

St. Pete Beach  
Stormwater Rate Study  
and  
Apportionment Report



**Woolpert, Inc.**

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## 1.0 INTRODUCTION

The City of St. Pete Beach, Florida (the "City") adopted Resolution No. 2010-07 on January 26, 2010 (including any amendments and supplements thereto, the "Initial Assessment Resolution") in order to provide for the imposition of special assessments as an initial funding source for the "fixed costs" associated with Stormwater Management Services (for ease of reference, capitalized terms herein generally have the meanings assigned in the Initial Assessment Resolution). Fixed costs can generally be described as those costs incurred in providing a service which do not vary from parcel to parcel based upon property classification, parcel-specific physical characteristics or actual demand. The costs associated with planning and development activities related to Stormwater Management Service and Stormwater Improvements (including but not limited to the cost of stormwater program development and administration, development of mapping and parcel array features, determining impervious area and pervious area, stormwater master planning and NPDES permit related activities), can be reasonably described as fixed.

The Initial Assessment Resolution also identified a method to apportion the funding of "variable costs," to be implemented by subsequent resolution. Variable costs are those dependent upon or which more closely bear a direct relationship to property classification, parcel-specific physical characteristics or actual demand and therefore do vary from parcel to parcel. The Initial Assessment Resolution therefore served as the premise to initially develop a foundation for allocating fixed costs across all Tax Parcels reasonably anticipated to benefit from the provision of Stormwater Management Service or Stormwater Improvements, including the assemblage of data and information to subsequently and additionally allocate variable costs based upon physical demand and characteristics of each Tax Parcel.

Since adoption of the Initial Assessment Resolution, the City has engaged Woolpert, Inc. to assemble and analyze the data and information necessary to additionally allocate variable costs based upon physical characteristics of, and the demand presented by, each Tax Parcel. Such data and information is summarized herein. Application of the apportionment methodology for variable costs to the parcel-specific area and information we have assembled provides the City with a two-tiered methodology by which fixed costs will continue to be assessed on a per Tax Parcel basis and variable costs will be assessed according to Impervious Area as described in Section 3.0 below. This is consistent with the approach contemplated in the Initial Assessment Resolution.

Substantially all of the Stormwater that is physically managed, controlled, and treated by the Stormwater System is generated by Developed Property; and, the amount of Stormwater generated by Undeveloped Property that is managed, controlled, and treated by the Stormwater System is inconsequential and not substantial. The Stormwater Management Services described in the Initial Assessment Resolution and anticipated to be provided by the City possess a logical relationship to the use and enjoyment of, and relieve a burden created by and provide a special benefit to, Developed Property by creating the premise or basis for a fair, efficient and cost effective stormwater program capable of treating and managing Stormwater generated or contaminated by improvements constructed on Developed Property which resulted in the alteration of such property from its natural state.

The relief of the burden created, or special benefit received by, Developed Property is the collection, storage, control, management, treatment, and conveyance of Stormwater runoff generated by the improvements on Developed Property. In our opinion, it is fair and reasonable to impose Stormwater Service Assessments upon Developed Property to fund the Stormwater Management Service Cost. This determination is consistent with the Final Judgment rendered by the Circuit Court in and for Pinellas County, Florida in *City of St. Pete Beach v. State of Florida, et al.*, Case No. 10-3948-CI-21 (the "Final Judgment"), which was decided in the City's favor and which validated and upheld the methodology contemplated herein.

Both Developed and Undeveloped Properties are benefited by compliance with nationally encouraged and in some cases mandated stormwater management planning; and, the development of an integrated and scalable Stormwater System enhances the quality of development and redevelopment potential for property and responsibly advances the preservation and protection of natural resources. The City is an urban area essentially located on a barrier island. Although Undeveloped Property may itself provide a benefit to the Stormwater System by receiving Stormwater, the urban characteristics of the City require the City to nonetheless plan Stormwater Improvements and plan and provide Stormwater Management Service to serve all property capable of Development and the cost thereof should be born by all properties benefited by the availability of such planning and related services. Accordingly, we agree with the City that it is fair and reasonable that all Assessed Property pay an equal share of the fixed costs associated with providing Stormwater Management Service, and that all Tax Parcels characterized as Undeveloped Property be subject to a minimum Assessment to fund only that portion of the Stormwater Management Service Cost described as the Program Cost.

The City has also determined that all Assessed Property pay a pro rata share of the variable costs associated with providing Stormwater Management Service apportioned on the basis of ERUs which reflect the amount of Impervious Area and the ratio of imperviousness to lot size presented by individual Tax Parcels. Apportionment on this basis is fair and reasonable because it reflects the relative burden or demand placed on the Stormwater System by Tax Parcels with varying amounts of Impervious Area and lot sizes and it is therefore consistent with the Final Judgment and fair and reasonable to allocate variable costs on this basis.

The classification system referenced in the Initial Assessment Resolution and based upon standardized Florida Department of Revenue "DOR Codes" employed by the public database maintained by law by the Property Appraiser and Tax Collector, is reasonable and equitable, and will continue to be so as properties within the City develop and change. The use of such classification system and description of Tax Parcels is also manageable and capable of being fairly implemented from year to year without wasteful or extraordinary consumption of resources which could better be expended to address stormwater related issues such that the amount of the assessment for variable costs will vary in direct proportion to the ratio of Impervious Area on any given parcel.

The use of the publicly maintained database of all Tax Parcels employed by the Property Appraiser and Tax Collector is an accurate, fair and efficient means to allocate or distribute fixed costs associated with Stormwater Service Assessments. It is fair, reasonable, effective, and

efficient for all Tax Parcels, including statutorily defined parcels such as individual condominium or cooperative units, to share equally in the fixed cost portion of the Stormwater Service Assessments as such costs are not dependent upon or determined by physical characteristics or stormwater demand.

Clearly there are a multitude of ways and means to address stormwater program funding. After reviewing the Initial Assessment Resolution and assembling and analyzing the data necessary for variable cost allocation as provided therein, we concur that the apportionment method described in the Initial Assessment Resolution for apportioning both fixed and variable costs is based on a credible approach that is fair and reasonable and bears a logical relationship to the cost, benefits and burdens of providing Stormwater Management Service and Stormwater Improvements. Again, this view is consistent with the Final Judgment rendered by the Circuit Court in and for Pinellas County, Florida in *City of St. Pete Beach v. State of Florida, et al.*

## **2.0 FIXED COST APPORTIONMENT**

As described in Section 1.0 above, all developable Tax Parcels within the City, developed and undeveloped, will share in the fixed costs associated with the City's stormwater program on an equal, per parcel basis (unless exempted from the assessment pursuant to policy decisions of the City). Accordingly, that portion of the stormwater assessment imposed to fund fixed costs is calculated for each Tax Parcel as follows:

$$\frac{\$ \text{ Total fixed cost of stormwater management services for FY 2011-2012}}{\text{Total \# of developable, non-exempt Tax Parcels}} = \text{fixed cost assessment per parcel}$$

## **3.0 VARIABLE COST APPORTIONMENT**

### **3.1 Single Basin**

The City is a substantially developed urban area essentially located on a barrier island and reasonable consists of a single geographic drainage area or basin, such that stormwater services and improvements delivered in one area benefit the entire City. Accordingly, there is no need to divide the City into distinct assessment areas or zones and limit the expenditure of assessment proceeds derived in a particular zone to stormwater-related activities within that zone.

### **3.2 Impervious-Based Allocation Models**

The cost of managing stormwater depends largely on the amount of stormwater that must be managed. In general, runoff that is not retained on a property will eventually find its way to a collection system (a street, swale or drainage pipe), to other property or water bodies. The existence of Impervious Area on a property affects the amount and the speed by which stormwater runoff reaches the collection system. The use of Impervious Area as the basis for estimating stormwater runoff is well established in Florida and other states. Impervious Area normally includes all "hard" surfaces that prevent percolation (the seepage of moisture, such as stormwater, into the ground). Typically, impervious surfaces include the area under all building

rooflines, paved driveways and parking areas, sidewalks, tennis courts, paved pool areas, and other similar features.

The vast majority of stormwater assessment programs are predicated on some form of impervious-based rate structure, with the assignment of billing or apportionment units reflecting the amount of Impervious Area found on each property. Impervious-based rate models tend to be relatively easy to understand, are easily modified to accept the application of mitigation credits and adjustments, and are well-suited for the City's two-tiered apportionment methodology which distinguishes between fixed and variable costs.

Other factors also influence the rate and volume of stormwater runoff, including soil type and permeability, transpiration of moisture and the slope of a site, all of which require data that is perceived to be too costly and difficult to manage than is worthwhile. Other factors, such as the direct connectivity of impervious surfaces to the infrastructure system and the amount of *pervious* area available for percolation have the potential to impact runoff amounts significantly, but are not considered in an "impervious-only" rate model – that is, a rate model which allocates costs to benefited properties solely on the basis of Impervious Area.

Application of an impervious-only approach arguably results in some degree of inequity (as illustrated in the examples set forth in Section 3.2 below), prompting many communities to consider a modified impervious-based rate model. The "Impervious plus Percent Impervious Coverage" model provides a greater degree of equity by allocating variable costs among benefited properties in a more accurate and relevant manner and is therefore the method recommended for use by the City in allocating variable costs.

### **3.3 Impervious Plus Percent Impervious Coverage Rationale**

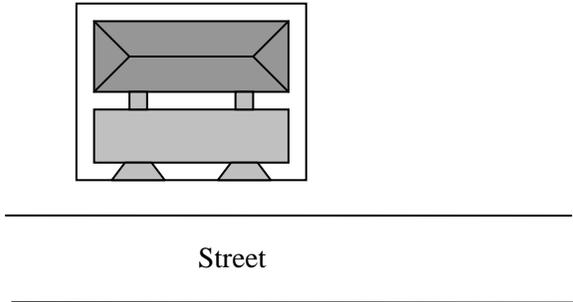
The Impervious Plus Percent Impervious Coverage ("Impervious Plus") methodology is premised upon the amount of Impervious Area, but it also takes into consideration a parcel-specific *Percent Impervious Coverage* factor. The factor is developed by dividing the impervious coverage (expressed as a percentage) of any property by the average impervious coverage (also a percentage) of single-family residential properties within the City.

