383803600000	RES	605	77	682	879	197	**28.8**
48	3350037800000	RES	836	105	941	1213	272	**28.9**
68	3361665500000	RES	980	121	1100	1423	322	**29.3**
162	3394659000000	MULTIFAM	772	83	855	1113	258	**30.2**
190	8100804000000	MULTIFAM	424937	36239	461176	612334	151158	**32.8**
86	3367489800000	RES	818	69	887	1187	301	**33.9**
159	3389623700000	RES	1078	85	1163	1566	402	**34.6**
91	3370878300000	RES	1270	87	1357	1843	487	**35.9**
119	3380027700000	RES	1014	58	1072	1472	400	**37.4**
55	3357357900000	MULTIFAM	1417	37	1454	2042	588	**40.5**
149	3376717900000	RES	4	0	4	6	2	**45.2**
146	3364086200000	RES	1059	0	1059	1538	479	**45.2**
150	3380612700000	RES	855	0	855	1241	386	**45.2**

s

Figures



SCATTERPLOT MATRIX, or, 'SPLOM'

The exhibit includes two panels of SPLOMs—the smaller panel in the upper left includes residential properties which account for the majority of accounts [77 percent]. Because non-residential and multi-family parcels are of greater interest for selecting accounts for re-digitizing, the larger panel [lower center] has been limited to accounts in the 6 SW|LU classes comprising those two broad categories of accounts: commercial, government, industrial, institutional, multifamily and not-for-profit.

The displays consist of 10 separate plots laid out in a lower triangle of a matrix. The five plots along the diagonal are the 5 are histograms displaying the distributions of the variables indicated on the x-axis of the entire matrix of plots; including, moving from left to right: IMP [impervious surface area], DEEDAC [deed-acres], ASSESS [total assessment], YRBLT [year constructed] and GIS_SF [GIS total square footage]. The 10 panels below the diagonal of histograms are paired variable plots with the variable on the x-axis indicated in the column heading below and the y-axis indicated by the variable names to the left of the first column. The 10 panels correspond to all possible paired variable plots. So, for example, the panel plotting paired GIS_square feet on the y-axis and deed_acre on the x-axis is the second plot from the left on the bottom row of the exhibit.

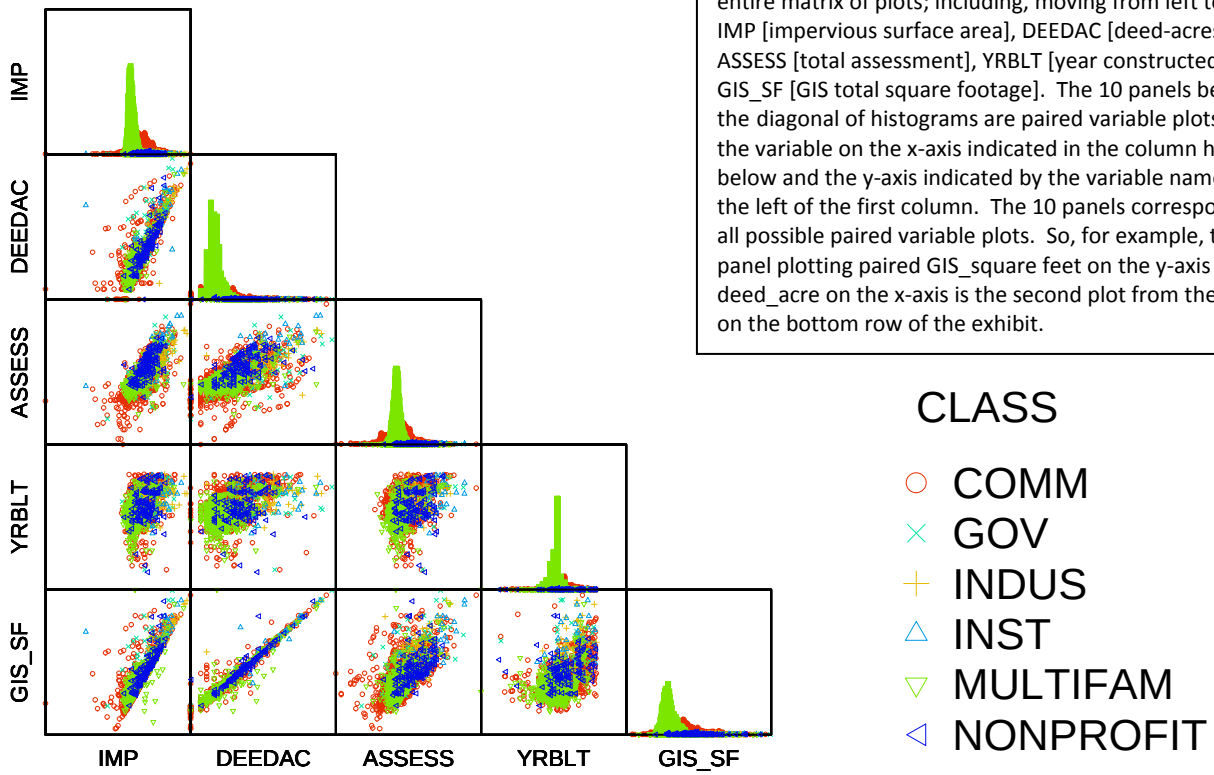


FIGURE 1

LANCASTER UTILITY GIS: CONTINUOUS VARIABLE RELATIONSHIPS

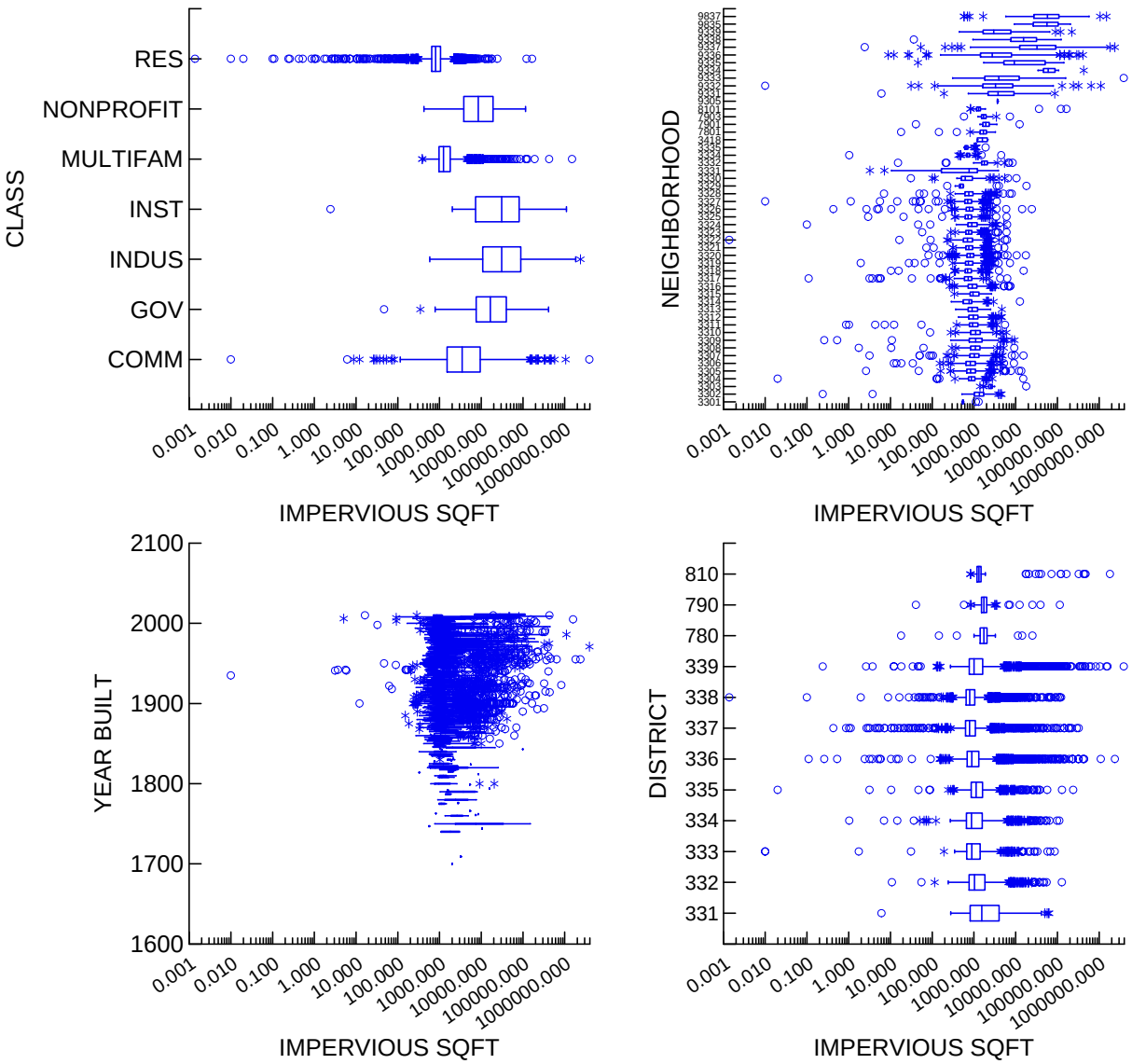
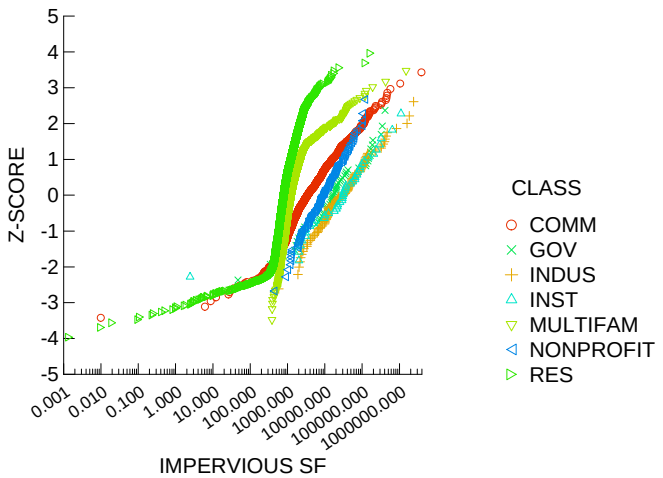