The Impervious Plus approach depends on the calculation of an equivalency unit, which will be stated in terms of an equivalent residential unit ("ERU"). The use of equivalent units as a proxy for allocating special assessments has been upheld as reasonable by the Florida Supreme Court. City of Winter Springs v. State, 776 So. 2d 255 (Fla. 2001). A description of the calculation which determined the standardized ERU value for the City (3,813 square feet) is included in Section 3.4 below. By definition, all single family residential parcels will constitute one ERU and will be assessed accordingly. Nonresidential and other parcels will be assessed according to the number of *factored* ERUs attributable to each. The factored ERU is developed from two inter-connected parameters – Impervious Area and ratio of Impervious Area to total area. By establishing the values for Impervious Area and "percent impervious" for the average single-family residential parcel, all other developed properties may be defined in terms of the standardized ERU.

The following example illustrates the difference between the application of an impervious-only and Impervious Plus methodologies on similarly-developed properties. In this example, Parcel B's lot size is twice as large as the lot size found on Parcel A. The Impervious Area shown on both examples is identical.

**Example:**

**Property A**



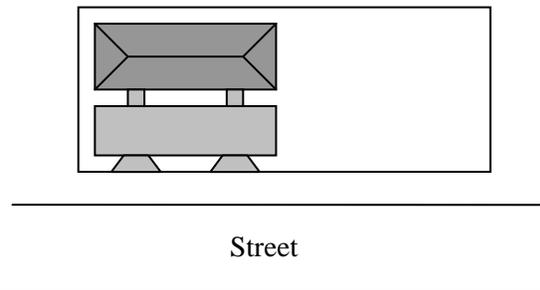
Lot Size (100 x 80) = 8,000 sf

Total Impervious = 6,000 sf  
(Building, Parking, Drive, Sidewalk)

Total Pervious = 2,000 sf

**Property impervious coverage = 75%**

**Property B**



Lot Size (200 x 80) = 16,000 sf

Total Impervious = 6,000 sf  
(Building, Parking, Drive, Sidewalk)

Total Pervious = 10,000 sf

**Property impervious coverage = 37.5%**

Using the impervious-only rate structure, both properties would be assigned the same number of billing units and would pay the same assessment, based on the total Impervious Area of 6,000 square feet presented by each site. In contrast, under the Impervious Plus model, Property B would be assessed less than Property A since Property B's percent of impervious coverage is lower. The existence of an additional 8,000 square feet of pervious area on Property B increases the opportunity for on-site percolation of runoff, decreasing the amount of runoff that can be expected to leave the property in a specific storm event. Application of the Impervious Plus approach thus recognizes and gives credit for the additional percolation that can be expected to occur on Property B which results in a lower relative assessment and a higher degree of equity.

The stormwater special assessment for each Tax Parcel comprising Developed Property is therefore based in part on the number of factored ERUs attributable to such parcel, calculated in accordance with the following formula:

$$\frac{\text{property total impervious area (in sq. ft.)}}{1 \text{ ERU (in sq. ft.)}} \times \frac{\text{property impervious coverage (\%)}}{\text{average percent impervious coverage (\%)}} = \text{factored ERUs}$$

The dollar amount attributable to each factored ERU is derived by dividing the total variable cost to be funded through special assessments by the total number of ERUs in the City. As described under Section 4.0 below, \$350,000 of the FY2011-12 stormwater budget is attributable to variable costs. Based on the data we have collected and analyzed, the total number of factored ERUs within the City is approximately 7,901. The total variable cost assessment to be levied against any given Tax Parcel would therefore be the number of factored ERUs attributed to such parcel multiplied by \$44.30. (\$350,000/7,901)

**Example:**

The variable cost assessment for Property A is calculated as follows:

$$\frac{6,000 \text{ sq. feet}}{3,813 \text{ sq. feet}} \times \frac{75\%}{46\%} = 2.56 \text{ factored ERUs}$$

$$2.56 \text{ factored ERUs} \times \$44.30 = \$113.41$$

The variable cost assessment for Property B is calculated as follows:

$$\frac{6,000 \text{ sq. feet}}{3,813 \text{ sq. feet}} \times \frac{37.5\%}{46\%} = 1.28 \text{ factored ERUs}$$

$$1.28 \text{ factored ERUs} \times \$44.30 = \$56.70$$

The example set forth above demonstrates the heightened equity afforded by the Impervious Plus approach compared with impervious-only. As stated above, all single family residential parcels will constitute one ERU and will be assessed accordingly. Nonresidential parcels would be assessed according to the number of factored ERUs attributable to each.

**3.4 ERU Determination and Average Percent Impervious Coverage**

Because Impervious Area data was not available for all residential properties within the City, Woolpert determined a statistically significant sampling of residential parcels for purposes of calculating the base ERU value. In order to determine the appropriate sample size, a sample of 500 parcels was used. These 500 parcels were randomly selected from the residential parcels in St. Pete Beach and are presented in Appendix A. Using GIS software, the amount of Impervious Area (represented by aerials provided by Pinellas County flown between December 29, 2009 and January 6, 2010) for each of the 500 parcels was calculated. The average Impervious Area for the parcels was 3799 square feet with a standard deviation of 1,567, and the average total parcel size was 8,287 square feet. The sample size was designed to be large enough to have 90%

confidence that the sample Impervious Area average would be within 10% of the average Impervious Area for parcels in the entire City.

$$\mu = 3799 \text{ ft}^2$$

$$\sigma = 1567$$

$$1 - \alpha = 0.90$$

$$\alpha = 0.10$$

$$\alpha / 2 = 0.05$$

$$z_{\alpha/2} = z_{0.025} = 1.65$$

$\mu$  = Mean

$\sigma$  = Standard Deviation

$1 - \alpha$  = Confidence

$d$  = Acceptable Error

$n$  = Required Sample Size

$$d = 0.03 \times \mu = 0.03 \times 3799 = 114.0$$

$$n = \left[ \frac{z_{\alpha/2} \times \sigma}{d} \right]^2 = \left[ \frac{1.65 \times 1567}{114.0} \right]^2 = 512$$

$n \cong 520$  parcels (rounded up to 520 parcels from required 512 parcels)

Based on the statistical analysis above, 520 randomly selected single family residential parcels were reviewed. The data from the 520 parcels is presented in Appendix B. The values determined from the results of the statistical sample include:

Average Impervious Area (SF) = 3,813 Square Feet

Average Total Parcel Size (SF) = 8,287 Square Feet

Average Percent Impervious Coverage (%) = 46.0%

Accordingly, for purposes of calculating the amount of the variable cost assessment to be imposed against affected parcels, one ERU is defined as 3,813 square feet and the average percent impervious area is 46.0%.

### 3.5 Condominiums

Because a substantial number of tax parcels in the City are composed of lands subjected to declarations of condominium, the size and configuration of each condominium development is dissimilar, and the City is substantially built-out, each parcel of land comprising a condominium development is treated as a non-residential parcel for the purpose of determining the number of ERUs attributable to that parcel. The number of ERUs is then divided by the number of individual condominium tax parcels in the declaration of condominium to arrive at the number of factored ERUs attributed to each condominium unit. Once determined, this calculation need not be reconsidered absent a physical change in the completed condominium project.

For purposes of illustrating this concept, a condominium development is made up of a group of individual fee simple tax parcels that share amenities such as a pool, recreation area, parking and access driveways, sidewalks and other features. Each amenity may be situated upon a tax parcel separate and distinct from the condominium proper. Condominium developments

have a higher factor of imperviousness than single family homes, but contain more units and require a specialized calculation. The calculation considers that individual condominium units sharing common area benefits are responsible for the burden created by runoff from common area impervious surfaces.

Typically, the Property Appraiser's office assigns a Department of Revenue classification code of "0430" to all residential condominium tax parcels. The assignment of "factored ERUs" to each unit in a condominium development requires the identification of the total lot(s) area of all parcels in the condominium development and the total number of individual condominium ("0430") units associated with the condominium development.

**Example:**

The following example considers a condominium having 10 units coded as "0430":

Aggregate of total impervious area associated with the condominium development, including all common area impervious = 17,200 sq. ft.

Aggregate of total land area associated with the condominium development, including all common area = 25,000 sq. ft.

$$\frac{17,200 \text{ sq. feet}}{3,813 \text{ sq. feet}} \times \frac{(17,200/25,000)}{.46} = 6.75 \text{ total ERUs} \quad 6.75/10 \text{ units} = .675 \text{ factored ERUs per unit}$$

Conceivably, the physical characteristics of a given condominium development could be such that the algorithms and rounding functions inherent in computer programs designed for application of this formula on a wide scale (i.e. citywide) basis result in a factored ERU value of virtually zero for individual condominium units. Accordingly, stormwater assessment programs throughout the state and elsewhere typically round ERU values to the nearest tenth for purposes of calculating the assessment due from any given condominium unit, and a minimum factored ERU value is established to ensure that each unit contributes to the overall costs involved with providing stormwater services and improvements. Accordingly, we are of the opinion that it is fair and reasonable to establish a minimum factored ERU value for residential condominium units of 0.3 ERU.

A further examination of Department of Revenue land use classifications reveals that the Pinellas County Property Appraiser has used eight (8) discrete four-digit codes to differentiate between tax parcels that are considered to be condominium in use. The code identifies the tax parcels ownership type or property type.

Condominium units are essentially statutorily created cubes of space which are fee simple tax parcels, developed as a part of a condominium regime, that share common elements. Table 1 indicates which condominium uses are appropriate for assessment and the apportionment calculation that is to be used.

Additionally, some condominium tax parcels of different types (more than one type of land use classification) share amenities. In such instances, it is recommended that the City Manager or his assign be directly authorized to use reasonable discretion to apportion variable costs to the affected tax parcels in a fair and equitable manner that does not exceed the aggregate of the assessment due from the underlying parcels.

**Table 1  
Condominium DOR Codes**

<b>DOR Code</b>	<b>Description:</b>	<b>Assess:</b>	<b>Calculation Type</b>
0040	Vacant Condominium Recreation Area, owned by the Development	Owner of Record	Non-Residential
0041	Condominium Common Area, owned by the Homeowner's Association	Individual condominium owners. HOAs are not assessed. Impervious values are considered in the calculation of associated condominium tax parcel impervious.	Not Applicable
0430	Condominium, private owner of record	Individual condominium owner of record.	Condominium
0431	Condominium, lease only	Individual condominium owner of record.	Condominium
0435	Condominium, privately owned amenity, such as a parking space, garage, boat slip, storage space, cabana	Not Assessed	Not Assessed
0436	Condominium Conversion of an Apartment Unit	Individual condominium owner of record.	Non-Residential
0442	Interval Ownership	Interval Ownership Management Company	Non-Residential
0443	Time Share	Time Share Management Company	Non-Residential

#### **4.0 BUDGETARY CONSIDERATIONS**

##### **4.1 Stormwater Program Budget Needs**

The initial step in determining an assessment structure for a municipal stormwater program is to calculate the required revenue stream to be funded. The costs to be funded by the stormwater program will be a function of policy direction. Stormwater assessments generally may be used to fund any stormwater related construction, maintenance, or administrative activities undertaken by a municipality. Florida stormwater programs or utilities generally focus their activities on several of the following services:

- Capital Projects for Improved Flood Control
- Enhanced Maintenance for Improved Flood and Pollution Control
- Capital Projects for Water Quality Treatment
- Water Quality Management and TMDLs
- Capital Facilities that Induce Groundwater Recharge
- Ecological Preservation
- System-Wide Parcel Identification, Mapping, Data Gathering and Planning
- Regulation and Enforcement Activities
- NPDES/MS4 Permit Compliance

## 4.2 Expenses

Based upon the following stormwater fund budget, it is anticipated that the stormwater program expenses can be divided into three categories: 1) People Costs, 2) Operational Costs, and 3) Capital Outlays. Each of these categories is discussed and summarized below. Table 2 presents the expected expenses for the stormwater utility.

**Table 2  
Planned Expenses**

<b>Expense</b>	<b>Costs</b>
People Costs	\$60,000
Operational Costs	\$206,000
Capital Outlays	\$350,000
<b>Total</b>	<b>\$616,000</b>

### People Costs

Personnel expenses are costs incurred for salaries and overhead for City staff that perform Stormwater related functions.

The stormwater program is anticipated to fund the following positions:

- Public Services Director
- CIP Construction Manager
- Operations Manager
- Maintenance Workers

Stormwater program duties and responsibilities include, but are not limited:

- Public Education Presentations
- Inspection and Cleaning of Drainage Structures
- Nuisance Aquatic Weed Control and Sediment Removal
- Complaint Response
- BMP Maintenance
- Wet Weather Screening
- Water Quality Testing Data
- Beach Program
- Private Stormwater System Inspections
- Stormwater Program Administration

For planning purposes \$60,000 is being allocated to people costs.

## Operation Costs

Stormwater program functions within the City of St. Pete Beach related to operation include, but are not limited to, professional and contractual services, planning/engineering services, NPDES consulting, Accounting/Audits services, limited travel, training, telephone, postage, insurance, equipment, and other miscellaneous items.

For planning purposes \$206,000 is being allocated to operational costs.

## Capital Outlays

Capital Outlays include specific projects, as well as ongoing expenses for specific programs. Under current budget funding, the stormwater department has identified a sampling of four specific projects on their Capital Improvement Project (CIP) list for construction over the next five years. The listed sample projects are based on the City's "Master Drainage Plan and 5-Year Capital Improvements Program) Report prepared in 1993. The needed CIP projects will be periodically reviewed and updated to generate a current priority listing of projects. Therefore, the projects are presented for informational proposes, as the prioritization of projects may change when more detailed stormwater master plans are developed.

- Drainage Issues near 1<sup>st</sup>/2<sup>nd</sup> Avenue – Construct Lift Station
- 2<sup>nd</sup> Street East – Replace Plugged Pipe
- Tessler Drive North – New Catch Basin and Piping
- 64<sup>th</sup> Avenue – Construct New Storm Line

The estimate costs for these projects range from \$85,000 to \$260,000. For planning purposes \$350,000 annually is being allocated to capital outlays. By no means does the City's stormwater fund budget cover the entirety of the stormwater costs experienced by the City; however, it does provide an alternative and equitable means to share a portion of these costs each year.

### 4.3 Fixed Costs and Variable Costs

We have undertaken an economic analysis of a proposed FY 2011-12 stormwater budget and determined that approximately \$266,000 of the budget may be fairly and reasonably characterized as fixed costs, with the remaining \$350,000 characterized as variable costs. Such analysis is consistent with the assessment methodology contemplated by the Initial Assessment Resolution and validated by the Circuit Court in and for Pinellas County, Florida in *City of St. Pete Beach v. State of Florida, et al.*

The fixed portion has been imposed and certified to the Tax Collector for collection on the November 2011 property tax bill at \$36 per Tax Parcel.

The remaining variable cost can be absorbed by the general fund budget, or included as a supplemental assessment imposed for FY 2011-12 by direct bill, or later imposed along with the flat assessment per Tax Parcel next spring for FY 2012-13.

Ennead, Woolpert, City staff and the City Attorneys have worked to prepare the supplemental roll in electronic format for all Tax Parcels as directed by the City Commission in June. Using the remaining \$350,000 variable ERU rate would be \$44.30. The lowest variable assessment per tax parcel would be \$4.43, the mode would be \$44.30, the mean would be \$46.07, and the highest would be \$6,924.09.

## **5.0 MITIGATION**

### **5.1 Introduction**

The Initial Assessment Resolution contemplated development of a mitigation credit pursuant to which owners of developed property with properly maintained and functioning mitigation facilities may be eligible to receive credit against some portion of stormwater assessments imposed to recover variable costs.

Woolpert, Inc. and City staff have determined stormwater mitigation credits can be divided into two distinct components. These components are Quality and Quantity (Volume). Quality refers to acts such as storing the first inch of runoff and other activities that enhance water quality. Quantity refers to the volume of stormwater runoff stored on-site. These two categories can be used for mitigation purposes.

Each of these two components typically can have a different weighting depending on the stormwater goals and activities in a basin and parcel land use. This percent or weighting is typically set as a matter of policy by the local governing body, based on recommendations from City staff and its consultants.

### **5.2 Weighting Factors**

This policy recommends an equal priority be given to the Quality and Quantity aspects. These percentages may vary in the future as needed to achieve the City's objectives. The recommended weighting factors are 10% for Quality and 10% for Quantity. Quality and Quantity receive an equal rating as they both will reduce pollutant loadings entering both inland and ocean waters. The remaining 80% of the stormwater variable costs and related charges associated with the stormwater program are not subject to mitigation credit.

### **5.3 Quality**

The Quality reduction is based on Chapter 62-40.432, State Water Policy. This rule states in Section 62-40.432.5.a.1 that new stormwater management systems shall be designed to achieve at least 80 percent reduction of the average annual load of pollutants that would cause or contribute to violations of state water quality standards. The Quality mitigation curve, developed by Dr. M. Wanielista at the University of Central Florida and adapted by Woolpert, in Figure 1

and Table 1 in Appendix C, identifies one inch (1") of storage over the site as equivalent to an 80% reduction in annual pollutants. This is true as storm event less than one-inch amount to 80% of the annual rainfall volume and 90% of the annual rainfall events.

#### **5.4 Quantity**

Quantity mitigation refers to the volume of storage on site. This credit is given based on the storage provided by storm water devices, mainly ponds, which have been constructed on site. The analysis is based on the annual runoff from a typical ERU of 3,813 square feet of impervious area and 4,474 square feet of pervious area. Adding these two numbers, an average ERU size of 8,287 square feet is obtained. Using this information and a typical rainfall histogram, 17.9 inches over the site is anticipated to runoff the property in a given year. Table 2 and Figure 2 in Appendix C outline the Quantity mitigation curve development. These exhibits show that as retention storage increases, the amount of runoff collected increases; likewise, the credit allocated increases.

#### **5.5 Program Costs**

Mitigation credit awarded should apply only to that portion of the stormwater assessment imposed to recover variable costs since the fixed costs comprising the Program Cost are incurred regardless of the existence or extent of mitigation facilities and are allocated equally among all Tax Parcels, developed and undeveloped. Limiting the applicability of mitigation credit to variable costs is consistent with the direction and determinations adopted by the City in the Initial Assessment Resolution.

#### **5.6 Application of Mitigation Factors**

The historical criteria of the Southwest Florida Water Management District were reviewed with respect to water quality (pollution abatement) and quantity (additional retention requirements). These data were then used to define standard mitigation credits for developments occurring within specified time periods. Table 3 in Appendix C summarizes the findings of this investigation.

The Southwest Florida Water Management District began issuing permits in 1981. The standard requirements of treating the first half-inch of runoff from the developed site will be used to estimate mitigation credit for parcels developed from 1981 through the present. Treating the first inch of rainfall gives an 80% credit for quality and a one-half inch of retention yields 25% mitigation for quantity. This yields a 10.5 mitigation credit of  $(0.10 \times 80 + 0.10 \times 25 = 10.5)$ .

Between 1979 and 1981, the Department of Environmental Protection enforced water quality criteria. As such, an 80% credit is estimated for water quality for developments constructed during this time period. This will amount to a total mitigation credit of 8%. Prior to 1979, minimal criteria were in place and the enforcement and depth of these requirements are in question. Therefore, no credit is estimated for developments constructed before 1979.

The standard mitigation credits calculated are based on typical developments. Additional credit may be available on a case-by-case basis if more stringent criteria are required. This may be the case if construction occurred within a landlocked basin, a primary groundwater recharge area or within designated Outstanding Florida Waters. The burden of proof lies with the property owner. The owner must show evidence to the City or its designated representative of designing and construction at a higher level.

## **5.7 Mitigation Credit Policy**

Credits are given to those individuals who implement stormwater control practices that further the City's stormwater control goals. The City of St. Pete Beach has identified two aspects of stormwater control that are important to protect the health, safety and public welfare of its citizens. These goals are related to water quality and water quantity or volume. Each identified objective has been studied in depth to ensure an equitable allocation of mitigation credits to those who control their stormwater runoff. The graphs and tables pertaining to mitigation credit have been simplified to the maximum extent feasible while still maintaining technical accuracy and financial equitability.

## **5.8 Mitigation Credit Procedure**

The following procedures for obtaining the mitigation credit have been developed with City staff to assist applicants with gathering the necessary data.