FIGURE 2

LANCASTER UTILITY GIS: IMPERVIOUS AREA BY SW|UL CLASS & NETWORK AREA



PROBABILITY PLOT
The panels are probability plots of the observed impervious area, color-coded by SW|LU class, against the theoretical 'Normal' distribution. The smaller panel to the left includes single residential properties which numerically dominate the Lancaster distribution network. The lower panel excludes the residential parcels to be better display the non-residential and/or multi-family accounts.

In the probability plots, if data are normally distributed they fall along a straight line. Lines falling further left indicate data subsets with lower impervious surface area; e.g., the distribution of residential accounts in the upper panel [dark green] as compared to the institutional accounts [aqua] with comparatively larger areas of impervious surface. The relative straightness of lines in the lower panel indicates a single population, excluding the 'break' in the multi-family plot which suggests a bimodal distribution of impervious areas.

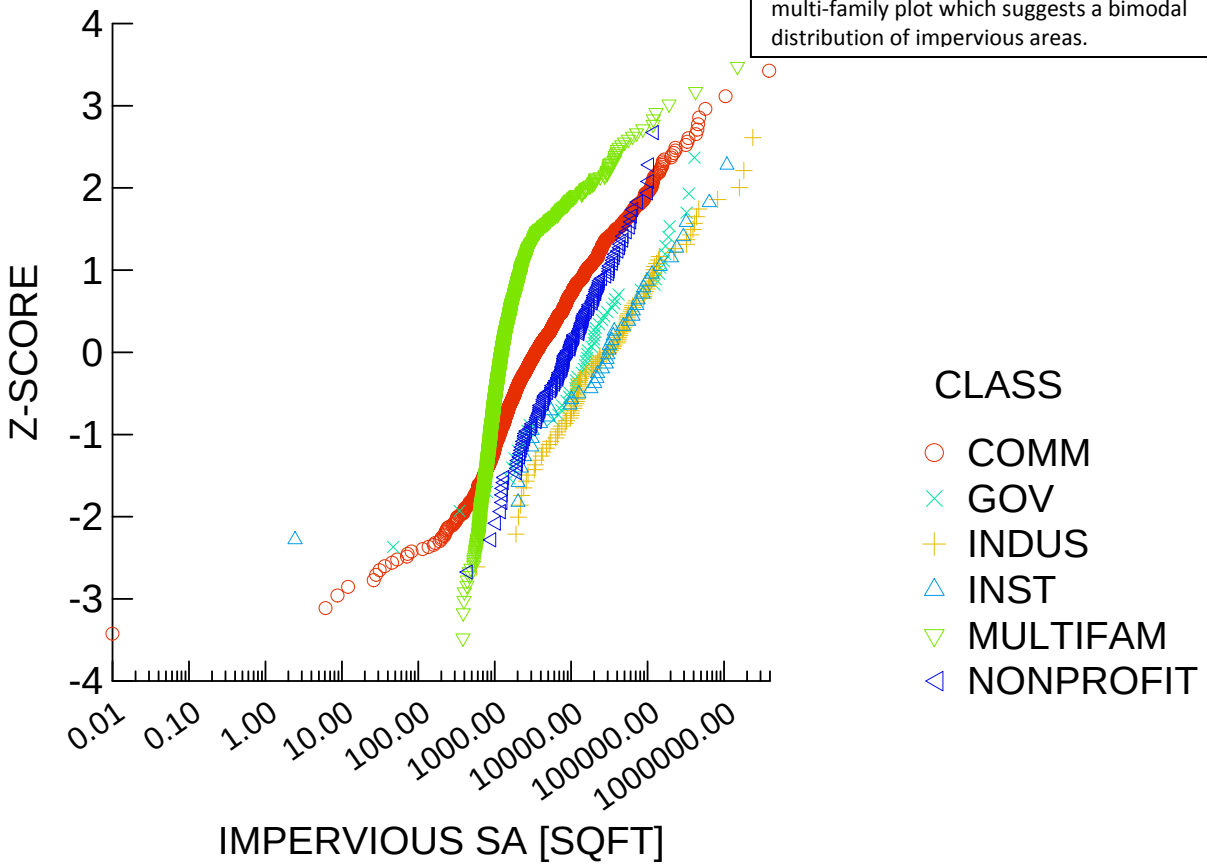


FIGURE 3

LANCASTER UTILITY GIS: IMPERVIOUS SURFACE AREA DISTRIBUTION BY CLASS

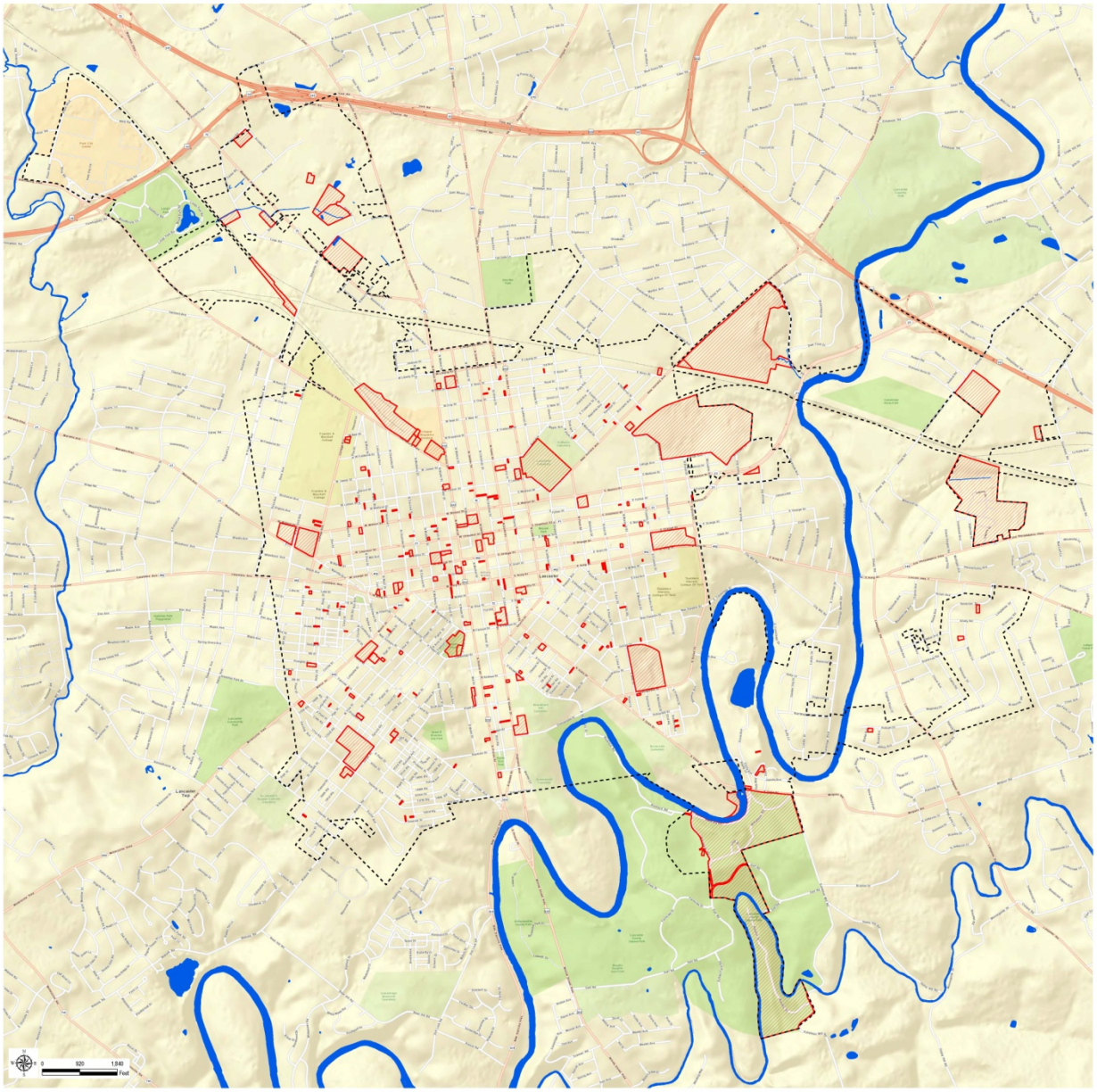


Figure 4

ACCOUNTS SELECTED FOR REDIGITIZING: SPATIAL DISTRIBUTION

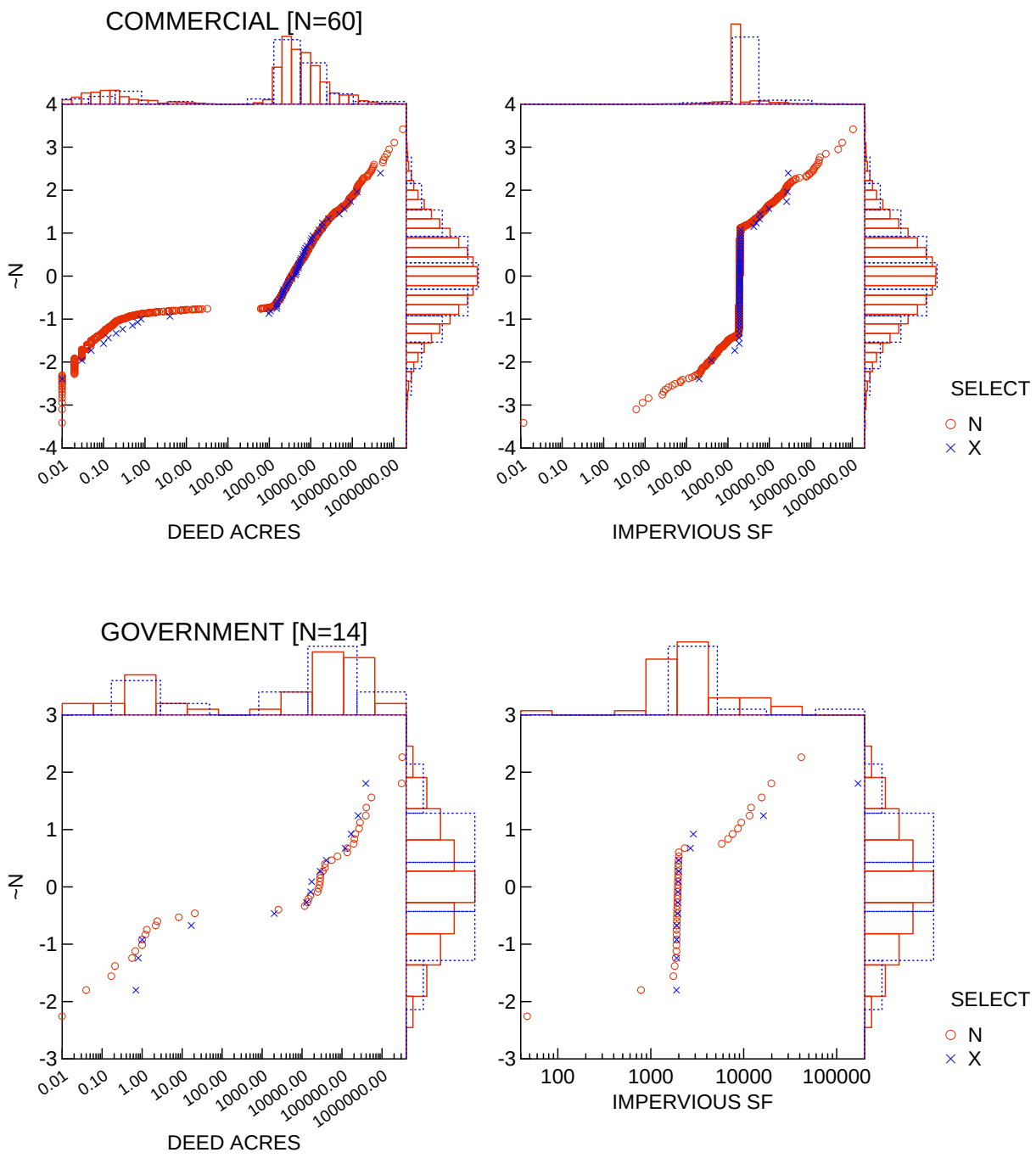
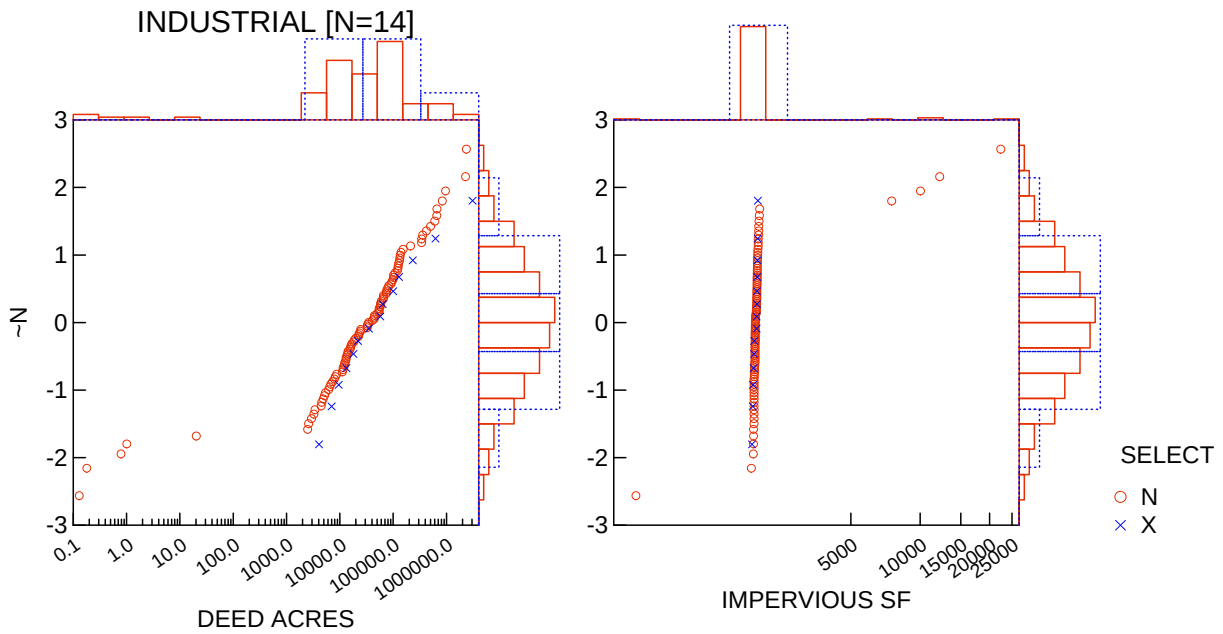