To ensure that the stormwater system is maintained and working properly a signed and sealed engineering report is required to document the treatment level being provided. The report must certify that the private stormwater system is in good working order and is in good repair. The report must document the stormwater treatment volume and infiltration rates. Only systems that are owned and maintained by the property owner are eligible for credits

Where a property owner or customer can unequivocally document and demonstrate through appropriate engineering studies that his property's stormwater runoff impact is mitigated due to on-site stormwater treatment facilities, the City Manager, Director of Public Services or designee should have administrative authority to make adjustments consistent with the intent of the Initial Assessment Resolution. Qualifying property owners may apply for mitigation credits in the following manner:

a. An application accompanied by a mitigation credit application fee must be filed in writing with the Director of Public Services or his designee. The application shall include a stormwater report and inspection certification performed and sealed by a professional engineer.

b. Using the information provided by the applicant, the Director of Public Services or his designee should conduct a technical review of the conditions on the property and respond to the mitigation request in writing within thirty (30) days.

c. In response to a mitigation request the Director of Public Services or his designee may adjust the stormwater service charge applicable to a property in conformance with the

general purpose and intent of the City's stormwater program(s). The adjustment may be downward or upward as appropriate.

d. Mitigation requests for the upcoming fiscal year need to be submitted to the City no later than May 1 in order that any changes can be updated in the assessment role.

e. Stormwater treatment areas should be certified every two years in order to maintain the mitigation credit. Credit will only be given for the next two fiscal years. Refunds will not be given for previous years.

f. It should not be necessary to involve the City Commission in the mitigation credit process since the Commission will have articulated the policy and procedure in sufficient detail to allow for complete administration by City staff. Any appeal of application denial by the Director of Public Services could be made to the City Manager.

A reasonable mitigation credit application fee of \$25.00 for residential parcels, or a mitigation credit application fee of \$100 for non-residential parcels of land, is recommended to be paid at the time the mitigation credit application is filed. Each additional parcel should require an additional application fee. The application fee is nonrefundable. Where a condominium regime is involved a non-residential parcel application fee would be appropriate.

## **Appendix A**

### **Raw Sample Data from 500 Parcels Used to Determine Sample Size**

## Appendix A

### Raw Sample Data from 500 Parcels Used to Determine Sample Size

Parcel ID Number	Impervious Area of Parcel (SF)	Entire Area of Parcel (SF)
253115952020000020	2,646	4,487
253115783181130090	3,260	9,017
253115783181130060	2,885	9,017
253115783181120070	3,543	7,362
253115783181120020	2,082	7,362
253115783001110050	3,548	9,017
253115783001100040	2,751	6,403
253115782821090090	2,966	6,403
253115782821090060	3,606	7,492
253115782821090020	2,562	7,187
253115782821080040	4,689	8,276
253115782821070080	3,008	7,536
253115782821070020	2,942	7,492
253115782821070050	4,289	7,492
253115782641050080	3,722	8,146
253115782641050080	3,432	8,146
253115782641050060	3,615	7,754
253115782461010060	3,775	9,322
253115782641060150	2,544	7,449
253115782641060100	2,733	6,970
253115782641060040	2,220	7,318
253115782641060070	2,633	7,318
253115782641040210	3,818	7,797
253115782641040130	3,640	7,797
253115782641040050	3,913	6,708
253115782641040070	2,419	6,708
253115782461030220	2,164	6,447
063216023220000011	4,182	174
063216023400000060	3,160	10,237
063216023400000090	3,364	7,362
063216023400000040	4,536	7,057
063216023400000190	2,961	6,621
063216023400000220	3,723	5,924
063216095940010140	3,747	12,240
063216095940010170	4,945	6,795
063216095940010290	7,853	6,795
063216095940010220	2,577	6,795

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
063216095940010300	2,676	9,670
063216095940010360	4,202	6,098
063216095940010410	4,384	14,070
063216095940010520	3,027	9,235
063216095940020350	3,645	8,843
063216095940020410	2,752	9,235
063216095940020520	3,002	6,316
063216114120010020	5,486	8,973
063216114120010140	6,422	10,367
063216114120020050	6,133	12,850
063216114120030070	9,988	14,201
063216114120030050	9,335	12,632
063216114120030100	5,138	12,023
063216114120040050	5,559	11,021
063216114120040090	6,033	10,454
063216114120040120	2,239	8,233
063216114120040100	4,873	10,454
063216114300000060	6,961	9,888
063216114300000020	4,349	11,021
063216114300000010	6,681	9,888
063216114300000170	6,949	9,888
063216114300000190	5,304	9,888
063216114480000040	5,220	9,888
063216114480000110	6,141	11,021
063216517510000050	11,508	18,208
063216517510000030	4,838	10,106
063216655200000150	4,619	6,795
063216655200000190	2,595	6,839
063216655200000240	4,332	7,797
063216732600000080	3,497	6,011
063216732600000180	6,469	12,110
063216732600000120	7,454	13,809
063216732600000210	4,275	7,187
063216732600000300	2,215	6,011
063216732600000330	2,643	6,011
073216516600010040	2,048	5,881
073216516960000250	4,740	7,318
073216516780040140	2,108	6,142
073216516780040170	2,743	5,968
073216516600020030	1,946	5,968
073216516600020040	2,242	5,968

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216516600020050	3,085	5,968
073216516600030050	2,555	5,881
073216516600030070	2,342	5,881
073216516600030080	2,190	5,881
073216073980030070	2,376	7,100
073216073980030090	2,524	7,100
073216073980040020	1,679	7,187
073216073980040110	1,729	10,803
073216073980040040	4,616	17,032
073216073980040100	2,259	7,187
073216073980040160	1,871	7,187
073216073980040220	2,674	7,187
073216073980040300	2,556	7,187
073216073980040250	2,428	7,187
073216073980040330	2,261	7,187
073216075240090730	3,941	9,191
073216073980050230	4,684	7,187
073216073980050250	3,340	7,187
073216073980020150	4,451	9,365
073216073980020200	4,824	9,235
073216073980060010	2,852	7,710
073216073980060030	2,559	7,187
073216075240090700	3,654	8,930
073216075240090680	5,648	9,191
073216075240090550	5,428	9,191
073216075240090450	3,715	9,191
073216075240090460	4,418	9,191
073216075240090510	4,877	12,415
073216075240090610	3,506	9,453
073216075240090290	4,026	13,112
073216075240090280	4,598	13,112
073216075240090230	7,140	10,934
073216075240090360	3,934	9,191
073216075240090180	3,914	11,064
073216075240090170	7,387	13,678
073216075240090160	4,227	15,769
073216075240090120	5,552	9,757
073216075240070110	3,534	10,629
073216075240070120	3,357	10,629
073216073980060210	1,589	7,187
073216075240070050	4,173	10,629

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216075240070030	2,643	10,629
073216073980020220	4,617	8,538
073216074340000170	2,244	11,151
073216074340000030	5,414	8,756
073216074340000040	2,974	8,756
073216074340000060	1,291	8,756
073216074340000070	1,881	8,756
073216074880010090	3,334	9,104
073216074880010040	2,740	9,148
073216074880010070	3,821	9,148
073216074340000110	2,357	8,799
073216074700020010	1,703	7,754
073216074700010110	2,898	7,013
073216074160000290	3,943	11,456
073216074700010070	2,076	7,841
073216074700020050	2,296	7,013
073216074700020090	2,207	7,318
073216074700020070	1,594	8,189
073216075420010070	1,570	9,757
073216074160000430	5,185	15,420
073216074160000430	6,466	15,420
073216074160000450	4,955	15,899
073216074880020050	3,256	9,191
073216074880020080	2,862	9,670
073216074880020090	2,871	9,540
073216074880020100	3,731	9,060
073216075060040230	3,471	9,583
073216075060050260	3,264	9,801
073216075060050250	3,821	10,672
073216075060050240	3,301	10,716
253115782461010020	4,249	10,934
253115782461030110	2,466	6,490
253115782461030080	4,210	6,490
253115782461030020	2,581	6,490
363115779940990010	4,421	13,112
253115781020980120	3,036	6,708
253115781020980090	1,721	6,011
253115781020980030	2,164	6,186
253115782461020010	3,873	11,500
253115782461020230	1,972	6,229
253115782461020060	2,396	6,229

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
253115782461020070	2,425	6,229
363115051480030080	2,850	6,926
363115780660970090	2,158	6,186
363115780660970080	2,415	6,186
363115780660970030	2,570	6,186
363115780480950060	1,720	6,186
363115780300940090	2,702	6,229
363115782100920050	4,463	7,754
363115782100960110	2,213	7,318
363115782100960150	3,014	6,708
363115782100960040	2,845	6,316
363115782100960020	3,824	6,316
363115782100930050	3,521	6,011
363115782100930050	2,536	6,011
363115782100930090	2,310	6,403
363115782100920010	3,155	6,752
363115781920910110	3,891	8,451
363115781920880030	1,845	5,619
363115781740840110	3,745	5,706
363115781920900130	2,619	8,930
363115781920910010	2,531	6,316
363115781920910050	4,685	10,716
363115781920910110	3,113	8,451
363115781920900010	6,532	12,415
363115781920890060	1,561	5,489
363115781920890090	1,755	5,489
363115781740810040	2,492	6,273
363115615240800110	1,647	5,009
363115615240800120	1,101	5,009
363115615240770300	1,348	5,009
363115615240770260	1,666	5,009
363115615240770190	1,928	5,009
363115615240770110	1,440	5,009
363115615240770090	2,020	5,009
363115615240780070	2,879	7,100
363115615240780030	6,741	12,502
363115779940730040	3,002	5,097
363115779940730020	3,004	5,358
363115779940740090	2,314	5,358
363115779940740120	1,890	5,358
363115051120030060	3,424	5,358

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
363115051120020040	6,919	9,235
363115051120020080	2,593	7,492
363115779940480130	946	5,358
363115779940410170	1,548	10,803
363115779940410120	1,307	5,401
363115779940410090	2,573	5,401
363115779940420130	1,098	5,358
363115051120010010	3,791	11,326
363115050940280020	3,513	7,710
363115050940280030	2,641	6,621
363115050940260090	2,925	7,013
363115906660000010	2,847	8,015
363115783360010110	1,252	5,009
363115783360020270	2,044	5,009
363115059400020260	1,516	5,009
363115906660000030	3,684	11,718
363115906660000050	4,173	9,060
363115906660000060	4,824	9,104
363115906660000100	3,865	9,017
363115906660000350	3,561	7,884
363115906660000340	3,316	8,015
363115906660000330	4,703	8,886
363115906660000140	4,765	8,233
363115906660000310	3,886	6,970
313116906840000110	4,918	9,060
363115906660000230	3,690	7,884
363115000004400300	3,063	8,886
313116906840000170	3,578	7,667
313116907020000030	2,794	7,928
313116907020000190	3,465	8,233
313116907200000040	6,292	8,538
313116907200000040	4,876	8,538
313116907380010160	3,611	8,233
313116907380020020	4,531	8,233
313116907380020050	5,018	8,059
313116907380020050	3,982	8,059
313116907420000010	3,299	8,233
313116907400000050	3,451	9,540
313116907420000100	4,736	9,583
313116907420000040	4,063	9,017
313116907420000030	4,650	9,017

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
313116907380010100	3,936	9,365
313116907460000020	4,111	10,237
313116907450000040	5,864	8,233
313116907440000220	4,547	9,017
313116907440000110	5,067	10,629
313116907440000130	4,987	9,583
313116907440000040	4,551	8,843
313116907440000330	3,998	8,102
313116907420000180	4,206	8,233
313116907400000150	4,985	8,233
313116114660000050	5,163	9,670
313116114660000020	5,215	9,888
313116023810000070	6,692	7,971
313116023810000030	4,530	8,146
313116023810000020	5,046	9,365
313116023810000130	5,856	8,538
313116023810000140	5,044	8,538
313116023800000120	3,769	7,667
313116023800000150	8,034	13,678
313116023800000190	2,921	8,494
313116023800000080	9,784	16,858
313116023790000130	3,893	7,754
313116023760000110	4,473	7,492
313116023760000140	4,849	8,189
313116023760000020	5,190	9,322
313116023580000180	3,110	7,492
313116023580000270	6,473	9,496
313116023580000290	4,886	8,494
313116023580000300	5,401	7,492
313116023580000080	3,266	7,492
313116023580000030	5,508	10,193
313116023580000020	6,560	8,799
313116023580000330	3,789	8,189
313116023580000340	5,742	11,718
363115783360150010	2,254	6,708
363115783360140040	2,516	6,752
193216589320110110	2,959	4,182
193216589320100180	3,179	4,530
193216589320100100	1,965	3,441
193216589320090220	1,375	4,182
193216589320090060	2,554	4,182

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
193216589320080170	1,275	4,530
193216589320080030	2,921	5,489
193216228420000041	1,274	2,004
193216228420000050	1,157	4,008
193216228420000070	1,086	2,004
193216589320050010	1,966	7,579
193216589320040170	1,907	3,790
183216954540010020	3,432	5,968
183216954540040540	1,377	5,009
183216954540051310	2,273	7,231
183216686340000009	3,078	7,318
183216686340070210	2,203	5,750
183216686340080410	2,259	5,009
183216551970000020	3,010	4,922
183216686340100340	2,024	5,009
183216686340101030	2,424	5,009
183216686340101060	2,512	5,881
183216880560010150	3,851	8,233
183216880740070020	3,612	8,102
183216880740070040	8,297	15,725
183216880740070090	3,304	6,752
183216880560020060	3,323	5,532
183216880560020050	2,009	4,835
183216610020030160	3,245	5,401
183216610020030150	3,602	6,708
183216610020040100	2,964	5,489
183216173160020190	2,745	5,489
183216173160020200	2,744	5,489
183216173160020210	2,379	5,489
183216173160020230	3,141	5,489
183216173160020240	3,303	5,489
183216173160020260	3,569	5,489
183216173160020260	2,975	5,489
073216609480000090	1,732	2,875
073216609660000060	2,214	3,136
073216140540000101	2,250	29,142
073216218520070060	1,887	5,140
073216218520280002	2,493	16,074
073216218520280005	6,254	13,896
073216218520090090	2,391	4,966
073216218520040020	3,564	5,009

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216218520020120	2,523	10,629
073216218520050120	1,704	5,009
073216218520050110	1,817	5,009
073216218520110100	2,399	5,489
073216218520110090	2,456	5,489
073216218520150080	3,546	8,233
073216218520120050	2,078	5,489
073216218520110040	3,563	6,621
073216218520050050	2,051	5,009
073216218520020020	7,604	15,377
073216218520120020	2,398	5,489
073216218520120010	2,295	5,445
073216074160000320	6,213	12,937
073216074160000340	6,466	13,634
073216074160000360	8,606	14,157
073216548590000010	5,516	9,322
073216074520000140	6,183	10,019
073216074520000160	6,092	10,367
073216075420020200	3,082	10,019
073216075420020040	2,049	7,362
073216074880030050	3,923	7,754
073216075060060030	3,098	8,494
073216075420030050	4,956	8,233
073216075060060090	3,514	8,364
073216075420030080	3,472	7,797
073216075060060120	2,119	8,494
073216075420030100	3,823	8,276
073216075420040220	6,145	7,884
073216075420050060	5,102	7,797
073216075420050070	3,733	7,797
073216075420050090	3,545	7,797
073216075420050130	5,421	10,367
073216075420050190	4,439	7,971
073216075420050190	4,326	7,971
073216075420050210	3,577	7,971
073216075060040050	5,198	8,886
073216075060050140	4,092	7,405
073216075060040080	4,472	8,886
073216075060050170	2,635	8,712
073216075060050080	3,378	8,712
073216075060050200	5,075	10,019

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216075060050210	4,163	10,324
073216218520160140	2,630	5,358
073216218520160150	2,555	5,358
073216218520160170	2,039	5,358
073216218520160040	2,666	9,801
073216218520240130	2,261	5,663
073216218520240110	2,013	5,663
073216218520240100	2,488	9,888
073216218520240050	4,183	5,881
073216218520240180	3,708	5,881
073216218520170140	7,780	12,807
073216218520170060	3,442	9,932
073216218520170010	2,399	6,403
073216218520180120	2,070	6,403
073216417780000020	2,735	6,795
073216218520190060	1,809	6,403
073216218520230050	2,921	6,795
073216218520230030	2,767	6,752
073216218520230010	2,430	7,100
073216218520230190	2,682	5,924
073216218520210150	2,033	6,403
073216218520210170	3,014	6,970
073216218520210060	3,652	6,403
073216218520200120	2,801	9,583
073216615600010140	5,050	9,017
073216615600010100	2,648	6,534
073216615600010060	4,394	10,629
073216615600010040	3,760	13,809
073216615600010860	4,278	12,981
073216615600010830	4,240	9,409
073216615600010250	5,363	9,017
073216615600010750	4,735	9,888
073216615600010680	5,020	8,668
073216615600010650	5,998	8,712
073216615600010610	5,593	10,324
073216615600020140	4,462	9,060
073216615600010540	3,952	8,712
073216615600020160	5,018	8,886
073216615600020110	4,098	8,712
073216615600020090	4,542	8,712
073216615600010450	3,777	8,712

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216615600020250	4,034	8,886
073216615600020280	3,575	9,365
073216615600010400	4,656	8,364
073216615600010370	4,469	11,108
073216615600010360	4,564	11,195
073216615600010340	4,879	8,712
083216615780030100	2,885	8,059
083216615780030120	4,764	8,233
083216615780030120	5,032	8,233
083216615420010140	4,489	9,017
083216615780050080	2,832	8,407
083216615780030170	3,205	7,667
083216615420030010	3,590	9,278
083216615780050010	3,982	10,411
073216615600030120	4,989	10,149
073216615600030080	4,515	9,017
073216615600030070	5,547	9,017
073216615600030060	5,590	9,017
083216615420020060	3,507	7,667
083216615420020010	4,939	7,623
183216941760020650	2,988	8,886
183216941760080140	3,441	8,407
183216942300011550	6,271	8,407
183216941760070260	3,774	7,884
183216941760020561	4,713	8,276
183216942300011480	3,219	9,714
183216941760070170	2,882	7,971
183216941760070160	3,805	7,928
183216941760070320	2,259	7,841
183216942300011440	2,996	8,756
183216941760020480	6,274	11,848
183216941760070360	4,354	7,841
183216941940011160	6,923	12,981
183216941940011190	4,773	8,407
183216941940011210	4,211	12,589
183216941940011100	5,375	8,407
183216941940011060	5,469	8,407
183216941940011040	5,471	8,407
183216941940011010	5,757	8,451
183216941940010980	4,559	8,407
183216941940011370	4,952	8,451

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
183216941940011380	5,360	8,320
183216941940011410	4,152	9,322
183216941940011410	5,462	9,322
183216941760070370	2,981	7,884
183216941760070380	4,241	7,710
183216941760070080	2,546	7,971
183216941760070060	3,830	7,971
183216941760070410	3,831	7,797
183216941580010610	5,754	9,583
183216941580010640	6,217	11,935
183216941580010660	6,251	8,407
183216941580060210	4,619	7,971
183216941580060230	3,593	7,971
183216941580060180	3,924	7,884
183216941580010490	5,629	8,407
183216941580010490	6,310	8,407
183216941580010470	3,812	8,407
183216941580060100	4,837	7,841
183216941580060090	2,794	7,884
183216941580010780	3,526	8,407
183216941580010800	3,893	8,407
183216941580060360	5,068	7,928
183216941580010840	5,242	8,146
183216941580010840	5,079	8,146
183216941580060030	3,650	7,884
183216941580010410	4,508	8,407
183216941580060380	3,516	7,971
183216941580010850	2,948	9,365
183216941580060010	2,963	8,494
183216941760050140	5,444	8,320
183216941760050100	2,804	8,668
183216941400020270	6,416	12,066
183216941400040080	3,956	7,492
183216941400010340	4,010	9,409
183216941400050050	3,395	9,017
183216941400010090	4,479	8,407
183216941400020250	8,395	11,979
183216941400020240	8,628	11,979
183216941400050030	3,456	8,886
183216941400040030	3,674	7,579
183216941400050010	3,740	8,756

Parcel ID Number	Impervious Area of Parcel (SF)	Entire Area of Parcel (SF)
183216941400010040	6,257	8,886
183216941400030010	5,011	8,799
183216941400020090	4,787	8,364
183216941400030070	3,804	7,623
183216941400020130	5,496	9,627
183216941400020150	4,832	12,023
183216941400020160	5,988	12,066
183216941400030040	6,156	8,843
183216941400020190	3,989	11,935
183216941400010270	4,890	8,668
183216941400010280	6,152	8,799
183216941400010290	4,002	8,712

### Results

Mean	3,799
Standard Deviation	1,567
Alpha	0.10
Confidence	0.90
Alpha/2	0.05
z sub Alpha/2	1.65
d = Acceptable Error	114
n (Needed Sample Size)	512
Sample Size Used	520