FIGURE 5.1

ACCOUNTS SELECTED FOR REDIGITIZING: ACREAGE|IA BY SW|LU CLASS



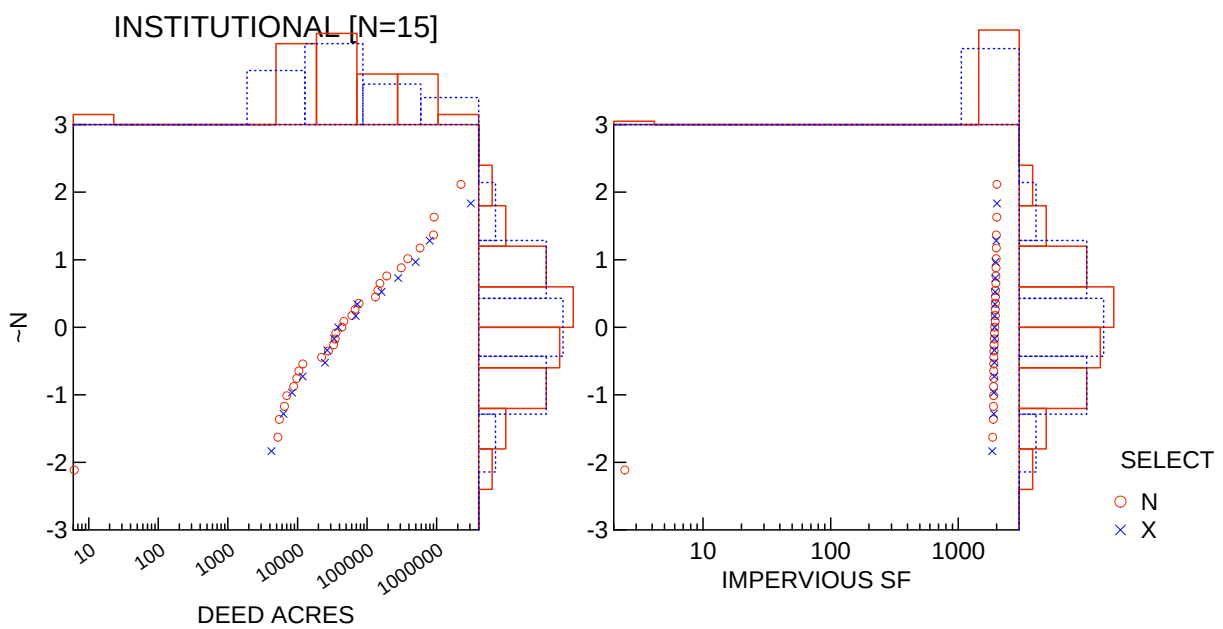
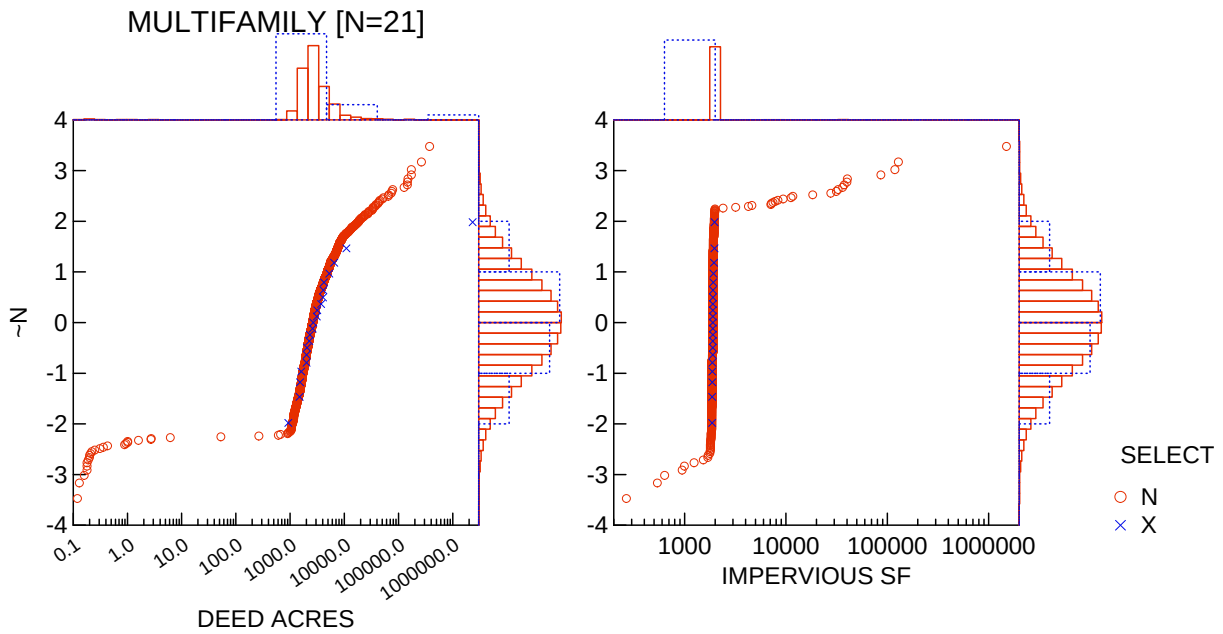