**Appendix B**  
**Raw Sample Data from 520 Single Family Parcels**

## Appendix B

### Raw Sample Data from 520 Single Family Parcels

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
363115779940480130	946	5,358
193216228420000070	1,086	2,004
363115779940420130	1,098	5,358
363115615240800120	1,101	5,009
193216228420000050	1,157	4,008
363115783360010110	1,252	5,009
193216228420000041	1,274	2,004
193216589320080170	1,275	4,530
073216074340000060	1,291	8,756
363115779940410120	1,307	5,401
363115615240770300	1,348	5,009
193216589320090220	1,375	4,182
183216954540040540	1,377	5,009
363115615240770110	1,440	5,009
363115059400020260	1,516	5,009
363115779940410170	1,548	10,803
363115781920890060	1,561	5,489
073216075420010070	1,570	9,757
073216073980060210	1,589	7,187
073216074700020070	1,594	8,189
363115615240800110	1,647	5,009
363115615240770260	1,666	5,009
073216073980040020	1,679	7,187
073216074700020010	1,703	7,754
073216218520050120	1,704	5,009
363115780480950060	1,720	6,186
253115781020980090	1,721	6,011
073216073980040110	1,729	10,803
073216609480000090	1,732	2,875
363115781920890090	1,755	5,489
073216218520190060	1,809	6,403
073216218520050110	1,817	5,009
363115781920880030	1,845	5,619
073216073980040160	1,871	7,187
073216074340000070	1,881	8,756
073216218520070060	1,887	5,140
363115779940740120	1,890	5,358

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
193216589320040170	1,907	3,790
363115615240770190	1,928	5,009
073216516600020030	1,946	5,968
193216589320100100	1,965	3,441
193216589320050010	1,966	7,579
253115782461020230	1,972	6,229
183216880560020050	2,009	4,835
073216218520240110	2,013	5,663
363115615240770090	2,020	5,009
183216686340100340	2,024	5,009
073216218520210150	2,033	6,403
073216218520160170	2,039	5,358
363115783360020270	2,044	5,009
073216516600010040	2,048	5,881
073216075420020040	2,049	7,362
073216218520050050	2,051	5,009
073216218520180120	2,070	6,403
073216074700010070	2,076	7,841
073216218520120050	2,078	5,489
253115783181120020	2,082	7,362
073216516780040140	2,108	6,142
073216075060060120	2,119	8,494
363115780660970090	2,158	6,186
253115782461030220	2,164	6,447
253115781020980030	2,164	6,186
073216516600030080	2,190	5,881
183216686340070210	2,203	5,750
073216074700020090	2,207	7,318
363115782100960110	2,213	7,318
073216609660000060	2,214	3,136
063216732600000300	2,215	6,011
253115782641060040	2,220	7,318
063216114120040120	2,239	8,233
073216516600020040	2,242	5,968
073216074340000170	2,244	11,151
073216140540000101	2,250	29,142
363115783360150010	2,254	6,708
183216941760070320	2,259	7,841
073216073980040100	2,259	7,187
183216686340080410	2,259	5,009

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216073980040330	2,261	7,187
073216218520240130	2,261	5,663
183216954540051310	2,273	7,231
363115050940270060	2,288	6,839
073216218520120010	2,295	5,445
073216074700020050	2,296	7,013
363115782100930090	2,310	6,403
363115779940740090	2,314	5,358
073216516780010180	2,341	6,621
073216516600020150	2,341	5,968
073216516600030070	2,342	5,881
073216074340000110	2,357	8,799
073216073980030070	2,376	7,100
183216173160020210	2,379	5,489
073216218520090090	2,391	4,966
253115782461020060	2,396	6,229
073216218520120020	2,398	5,489
073216218520170010	2,399	6,403
073216218520110100	2,399	5,489
363115780660970080	2,415	6,186
253115782641040070	2,419	6,708
183216686340101030	2,424	5,009
253115782461020070	2,425	6,229
073216073980040250	2,428	7,187
183216686340090660	2,428	5,009
073216218520230010	2,430	7,100
073216218520110090	2,456	5,489
253115782461030110	2,466	6,490
073216218520240100	2,488	9,888
363115781740810040	2,492	6,273
073216218520280002	2,493	16,074
183216686340101060	2,512	5,881
363115783360140040	2,516	6,752
073216218520020120	2,523	10,629
073216073980030090	2,524	7,100
363115781920910010	2,531	6,316
363115782100930050	2,536	6,011
253115782641060150	2,544	7,449
183216941760070080	2,546	7,971
193216589320090060	2,554	4,182

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216516600030050	2,555	5,881
073216218520160150	2,555	5,358
073216073980040300	2,556	7,187
073216073980060030	2,559	7,187
253115782821090020	2,562	7,187
363115780660970030	2,570	6,186
363115779940410090	2,573	5,401
063216095940010220	2,577	6,795
253115782461030020	2,581	6,490
363115051120020080	2,593	7,492
063216655200000190	2,595	6,839
363115781920900130	2,619	8,930
073216218520160140	2,630	5,358
253115782641060070	2,633	7,318
073216075060050170	2,635	8,712
363115050940280030	2,641	6,621
073216075240070030	2,643	10,629
063216732600000330	2,643	6,011
253115952020000020	2,646	4,487
073216615600010100	2,648	6,534
073216218520160040	2,666	9,801
073216073980040220	2,674	7,187
063216095940010300	2,676	9,670
073216218520230190	2,682	5,924
073216516780040010	2,700	6,142
363115780300940090	2,702	6,229
253115782641060100	2,733	6,970
073216417780000020	2,735	6,795
073216074880010040	2,740	9,148
073216516780040170	2,743	5,968
183216173160020200	2,744	5,489
183216173160020190	2,745	5,489
253115783001100040	2,751	6,403
063216095940020410	2,752	9,235
073216218520230030	2,767	6,752
313116907020000030	2,794	7,928
183216941580060090	2,794	7,884
073216218520200120	2,801	9,583
183216941760050100	2,804	8,668
083216615780050080	2,832	8,407

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
363115782100960040	2,845	6,316
363115906660000010	2,847	8,015
363115051480030080	2,850	6,926
073216073980060010	2,852	7,710
073216074880020080	2,862	9,670
073216074880020090	2,871	9,540
363115615240780070	2,879	7,100
183216941760070170	2,882	7,971
253115783181130060	2,885	9,017
083216615780030100	2,885	8,059
073216074700010110	2,898	7,013
193216589320080030	2,921	5,489
313116023800000190	2,921	8,494
073216218520230050	2,921	6,795
363115050940260090	2,925	7,013
253115782821070020	2,942	7,492
183216941580010850	2,948	9,365
193216589320110110	2,959	4,182
063216023400000190	2,961	6,621
183216941580060010	2,963	8,494
183216610020040100	2,964	5,489
253115782821090090	2,966	6,403
073216074340000040	2,974	8,756
183216173160020260	2,975	5,489
183216941760070370	2,981	7,884
183216941760020650	2,988	8,886
183216942300011440	2,996	8,756
363115779940730040	3,002	5,097
063216095940020520	3,002	6,316
363115779940730020	3,004	5,358
253115782821070080	3,008	7,536
183216551970000020	3,010	4,922
073216218520210170	3,014	6,970
363115782100960150	3,014	6,708
063216095940010520	3,027	9,235
253115781020980120	3,036	6,708
363115000004400300	3,063	8,886
183216686340000009	3,078	7,318
073216075420020200	3,082	10,019
073216516600020050	3,085	5,968

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216075060060030	3,098	8,494
313116023580000180	3,110	7,492
363115781920910110	3,113	8,451
183216173160020230	3,141	5,489
363115782100920010	3,155	6,752
063216023400000060	3,160	10,237
193216589320100180	3,179	4,530
083216615780030170	3,205	7,667
183216942300011480	3,219	9,714
183216610020030160	3,245	5,401
073216074880020050	3,256	9,191
253115783181130090	3,260	9,017
073216075060050260	3,264	9,801
313116023580000080	3,266	7,492
313116907420000010	3,299	8,233
073216075060050240	3,301	10,716
183216173160020240	3,303	5,489
183216880740070090	3,304	6,752
363115906660000340	3,316	8,015
183216880560020060	3,323	5,532
073216074880010090	3,334	9,104
073216073980050250	3,340	7,187
073216075240070120	3,357	10,629
063216023400000090	3,364	7,362
073216075060050080	3,378	8,712
183216941400050050	3,395	9,017
363115051120030060	3,424	5,358
183216954540010020	3,432	5,968
253115782641050080	3,432	8,146
183216941760080140	3,441	8,407
073216218520170060	3,442	9,932
313116907400000050	3,451	9,540
183216941400050030	3,456	8,886
313116907020000190	3,465	8,233
073216075060040230	3,471	9,583
073216075420030080	3,472	7,797
063216732600000080	3,497	6,011
073216075240090610	3,506	9,453
083216615420020060	3,507	7,667
363115050940280020	3,513	7,710

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216075060060090	3,514	8,364
183216941580060380	3,516	7,971
363115782100930050	3,521	6,011
183216941580010780	3,526	8,407
073216075240070110	3,534	10,629
253115783181120070	3,543	7,362
073216075420050090	3,545	7,797
073216218520150080	3,546	8,233
253115783001110050	3,548	9,017
363115906660000350	3,561	7,884
073216218520110040	3,563	6,621
073216218520040020	3,564	5,009
183216173160020260	3,569	5,489
073216615600020280	3,575	9,365
073216075420050210	3,577	7,971
313116906840000170	3,578	7,667
083216615420030010	3,590	9,278
183216941580060230	3,593	7,971
183216610020030150	3,602	6,708
253115782821090060	3,606	7,492
313116907380010160	3,611	8,233
183216880740070020	3,612	8,102
253115782641050060	3,615	7,754
363115782100920020	3,622	7,013
253115782641040130	3,640	7,797
063216095940020350	3,645	8,843
183216941580060030	3,650	7,884
073216218520210060	3,652	6,403
073216075240090700	3,654	8,930
183216941400040030	3,674	7,579
363115906660000030	3,684	11,718
363115906660000230	3,690	7,884
073216218520240180	3,708	5,881
073216075240090450	3,715	9,191
253115782641050080	3,722	8,146
063216023400000220	3,723	5,924
073216074880020100	3,731	9,060
073216075420050070	3,733	7,797
183216941400050010	3,740	8,756
063216114300000130	3,743	9,888