FIGURE 5.2

ACCOUNTS SELECTED FOR REDIGITIZING: ACREAGE|IA BY SW|LU CLASS *cont'd*



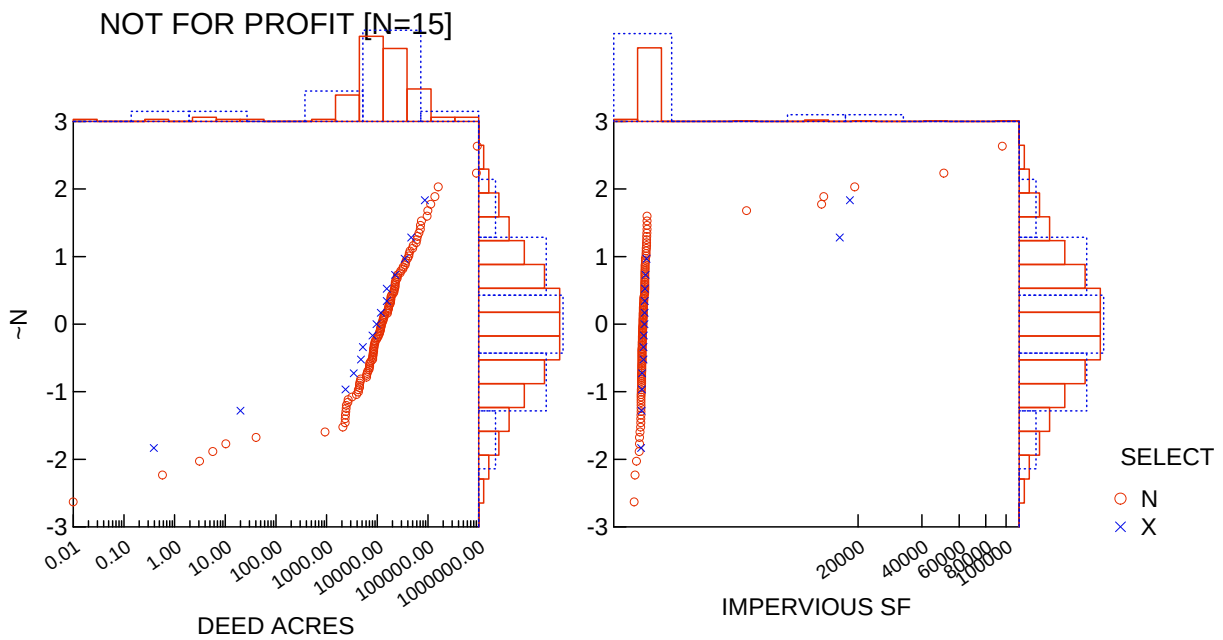


FIGURE 5.3

ACCOUNTS SELECTED FOR REDIGITIZING: ACREAGE|IA BY SW|LU CLASS*cont'd*

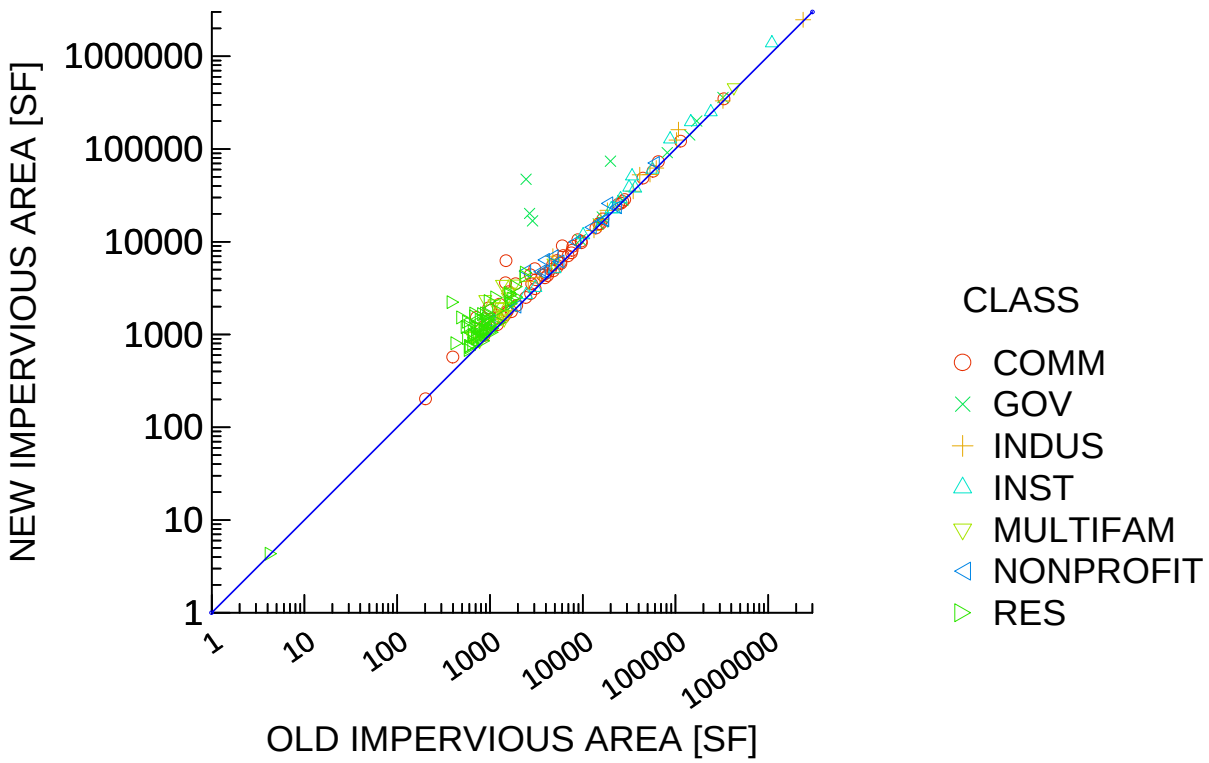


FIGURE 6

NEW IMPERVIOUS SURFACE VS OLD IMPERVIOUS SURFACE AREA: BY CLASS

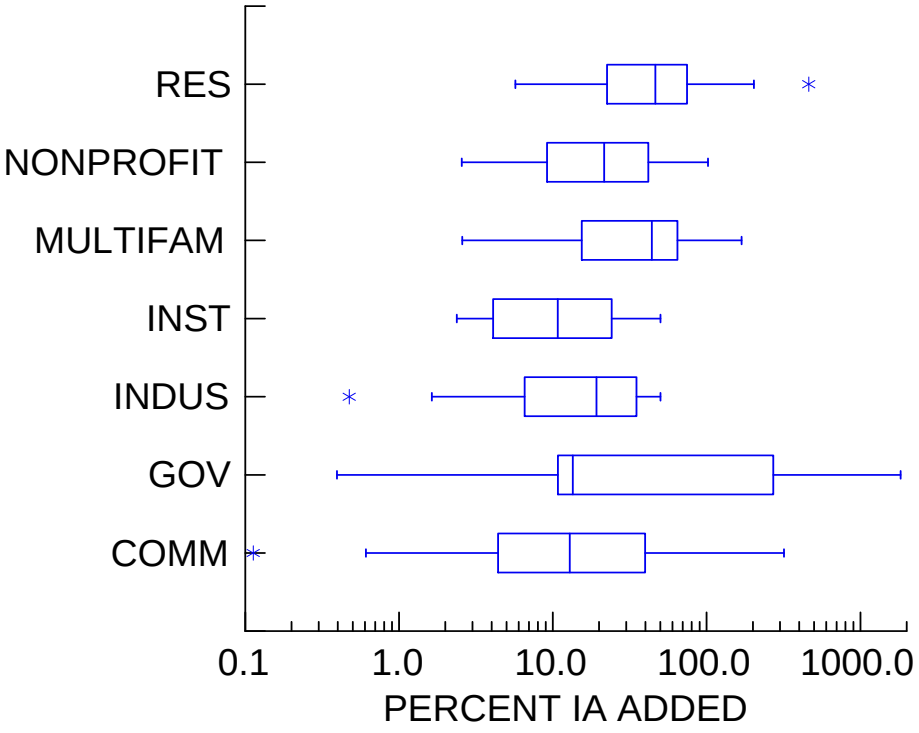
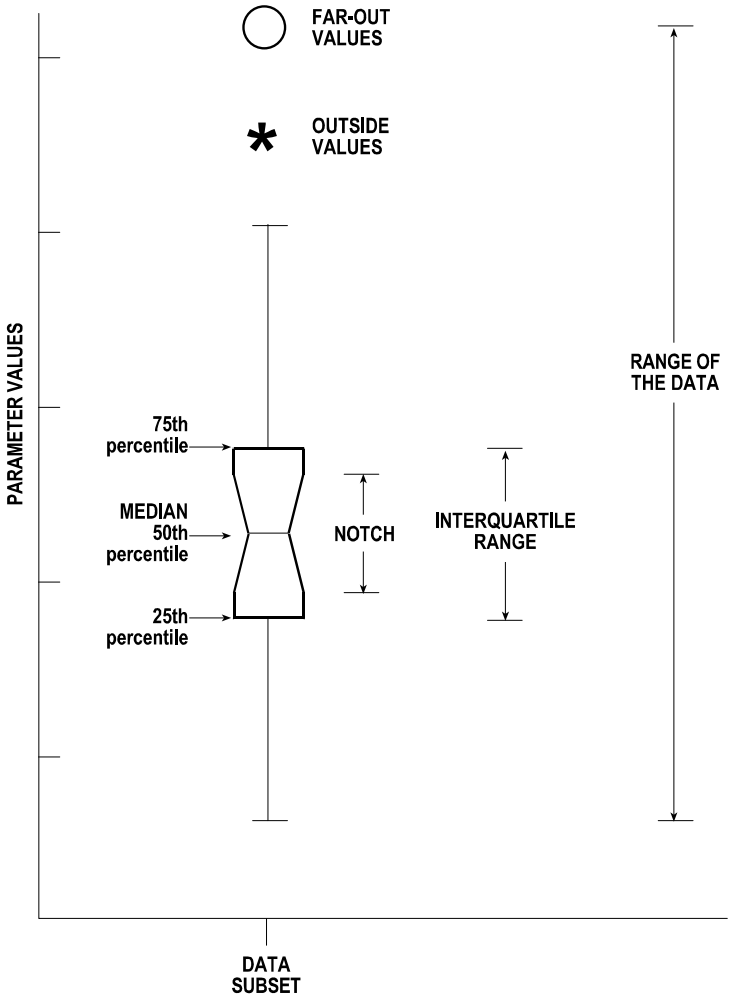


FIGURE 7

PERCENT IMPERVIOUS SURFACE ADDED: BY CLASS



Components. **A BOX PLOT** identifies the **MEDIAN**, (50th percentile), the lower and upper quartiles **(25th and 75th PERCENTILES)**, and the **RANGE** (extreme spread of the data). The edges of the box demarcate the 25th and 75th percentiles, and so represent the middle 50 percent **(INTERQUARTILE RANGE)** of the parameter values for the data subset. The line inside the box is the **MEDIAN**. The lines, or whiskers, extend outward from the box through the range of data, excluding outliers. Two outliers are defined, based on their distance from the nearest edge of the box, relative to the range of the box. **OUTSIDE VALUES** lie 1.5 to 3 interquartile ranges away from the nearest box edge, and **FAR-OUT VALUES** lie three or more interquartile ranges away form the nearest box edge. The **NOTCH** represents the approximate 95 percent confidence interval around the median.

Interpretation. If notches from different subsets of data overlap completely, one can conclude with 95% confidence that the groups have been sampled from a common population. If notches do not overlap at all, one can conclude (with 95% confidence) that the groups represent different populations. Cases of partial overlap require explicit tests (e.g., t-Test, ANOVA, Mann-Whitney, or Kruskal-Wallis) to specify significance of differences among groups.