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
363115781740840110	3,745	5,706
063216095940010140	3,747	12,240
073216615600010040	3,760	13,809
313116023800000120	3,769	7,667
183216941760070260	3,774	7,884
253115782461010060	3,775	9,322
073216615600010450	3,777	8,712
073216075420040110	3,780	9,714
313116023580000330	3,789	8,189
363115051120010010	3,791	11,326
183216941400030070	3,804	7,623
183216941760070160	3,805	7,928
183216941580010470	3,812	8,407
253115782641040210	3,818	7,797
073216075060050250	3,821	10,672
073216074880010070	3,821	9,148
073216075420030100	3,823	8,276
363115782100960020	3,824	6,316
183216941760070060	3,830	7,971
183216941760070410	3,831	7,797
183216880560010150	3,851	8,233
363115906660000100	3,865	9,017
253115782461020010	3,873	11,500
363115906660000310	3,886	6,970
363115781920910110	3,891	8,451
183216941580010800	3,893	8,407
313116023790000130	3,893	7,754
253115782641040050	3,913	6,708
073216075240090180	3,914	11,064
073216074880030080	3,917	9,801
073216074880030050	3,923	7,754
183216941580060180	3,924	7,884
073216075240090360	3,934	9,191
313116907380010100	3,936	9,365
073216075240090730	3,941	9,191
073216074160000290	3,943	11,456
073216075420010050	3,944	8,712
073216615600010540	3,952	8,712
183216941400040080	3,956	7,492
083216615780050010	3,982	10,411

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
313116907380020050	3,982	8,059
183216941400020190	3,989	11,935
313116907440000330	3,998	8,102
183216941400010290	4,002	8,712
183216941400010340	4,010	9,409
073216075240090290	4,026	13,112
073216615600020250	4,034	8,886
313116907420000040	4,063	9,017
073216075060050140	4,092	7,405
073216615600020110	4,098	8,712
313116907460000020	4,111	10,237
183216941940011410	4,152	9,322
073216075060050210	4,163	10,324
073216075240070050	4,173	10,629
363115906660000050	4,173	9,060
063216023220000011	4,182	174
073216218520240050	4,183	5,881
063216095940010360	4,202	6,098
313116907420000180	4,206	8,233
253115782461030080	4,210	6,490
183216941940011210	4,211	12,589
073216075240090160	4,227	15,769
073216615600010830	4,240	9,409
183216941760070380	4,241	7,710
253115782461010020	4,249	10,934
063216732600000210	4,275	7,187
073216615600010860	4,278	12,981
183216032760100030	4,286	5,968
253115782821070050	4,289	7,492
073216075420050190	4,326	7,971
183216941760070420	4,330	7,754
063216655200000240	4,332	7,797
063216114300000020	4,349	11,021
183216941760070360	4,354	7,841
363115781920910070	4,357	6,490
063216095940010410	4,384	14,070
073216615600010060	4,394	10,629
073216075240090460	4,418	9,191
363115779940990010	4,421	13,112
073216075420050190	4,439	7,971

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216073980020150	4,451	9,365
073216615600020140	4,462	9,060
363115782100920050	4,463	7,754
073216615600010370	4,469	11,108
073216075060040080	4,472	8,886
313116023760000110	4,473	7,492
183216941400010090	4,479	8,407
083216615420010140	4,489	9,017
063216023400000150	4,508	7,275
183216941580010410	4,508	8,407
073216615600030080	4,515	9,017
313116023810000030	4,530	8,146
313116907380020020	4,531	8,233
313116907420000160	4,532	8,233
063216023400000040	4,536	7,057
073216615600020090	4,542	8,712
313116907440000220	4,547	9,017
313116907440000040	4,551	8,843
183216941940010980	4,559	8,407
073216615600010360	4,564	11,195
073216075240090280	4,598	13,112
073216073980040040	4,616	17,032
073216073980020220	4,617	8,538
063216655200000150	4,619	6,795
183216941580060210	4,619	7,971
313116907420000030	4,650	9,017
073216615600010400	4,656	8,364
073216073980050230	4,684	7,187
363115781920910050	4,685	10,716
253115782821080040	4,689	8,276
363115906660000330	4,703	8,886
183216941760020561	4,713	8,276
073216615600010750	4,735	9,888
313116907420000100	4,736	9,583
073216516960000250	4,740	7,318
083216615780030120	4,764	8,233
363115906660000140	4,765	8,233
183216941940011190	4,773	8,407
183216941400020090	4,787	8,364
363115906660000060	4,824	9,104

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
073216073980020200	4,824	9,235
183216941400020150	4,832	12,023
183216941580060100	4,837	7,841
063216517510000030	4,838	10,106
313116023760000140	4,849	8,189
063216114120040100	4,873	10,454
313116907200000040	4,876	8,538
073216075240090510	4,877	12,415
073216615600010340	4,879	8,712
313116023580000290	4,886	8,494
183216941400010270	4,890	8,668
313116906840000110	4,918	9,060
083216615420020010	4,939	7,623
063216095940010170	4,945	6,795
183216941940011370	4,952	8,451
073216074160000450	4,955	15,899
073216075420030050	4,956	8,233
313116907400000150	4,985	8,233
313116907440000130	4,987	9,583
073216615600030120	4,989	10,149
183216941400030010	5,011	8,799
313116907380020050	5,018	8,059
073216615600020160	5,018	8,886
073216615600010680	5,020	8,668
083216615780030120	5,032	8,233
313116023810000140	5,044	8,538
313116023810000020	5,046	9,365
073216615600010140	5,050	9,017
313116907440000110	5,067	10,629
183216941580060360	5,068	7,928
073216075060050200	5,075	10,019
183216941580010840	5,079	8,146
073216075420050060	5,102	7,797
063216114120030100	5,138	12,023
313116114660000050	5,163	9,670
073216074160000430	5,185	15,420
313116023760000020	5,190	9,322
073216075060040050	5,198	8,886
313116114660000020	5,215	9,888
063216114480000040	5,220	9,888

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
313116907020000120	5,222	10,149
183216941580010840	5,242	8,146
073216075240090070	5,255	9,757
063216114300000190	5,304	9,888
183216941940011380	5,360	8,320
073216615600010250	5,363	9,017
183216941940011100	5,375	8,407
313116023580000300	5,401	7,492
073216074340000030	5,414	8,756
073216075420050130	5,421	10,367
073216075240090550	5,428	9,191
183216941760050140	5,444	8,320
183216941940011410	5,462	9,322
183216941940011060	5,469	8,407
183216941940011040	5,471	8,407
063216114120010020	5,486	8,973
183216941400020130	5,496	9,627
313116023580000030	5,508	10,193
073216548590000010	5,516	9,322
073216615600030070	5,547	9,017
073216075240090120	5,552	9,757
063216114120040050	5,559	11,021
073216615600030060	5,590	9,017
073216615600010610	5,593	10,324
183216941580010490	5,629	8,407
073216075240090680	5,648	9,191
073216074880010120	5,706	9,104
313116023580000340	5,742	11,718
183216941580010610	5,754	9,583
183216941940011010	5,757	8,451
313116023810000130	5,856	8,538
313116907450000040	5,864	8,233
063216114480000050	5,935	9,888
183216941400020160	5,988	12,066
073216615600010650	5,998	8,712
063216114120040090	6,033	10,454
073216074520000160	6,092	10,367
063216114120020050	6,133	12,850
063216114480000110	6,141	11,021
073216075420040220	6,145	7,884

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
c	6,152	8,799
183216941400030040	6,156	8,843
073216074520000140	6,183	10,019
073216074160000320	6,213	12,937
183216941580010640	6,217	11,935
183216941580010660	6,251	8,407
073216218520280005	6,254	13,896
183216941400010040	6,257	8,886
183216942300011550	6,271	8,407
183216941760020480	6,274	11,848
313116907200000040	6,292	8,538
183216941580010490	6,310	8,407
183216941400020270	6,416	12,066
063216114120010140	6,422	10,367
073216074160000340	6,466	13,634
073216074160000430	6,466	15,420
063216732600000180	6,469	12,110
313116023580000270	6,473	9,496
363115781920900010	6,532	12,415
313116023580000020	6,560	8,799
063216114300000010	6,681	9,888
313116023810000070	6,692	7,971
363115615240780030	6,741	12,502
363115051120020040	6,919	9,235
183216941940011160	6,923	12,981
063216114300000170	6,949	9,888
063216114300000060	6,961	9,888
073216075240090230	7,140	10,934
073216075240090170	7,387	13,678
063216732600000120	7,454	13,809
073216218520020020	7,604	15,377
073216218520170140	7,780	12,807
063216095940010490	7,794	11,064
063216095940010290	7,853	6,795
313116023800000150	8,034	13,678
183216880740070040	8,297	15,725
183216941400020250	8,395	11,979
073216074160000360	8,606	14,157
183216941400020240	8,628	11,979
063216114120030050	9,335	12,632

<b>Parcel ID Number</b>	<b>Impervious Area of Parcel (SF)</b>	<b>Entire Area of Parcel (SF)</b>
313116023800000080	9,784	16,858
063216114120030070	9,988	14,201
063216517510000050	11,508	18,208

### **Results**

Mean	3,813	8,287
Standard Deviation	1,562	2,556
Percent Imperviousness	46.0%	

**Appendix C**  
**Mitigation Tables and Figures**

**Table 1  
Quality Mitigation Curve Development**

Precipitation Inches	Ni	Vi Inches	Sum Ni	NiVi Inches	Sum NiVi Inches	Volume Inches	Volume (%) Quality/Quantity
0.00		0.00					0.0%
0.10	396	0.05	396	19.8	19.8	125.0	18.0%
0.20	284	0.15	680	42.6	62.4	216.0	31.1%
0.30	133	0.25	813	33.3	95.7	286.2	41.2%
0.40	107	0.35	920	37.5	133.1	344.3	49.5%
0.50	93	0.45	1013	41.9	175.0	392.5	56.5%
0.60	70	0.55	1083	38.5	213.5	432.5	62.2%
0.70	46	0.65	1129	29.9	243.4	466.7	67.1%
0.80	43	0.75	1172	32.3	275.6	496.4	71.4%
0.90	36	0.85	1208	30.6	306.2	522.2	75.1%
1.00	36	0.95	1244	34.2	340.4	544.4	78.3%
1.10	35	1.05	1279	36.8	377.2	563.1	81.0%
1.20	23	1.15	1302	26.5	403.6	578.8	83.2%
1.30	18	1.25	1320	22.5	426.1	592.5	85.2%
1.40	13	1.35	1333	17.6	443.7	604.7	87.0%
1.50	17	1.45	1350	24.7	468.3	615.3	88.5%
2.00	47	1.75	1397	82.3	550.6	652.6	93.9%
2.50	22	2.25	1419	49.5	600.1	672.6	96.7%
3.20	11	2.85	1430	31.4	631.4	684.3	98.4%
3.50	8	3.35	1438	26.8	658.2	691.3	99.4%
4.00	4	3.75	1442	15.0	673.2	695.3	100.0%
>4.00	6	11.00	1448	66.0	739.2	695.3	100.0%
	1448						