Generic Box Plot

Attachment Figure 1
GENERIC BOX PLOT: COMPONENTS & INTERPRETATION

Attachment G
Rate Model Output

Lancaster Stormwater Utility Rate Model Assumptions

Rate Scenarios	Description
Low	Current conditions, no credits/incentives, no debt service
Medium	GI infrastructure maintenance, credits/incentives, publc GI CIP, Pay Go CIP
High	GI infrastructure maintenance, credits/incentives, public/private GI CIP, Pay Go CIP

Fiscal Policy		
Collection Factor	90.00%	
Operating Reserve	6	months operating expense
Inflation	3.00%	
Interest Rate on Investments	0.20%	
Debt Funding		
Interest Rate	5%	
Term (years)	20	
Cost of Issuance	2%	
Bond Reserve (% of estimated bond issue)	10%	
Target Coverage Ratio	1.50	
Credits / Incentives	% of revenues	
Tier 1	0%	
Tier 2	0%	
Tier 3	10%	
Tier 4	10%	
ERU Basis	1,000	sf
Growth in ERUs	0.05%	

Low

Current conditions, no credits/incentives, no debt service

Stormwater Utility Pro forma

Line Item	Budget Item	PROJECTED Year 1	PROJECTED Year 2	PROJECTED Year 3	PROJECTED Year 4	PROJECTED Year 5
1	**Beginning Balance**	**0**	**$ 483,409**	**$ 939,553**	**$ 1,367,458**	**$ 1,766,139**
2	**Stormwater Utility Rate ($/1,000 sf)**	$ 19.22	$ 19.22	$ 19.22	$ 19.22	$ 19.22
3	**% increase**		0%	0%	0%	0%
	Operating Revenues					
a	Tier 1 (<=1,000 sf)	$43,216	$43,238	$43,259	$43,281	$43,303
b	Tier 2 (>1,000 sf and <=2,000 sf)	$258,000	$258,129	$258,258	$258,387	$258,516
c	Tier 3 (>2,000 sf and <=3,000 sf)	$92,064	$92,110	$92,156	$92,202	$92,248
d	Tier 4 (>3,000)	$1,216,295	$1,216,903	$1,217,511	$1,218,120	$1,218,729
4	**Total Operating Revenues**	**$1,609,575**	**1,610,380**	**1,611,180**	**1,611,990**	**1,612,800**
5	**Less: Allowance Uncollectible Accounts**	$161,000	$161,000	$161,100	$161,200	$161,300
6	**Less: SWMF Incentives**	**$0**	**$0**	**$0**	**$0**	**$0**
	Non-Operating Revenues					
a	Investment Income	500	1,400	2,300	3,100	3,900
7	**Total Non-Operating Revenues**	**500**	**1,400**	**2,300**	**3,100**	**3,900**
8	**Total Revenues**	**$1,449,075**	**$1,450,780**	**$1,452,380**	**$1,453,890**	**$1,455,400**
	Operating Expenses					
	Green Infrastructure					
	Green Streets		0	0	0	0
	Park Improvements / Greening		0	0	0	0
	Disconnection, Porous Pavement		0	0	0	0
	Porous Pavement, Bioretention		0	0	0	0
	Vegetated Roofs / Disconnection		0	0	0	0
	Disconnection/Rain Gardens		0	0	0	0
	Enhanced Tree Planting		0	0	0	0
	Green Schools		0	0	0	0
	Dry and Wet Ponds (inspections only)	2,300	2,369	2,440	2,513	2,589
	Street Sweeping	168,800	173,864	179,080	184,452	189,986
	Catch Basin	201,000	207,030	213,241	219,638	226,227
	Storm Drainage		0	0	0	0
	MS4 Implementation					
	Public Education	15,692	16,163	16,648	17,147	17,661
	Public Participation / Involvement	6,462	6,656	6,856	7,061	7,273
	Illicit Discharge Detection / Elimination	53,800	55,414	57,076	58,789	60,552
	Construction Site Runoff Control	52,600	54,178	55,803	57,477	59,202
	Post-Construction Stormwater Management	17,800	18,334	18,884	19,451	20,034
	Pollution Prevention	305,212	314,368	323,799	333,513	343,519
	Program Adminstration					
	Billing and Collection	90,000	92,700	95,481	98,345	101,296
	Incentive/Credit Program		0	0	0	0
	NPDES permit	29,000	29,870	30,766	31,689	32,640
	Plan Review	23,000	23,690	24,401	25,133	25,887
9	**Total Operating Expenses**	**965,666**	**994,636**	**1,024,475**	**1,055,209**	**1,086,866**
	Non-Operating Expenses					
	Category 1					
	Category 2					
10	**Total Non-Operating Revenues**	**-**	**-**	**-**	**-**	**-**
11	**Net Revenues**	**$483,409**	**$456,144**	**$427,905**	**$398,681**	**$368,534**
	Debt Service Funded by IASF					
12	Existing Debt Service	$0	$0	$0	$0	$0
13	Projected Debt Service	$0	$0	$0	$0	$0
14	**Total Debt Service**	**$0**	**$0**	**$0**	**$0**	**$0**
15	*Debt Service Coverage Ratio (Calculated)*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
16	*Debt Service Coverage Ratio (Target)*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*
17	**Equity Funded CIP**	-	-	-	-	-
18	**Ending Balance**	**483,409**	**939,553**	**1,367,458**	**1,766,139**	**2,134,673**

Low

Current conditions, no credits/incentives, no debt service

Stormwater Utility Pro forma

Line Item	Budget Item	PROJECTED Year 1	PROJECTED Year 2	PROJECTED Year 3	PROJECTED Year 4	PROJECTED Year 5

Stormwater Utility CIP

		Year 1	Year 2	Year 3	Year 4	Year 5
	Green Infrastructure					
	Green Streets	$93,000	$123,000	$141,000	$174,000	$179,000
	Park Improvements / Greening	$35,000	$46,000	$53,000	$66,000	$68,000
	Disconnection, Porous Pavement	$41,000	$54,000	$62,000	$76,000	$79,000
	Porous Pavement, Bioretention	$49,000	$65,000	$74,000	$92,000	$95,000
	Vegetated Roofs / Disconnection	$66,000	$87,000	$99,000	$123,000	$126,000
	Disconnection/Rain Gardens	$92,000	$121,000	$139,000	$172,000	$177,000
	Enhanced Tree Planting	$101,000	$133,000	$153,000	$189,000	$194,000
	Green Schools	$36,000	$47,000	$54,000	$67,000	$69,000
	Storm Drainage					
	MS4					
	Rehabilitation					
	Replacement					
	Information Management					
	CSS					
	Rehabilitation					
	Replacement					
	Information Management					
	Catch Basin					
	Rehabilitation	$82,000	$84,000	$89,000	$97,000	$109,000
	Replacement	$82,000	$84,000	$89,000	$97,000	$109,000
	Total Stormwater Utility CIP	**$ 677,000**	**$ 844,000**	**$ 953,000**	**$ 1,153,000**	**$ 1,205,000**

Stormwater Utility Capital Requirements

		Year 1	Year 2	Year 3	Year 4	Year 5
	Total Stormwater CIP	**$ 677,000**	**$ 844,000**	**$ 953,000**	**$ 1,153,000**	**$ 1,205,000**
$ 4,832,000	Less: Penn Vest Loan	**$ 677,000**	**$ 844,000**	**$ 953,000**	**$ 1,153,000**	**$ 1,205,000**
	Less: Grants	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Amount to be funded by stormwater utility	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Percent Debt Funded	0%	0%	0%	0%	0%
	Percent Equity Funded	100%	100%	100%	100%	100%
	Amount Debt Funded	$ -	$ -	$ -	$ -	$ -
	Amount Equity Funded	$ -	$ -	$ -	$ -	$ -
	Amount to be funded by stormwater utility	$ -	$ -	$ -	$ -	$ -
	CIP Debt Funding Schedule					
	Year of Debt Issuance					
	Series Year 1	$0	$0	$0	$0	$0
	Series Year 2		$0	$0	$0	$0
	Series Year 3			$0	$0	$0
	Series Year 4				$0	$0
	Series Year 5					$0
	Total CIP Debt Funding	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Stormwater Utility Debt Service

	Year 1	Year 2	Year 3	Year 4	Year 5
Projected Debt Issuance					
Capital Requirements	**$0**	**$0**	**$0**	**$0**	**$0**
Cost of Issuance	$0	$0	$0	$0	$0
Bond Reserve	$0	$0	$0	$0	$0
Estimated Bond Issue	**$0**	**$0**	**$0**	**$0**	**$0**
Projected Debt Service					
Series Year 1	**$0**	**$0**	**$0**	**$0**	**$0**
Series Year 2		**$0**	$0	$0	$0
Series Year 3			**$0**	$0	$0
Series Year 4				**$0**	$0
Series Year 5					**$0**
Total Projected Debt Service	**$0**	**$0**	**$0**	**$0**	**$0**

Medium

Current conditions, no credits/incentives, no debt service

Stormwater Utility Pro forma

Line Item	Budget Item	PROJECTED Year 1	PROJECTED Year 2	PROJECTED Year 3	PROJECTED Year 4	PROJECTED Year 5
1	**Beginning Balance**	**0**	**$ 644,852**	**$ 1,219,623**	**$ 1,484,113**	**$ 705,904**
2	**Stormwater Utility Rate ($/1000 sf)**	$ 30.96	$ 30.96	$ 30.96	$ 79.47	$ 96.32
3	**% increase**		0%	0%	157%	21%
	Operating Revenues					
a	Tier 1 (<=1,000 sf)	$69,614	$69,648	$69,683	$178,956	$217,009
b	Tier 2 (>1,000 sf and <=2,000 sf)	$415,592	$415,799	$416,007	$1,068,366	$1,295,539
c	Tier 3 (>2,000 sf and <=3,000 sf)	$148,298	$148,373	$148,447	$381,233	$462,296
d	Tier 4 (>3,000)	$1,959,234	$1,960,214	$1,961,194	$5,036,629	$6,107,596
4	**Total Operating Revenues**	**$2,592,738**	**2,594,030**	**2,595,330**	**6,665,180**	**8,082,440**
5	**Less: Allowance Uncollectible Accounts**	$259,274	$259,403	$259,533	$666,518	$808,244
6	**Less: SWMF Incentives**		**$210,859**	**$210,964**	**$541,786**	**$656,989**
	Non-Operating Revenues					
a	Investment Income	600	1,900	2,700	2,200	1,400
7	**Total Non-Operating Revenues**	**600**	**1,900**	**2,700**	**2,200**	**1,400**
8	**Total Revenues**	**$2,334,064**	**$2,125,668**	**$2,127,533**	**$5,459,076**	**$6,618,607**
	Operating Expenses					
	Green Infrastructure					
	Green Streets	29,000	29,870	30,766	31,689	32,640
	Park Improvements / Greening	24,000	24,720	25,462	26,225	27,012
	Disconnection, Porous Pavement	16,000	16,480	16,974	17,484	18,008
	Porous Pavement, Bioretention	3,000	3,090	3,183	3,278	3,377
	Vegetated Roofs / Disconnection	10,000	10,300	10,609	10,927	11,255
	Disconnection/Rain Gardens	0	0	0	0	0
	Enhanced Tree Planting	50,000	51,500	53,045	54,636	56,275
	Green Schools	30,000	30,900	31,827	32,782	33,765
	Dry and Wet Ponds (inspections only)	2,300	2,369	2,440	2,513	2,589
	Street Sweeping	168,800	173,864	179,080	184,452	189,986
	Catch Basin	201,000	207,030	213,241	219,638	226,227
	Storm Drainage		0	0	0	0
	MS4 Implementation					
	Public Education	92,000	94,760	97,603	100,531	103,547
	Public Participation / Involvement	15,000	15,450	15,914	16,391	16,883
	Illicit Discharge Detection / Elimination	53,800	55,414	57,076	58,789	60,552
	Construction Site Runoff Control	52,600	54,178	55,803	57,477	59,202
	Post-Construction Stormwater Management	17,800	18,334	18,884	19,451	20,034
	Pollution Prevention	305,212	314,368	323,799	333,513	343,519
	Program Administration					
	Billing and Collection	90,000	92,700	95,481	98,345	101,296
	Incentive/Credit Program	77,000	79,310	81,689	84,140	86,664
	NPDES permit	29,000	29,870	30,766	31,689	32,640
	Plan Review	23,000	23,690	24,401	25,133	25,887
9	**Total Operating Expenses**	**1,289,512**	**1,328,197**	**1,368,043**	**1,409,085**	**1,451,357**
	Non-Operating Expenses					
	Category 1					
	Category 2					
10	**Total Non-Operating Revenues**	**-**	**-**	**-**	**-**	**-**
11	**Net Revenues**	**$1,044,552**	**$797,471**	**$759,490**	**$4,049,991**	**$5,167,250**
	Debt Service Funded by IASF					
12	Existing Debt Service	$104,700	$104,700	$255,000	$405,200	$405,200
13	Projected Debt Service	$0	$0	$0	$0	$0
14	**Total Debt Service**	**$104,700**	**$104,700**	**$255,000**	**$405,200**	**$405,200**
15	*Debt Service Coverage Ratio (Calculated)*	*9.98*	*7.62*	*2.98*	*10.00*	*12.75*
16	*Debt Service Coverage Ratio (Target)*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*
17	**Equity Funded CIP**	**295,000**	**118,000**	**240,000**	**4,423,000**	**4,739,000**
18	**Ending Balance**	**644,852**	**1,219,623**	**1,484,113**	**705,904**	**728,954**

Medium

Current conditions, no credits/incentives, no debt service

Stormwater Utility Pro forma

Line Item	Budget Item	PROJECTED Year 1	PROJECTED Year 2	PROJECTED Year 3	PROJECTED Year 4	PROJECTED Year 5

Stormwater Utility CIP

		Year 1	Year 2	Year 3	Year 4	Year 5
	Green Infrastructure					
	Green Streets	371,000	491,000	562,000	695,000	716,000
	Park Improvements / Greening	140,000	185,000	212,000	262,000	270,000
	Disconnection, Porous Pavement	163,000	215,000	247,000	305,000	314,000
	Porous Pavement, Bioretention	20,000	26,000	30,000	37,000	38,000
	Vegetated Roofs / Disconnection	97,000	129,000	147,000	182,000	187,000
	Disconnection/Rain Gardens	0	0	0	0	0
	Enhanced Tree Planting	403,000	533,000	610,000	754,000	777,000
	Green Schools	144,000	190,000	217,000	269,000	277,000
	Storm Drainage					
	MS4					
	Rehabilitation	667,000	687,000	729,000	797,000	897,000
	Replacement	417,000	430,000	456,000	498,000	561,000
	Information Management	2,000	2,000	2,000	2,000	2,000
	CSS					
	Rehabilitation	220,000	227,000	241,000	263,000	296,000
	Replacement	137,000	141,000	150,000	164,000	185,000
	Information Management	1,000	1,000	1,000	1,000	1,000
	Catch Basin					
	Rehabilitation	$82,000	84,000	89,000	97,000	109,000
	Replacement	$82,000	84,000	89,000	97,000	109,000
	Total Stormwater Utility CIP	**$ 2,946,000**	**$ 3,425,000**	**$ 3,782,000**	**$ 4,423,000**	**$ 4,739,000**

Stormwater Utility Capital Requirements

		Year 1	Year 2	Year 3	Year 4	Year 5
	Total Stormwater CIP	**$ 2,946,000**	**$ 3,425,000**	**$ 3,782,000**	**$ 4,423,000**	**$ 4,739,000**
$ 7,000,000	Less: Penn Vest Loan	**$ 1,473,000**	**$ 2,794,000**	**$ 2,733,000**	**$ -**	**$ -**
$ 2,500,000	Less: Grants	**$ 1,178,000**	**$ 513,000**	**$ 809,000**	**$ -**	
	Amount to be funded by stormwater utility	**$ 295,000**	**$ 118,000**	**$ 240,000**	**$ 4,423,000**	**$ 4,739,000**
	Percent Debt Funded	0%	0%	0%	0%	0%
	Percent Equity Funded	100%	100%	100%	100%	100%
	Amount Debt Funded	$ -	$ -	$ -	$ -	$ -
	Amount Equity Funded	$ 295,000	$ 118,000	$ 240,000	$ 4,423,000	$ 4,739,000
	Amount to be funded by stormwater utility	$ 295,000	$ 118,000	$ 240,000	$ 4,423,000	$ 4,739,000
	CIP Debt Funding Schedule					
	Year of Debt Issuance				Year 4	Year 4
	Series Year 1	$0	$0	$0	$0	$0
	Series Year 2		$0	$0	$0	$0
	Series Year 3			$0	$0	$0
	Series Year 4				$0	$0
	Series Year 5					$0
	Total CIP Debt Funding	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Stormwater Utility Debt Service

	Year 1	Year 2	Year 3	Year 4	Year 5
Projected Debt Issuance					
Capital Requirements	**$0**	**$0**	**$0**	**$0**	**$0**
Cost of Issuance	$0	$0	$0	$0	$0
Bond Reserve	$0	$0	$0	$0	$0
Estimated Bond Issue	**$0**	**$0**	**$0**	**$0**	**$0**
Projected Debt Service					
Series Year 1	**$0**	$0	$0	$0	$0
Series Year 2		**$0**	$0	$0	$0
Series Year 3			**$0**	$0	$0
Series Year 4				**$0**	$0
Series Year 5					**$0**
Total Projected Debt Service	**$0**	**$0**	**$0**	**$0**	**$0**