Precipitation = Precipitation interval from histogram of rainfall volumes

Ni = Number of rainfall events in each precipitation interval

Vi = Volume in each precipitation events

Sum Ni = Summation of precipitation events

NiVi = Volume of inches for all storm events of a particular size

Sum NiVi = Summation of volumes in inches for all storm events of an equal or lesser magnitude

Volume (inches) = Diversion volume for the 15 years of records associated with a particular diversion depth

Volume Percent = Percent of storm event that are equal to or less than the current storm event

**Table 2**  
**Quantity Mitigation Curve Development**

Precipitation (Inches)	Incremental Runoff (in/yr)	Treatment Volume							
		0.5 inches	1 inch	1.5 inches	2 inches	2.5 inches	3 inches	3.5 inches	4 inches
0.0 - 0.5	4.51	0	0	0	0	0	0	0	0
0.5 - 1.0	3.96	3.96	0	0	0	0	0	0	0
1.0 - 1.5	3.17	3.17	3.17	0	0	0	0	0	0
1.5 - 2.0	1.87	1.87	1.87	1.87	0	0	0	0	0
2.0 - 2.5	1.24	1.24	1.24	1.24	1.24	0	0	0	0
2.5 - 3.0	1.29	1.29	1.29	1.29	1.29	1.29	0	0	0
3.0 - 3.5	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0	0
3.5 - 4.0	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0
4.0 - 4.5	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
<b>Total Runoff</b>	<b>17.90</b>	<b>13.38797</b>	<b>9.432804</b>	<b>6.264854</b>	<b>4.394689</b>	<b>3.154235</b>	<b>1.868131</b>	<b>1.165374</b>	<b>0.743787</b>
<b>Percent Reduction *</b>	<b>100%</b>	<b>75%</b>	<b>53%</b>	<b>35%</b>	<b>25%</b>	<b>18%</b>	<b>10%</b>	<b>7%</b>	<b>4%</b>
<b>Mitigation Credit **</b>	<b>0%</b>	<b>25%</b>	<b>47%</b>	<b>65%</b>	<b>75%</b>	<b>82%</b>	<b>90%</b>	<b>93%</b>	<b>96%</b>

17.898 inches is total annual runoff for an ERU with no mitigation

\* Percent Reduction = (Total Runoff / Total with no storage) \* 100  
Example 13.388/17.898 \* 100 = 75%

\*\* Mitigation Credit - (Reduction in quantity retention in excess of 1 inch)/(17.898 inches) \* 100  
Example = (17.898-13.388)/17.898 \* 100 = 25%

mitigatipon credits.xls

### Figure 1 Quality Mitigation Curve

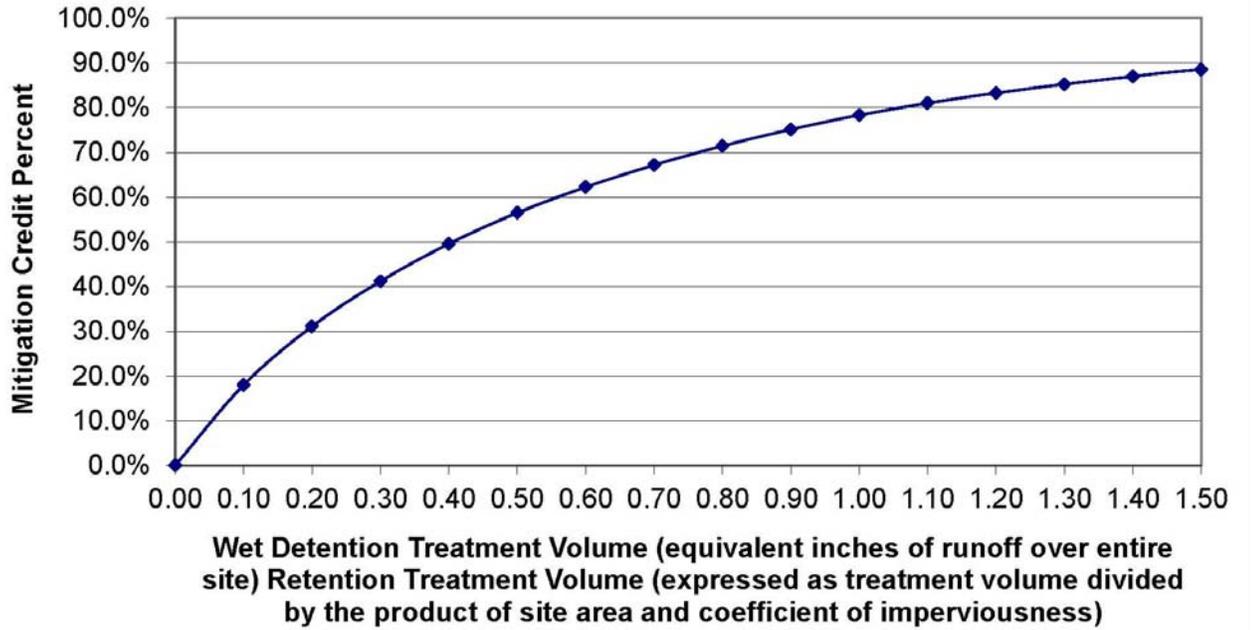
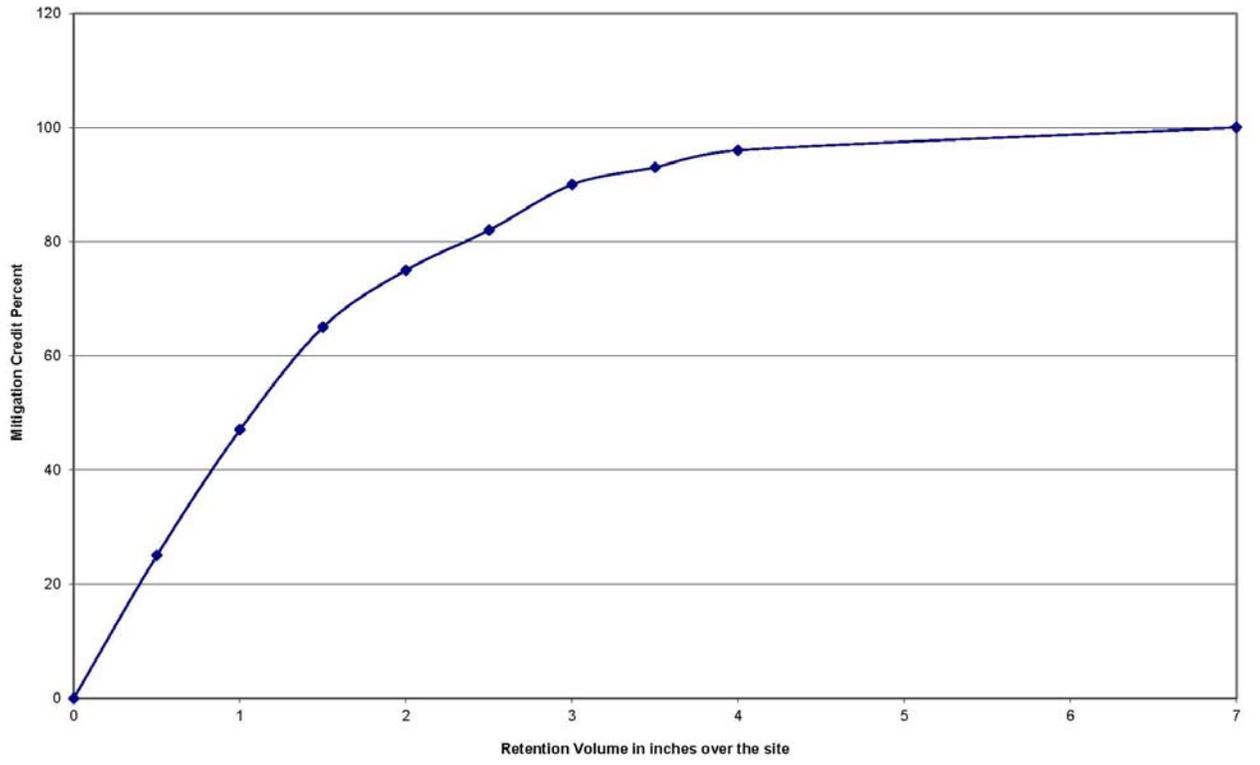


Figure 2 Quantity Mitigation Curve



**Appendix D**  
**Application for Mitigation Credit**

**APPLICATION FOR STORMWATER ASSESSMENT MITIGATION CREDITS**

Property Owner(s): \_\_\_\_\_  
 Last Name \_\_\_\_\_ First Name \_\_\_\_\_

Mailing Address: \_\_\_\_\_  
 Street Number and Name \_\_\_\_\_

\_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP Code \_\_\_\_\_

Tax Map Parcel No.: \_\_\_\_\_

Phone: \_\_\_\_\_

Certifying Registered Engineer or Land Surveyor: \_\_\_\_\_

Professional Registration No.: \_\_\_\_\_

Company: \_\_\_\_\_

Company Phone: \_\_\_\_\_

Check if attached	Required for Submission by Owner
<input type="checkbox"/>	Location Map
<input type="checkbox"/>	Stormwater Facility Information a. Date constructed or anticipated construction date. b. Was design approved by City Staff? c. Certified stormwater report using City mitigation credit methodology. d. Best Management Practice (BMP) inspection certification. e. Receipts, photos, dates of last system maintenance. f. Basin outlet information, including size and type. g. Property area (acres) h. Area of parcel treated by BMP (acres) i. Impervious Area (acres) j. Condition rating facility by owner (e.g., good, fair, or poor).
<input type="checkbox"/>	Type of BMP
<input type="checkbox"/>	Maintenance Plan and Schedule
<input type="checkbox"/>	Right of Entry Agreement for Department Staff
<input type="checkbox"/>	Application Fee (\$25.00 or \$100.00)

**Owner Certification**

I certify that the information contained in the application is, to the best of my knowledge, correct and represents a complete and accurate statement. I further understand that the credit determination will be based on the information provided and a later determination that the information provided was inaccurate may result in loss of the credit.

\_\_\_\_\_  
 Signature of Owner \_\_\_\_\_ Date \_\_\_\_\_

\_\_\_\_\_  
 Signature of PE or PLS, License Number, Seal \_\_\_\_\_ Date \_\_\_\_\_

Mail form and any applicable information to:  
 City of St. Pete Beach, Stormwater Management  
 155 Corey Avenue, St. Pete Beach, FL 33706  
 (727) 363-9243  
 Attn.: Mitigation Credit Review