High

Current conditions, no credits/incentives, no debt service

Stormwater Utility Pro forma

Line Item	Budget Item	PROJECTED Year 1	PROJECTED Year 2	PROJECTED Year 3	PROJECTED Year 4	PROJECTED Year 5
1	**Beginning Balance**	**0**	**$ 876,184**	**$ 932,384**	**$ 930,285**	**$ 955,989**
2	**Stormwater Utility Rate ($/ERU)**	$ 60.89	$ 60.89	$ 71.00	$ 140.15	$ 147.58
3	**% increase**		0%	17%	97%	5%
	Operating Revenues					
a	Tier 1 (<=1,000 sf)	$136,911	$136,980	$159,803	$315,600	$332,498
b	Tier 2 (>1,000 sf and <=2,000 sf)	$817,357	$817,766	$954,022	$1,884,127	$1,985,005
c	Tier 3 (>2,000 sf and <=3,000 sf)	$291,663	$291,809	$340,430	$672,326	$708,323
d	Tier 4 (>3,000)	$3,853,287	$3,855,214	$4,497,570	$8,882,390	$9,357,963
4	**Total Operating Revenues**	**$5,099,218**	**5,101,770**	**5,951,830**	**11,754,440**	**12,383,790**
5	**Less: Allowance Uncollectible Accounts**	$509,922	$510,177	$595,183	$1,175,444	$1,238,379
6	**Less: SWMF Incentives**		**$414,702**	**$483,800**	**$955,472**	**$1,006,629**
	Non-Operating Revenues					
a	Investment Income	900	1,800	1,900	1,900	1,900
7	**Total Non-Operating Revenues**	**900**	**1,800**	**1,900**	**1,900**	**1,900**
8	**Total Revenues**	**$4,590,196**	**$4,178,691**	**$4,874,747**	**$9,625,424**	**$10,140,682**
	Operating Expenses					
	Green Infrastructure					
	Green Streets	36,250	37,338	38,458	39,611	40,800
	Park Improvements / Greening	30,000	30,900	31,827	32,782	33,765
	Disconnection, Porous Pavement	20,000	20,600	21,218	21,855	22,510
	Porous Pavement, Bioretention	3,750	3,863	3,978	4,098	4,221
	Vegetated Roofs / Disconnection	12,500	12,875	13,261	13,659	14,069
	Disconnection/Rain Gardens	0	0	0	0	0
	Enhanced Tree Planting	62,500	64,375	66,306	68,295	70,344
	Green Schools	37,500	38,625	39,784	40,977	42,207
	Dry and Wet Ponds (inspections only)	2,300	2,369	2,440	2,513	2,589
	Street Sweeping	234,100	241,123	248,357	255,807	263,482
	Catch Basin	402,000	414,060	426,482	439,276	452,455
	Storm Drainage		0	0	0	0
	MS4 Implementation					
	Public Education	136,000	140,080	144,282	148,611	153,069
	Public Participation / Involvement	47,000	48,410	49,862	51,358	52,899
	Illicit Discharge Detection / Elimination	53,800	55,414	57,076	58,789	60,552
	Construction Site Runoff Control	52,600	54,178	55,803	57,477	59,202
	Post-Construction Stormwater Management	17,800	18,334	18,884	19,451	20,034
	Pollution Prevention	305,212	314,368	323,799	333,513	343,519
	Program Adminstration					
	Billing and Collection	90,000	92,700	95,481	98,345	101,296
	Incentive/Credit Program	154,000	158,620	163,379	168,280	173,328
	NPDES permit	29,000	29,870	30,766	31,689	32,640
	Plan Review	23,000	23,690	24,401	25,133	25,887
9	**Total Operating Expenses**	**1,749,312**	**1,801,791**	**1,855,845**	**1,911,520**	**1,968,866**
	Non-Operating Expenses					
	Category 1					
	Category 2					
10	**Total Non-Operating Revenues**	**-**	**-**	**-**	**-**	**-**
11	**Net Revenues**	**$2,840,884**	**$2,376,899**	**$3,018,902**	**$7,713,904**	**$8,171,816**
	Debt Service Funded by IASF					
12	Existing Debt Service	$104,700	$104,700	$255,000	$405,200	$405,200
13	Projected Debt Service	$0	$0	$0	$0	$0
14	**Total Debt Service**	**$104,700**	**$104,700**	**$255,000**	**$405,200**	**$405,200**
15	*Debt Service Coverage Ratio (Calculated)*	*27.13*	*22.70*	*11.84*	*19.04*	*20.17*
16	*Debt Service Coverage Ratio (Target)*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*
17	**Equity Funded CIP**	**1,860,000**	**2,216,000**	**2,766,000**	**7,283,000**	**7,735,000**
18	**Ending Balance**	**$876,184**	**$932,384**	**$930,285**	**$955,989**	**$987,606**

High

Current conditions, no credits/incentives, no debt service

Stormwater Utility Pro forma

Line Item	Budget Item	PROJECTED Year 1	PROJECTED Year 2	PROJECTED Year 3	PROJECTED Year 4	PROJECTED Year 5

Stormwater Utility CIP

		Year 1	Year 2	Year 3	Year 4	Year 5
	Green Infrastructure					
	Green Streets	$464,000	$614,000	$703,000	$869,000	$895,000
	Park Improvements / Greening	$175,000	$232,000	$265,000	$328,000	$337,000
	Disconnection, Porous Pavement	$203,000	$269,000	$308,000	$381,000	$392,000
	Porous Pavement, Bioretention	$246,000	$326,000	$373,000	$461,000	$474,000
	Vegetated Roofs / Disconnection	$328,000	$434,000	$497,000	$614,000	$632,000
	Disconnection/Rain Gardens	$459,000	$607,000	$695,000	$859,000	$885,000
	Enhanced Tree Planting	$503,000	$666,000	$763,000	$943,000	$971,000
	Green Schools	$179,000	$237,000	$272,000	$336,000	$346,000
	Storm Drainage					
	MS4					
	Rehabilitation	$890,000	$917,000	$973,000	$1,063,000	$1,196,000
	Replacement	$556,000	$573,000	$608,000	$664,000	$747,000
	Information Management	$3,000	$3,000	$3,000	$3,000	$3,000
	CSS					
	Rehabilitation	$293,000	$302,000	$320,000	$350,000	$394,000
	Replacement	$183,000	$188,000	$199,000	$217,000	$244,000
	Information Management	$1,000	$1,000	$1,000	$1,000	$1,000
	Catch Basin					
	Rehabilitation	$82,000	$84,000	$89,000	$97,000	$109,000
	Replacement	$82,000	$84,000	$89,000	$97,000	$109,000
	Total Stormwater Utility CIP	**$ 4,647,000**	**$ 5,537,000**	**$ 6,158,000**	**$ 7,283,000**	**$ 7,735,000**

Stormwater Utility Capital Requirements

		Year 1	Year 2	Year 3	Year 4	Year 5
	Total Stormwater CIP	**$ 4,647,000**	**$ 5,537,000**	**$ 6,158,000**	**$ 7,283,000**	**$ 7,735,000**
$ 7,000,000	Less: Penn Vest Loan	**$ 1,858,000**	**$ 2,768,000**	**$ 2,374,000**	**$ -**	**$ -**
$ 2,500,000	Less: Grants	**$ 929,000**	**$ 553,000**	**$ 1,018,000**	**$ -**	**$ -**
	Amount to be funded by stormwater utility	**$ 1,860,000**	**$ 2,216,000**	**$ 2,766,000**	**$ 7,283,000**	**$ 7,735,000**
	Percent Debt Funded	0%	0%	0%	0%	0%
	Percent Equity Funded	100%	100%	100%	100%	100%
	Amount Debt Funded	$ -	$ -	$ -	$ -	$ -
	Amount Equity Funded	$ 1,860,000	$ 2,216,000	$ 2,766,000	$ 7,283,000	$ 7,735,000
	Amount to be funded by stormwater utility	$ 1,860,000	$ 2,216,000	$ 2,766,000	$ 7,283,000	$ 7,735,000
	CIP Debt Funding Schedule					
	Year of Debt Issuance				Year 4	Year 4
	Series Year 1	$0	$0	$0	$0	$0
	Series Year 2		$0	$0	$0	$0
	Series Year 3			$0	$0	$0
	Series Year 4				$0	$0
	Series Year 5					$0
	Total CIP Debt Funding	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Stormwater Utility Debt Service

		Year 1	Year 2	Year 3	Year 4	Year 5
	Projected Debt Issuance					
	Capital Requirements	$0	$0	$0	$0	$0
	Cost of Issuance	$0	$0	$0	$0	$0
	Bond Reserve	$0	$0	$0	$0	$0
	Estimated Bond Issue	**$0**	**$0**	**$0**	**$0**	**$0**
	Projected Debt Service					
	Series Year 1	**$0**	$0	$0	$0	$0
	Series Year 2		**$0**	$0	$0	$0
	Series Year 3			**$0**	$0	$0
	Series Year 4				**$0**	$0
	Series Year 5					**$0**
	Total Projected Debt Service	**$0**	**$0**	**$0**	**$0**	**$0**