Section 2
Stormwater Management Requirements

2.1 Coordinating with other agencies

Many agencies may need input on development plans. The following table outlines the type of activity that may require approval or information from other agencies. A permit or application cannot be approved until documentation from those agencies has been received.

Table 2.1-1 Other Agency Contact Information

Activity that may require information from another agency	Permit or approval	Contact
Disturbing an acre or more or disturbing less than one acre but part of a larger common development disturbing one acre or more.	KPDES General Permit	Section Supervisor Inventory and Data Management Section KPDES Branch, Kentucky Division of Water 14 Reilly Road, Frankfort Office Park Frankfort, Kentucky 40601
Improving the throat of a sinkhole or drilling a drywell	Class V Injection Well	EPA Region 4 US EPA Ground Water/Drinking Water Branch 61 Forsyth St. Atlanta, GA 30308-8960 (404)562-9307
Working in a stream or river	404 Permit	U.S. Army Corps of Engineers 3701 Bell Road Nashville, Tennessee 37214 Phone (615) 369-7500 Fax (615) 369-7501
Stream crossings and riparian area development	401/Water quality certification	Water Quality Certification Section 14 Reilly Road Frankfort, KY 40601 Phone: 502-564-3410 Fax: 502-564-0111
Development in a floodplain or flood prone area	LOMR, CLOMR, Elevation Certificate, No-Rise Certification	City-County Planning Commission of Warren County 1141 State Street, Bowling Green, KY 42101 270-842-1953

2.2 Regulations

This section describes the regulations supporting the City's stormwater management program. It establishes the baseline requirements. More information about the policies and procedures in support of these regulations can be found in Section 3 and the appendices.

2.2.1 Waterway Buffers

Areas of new development and redevelopment require a 25- to 50-foot undisturbed no-build buffer zone from top of bank on both sides for the entire length of streams that are identified in the most recent USGS Quadrangle maps within the City of Bowling Green. Buffer zones are vegetated areas, including trees and shrubs which exist or are established to protect a stream system, lake, or reservoir area. These buffers also apply to other sensitive areas such as springs, wetlands and sinkholes as follows:

KYR10 requires buffer zones as described below:

> For discharges to waters categorized as High Quality Waters or Impaired Waters (Non-construction related impairment) permittees are required maintain at a minimum a 25-foot buffer zone between any disturbance and all edges of the receiving water as means of providing adequate protection to receiving waters. For discharges to waters categorized as Impaired Waters (Sediment impaired, but no TMDL), permittees are required to maintain a minimum 50-footwide buffer zone between any disturbance and all edges of the receiving water as means of providing adequate protection to receiving waters. If the buffer zone between any disturbance and the edge of the receiving water on all edges of the water body cannot be maintained, an adequately protective alternate practice may be employed. The SWPPP shall explain any alternate practices and how these practices are adequately protective. Such cases include but are not limited to stream crossings and dredge and fill areas. In these cases the permittee shall minimize disturbances in the buffer zones by using hand held or other low-impact equipment.

2.2.2 Erosion Prevention and Sediment Control Requirements

The City of Bowling Green, KY requires an Erosion Prevention and Sediment Control (EPSC) Plan for most types of construction. When preparing the EPSC Plan, the design engineer and/or developer should determine the best practices to protect the environment from the potential impacts from construction sites by selecting source control and sediment containment practices. Proper site planning and BMP selection are critical to the success of the erosion prevention and sediment control plan. The appendices contain plan submittal forms and checklists for your use.

Site characteristics such as soil types, topography, and on-site or nearby natural resources, and construction methods should be thoroughly reviewed when selecting BMPs to implement throughout the life of the project. The designer should plan for how the site will change throughout the project so that BMPs can be repaired, modified or replaced.

For more information regarding the required elements of an EPSC Plan, refer to Appendix C – EPSC Plans.

EPSC plans must incorporate the following concepts:

Minimize Disturbed Areas - Phasing

Construction planning and sequencing are the least expensive methods to reduce and control erosion and sediment. The following points should be considered to minimize disturbed areas:

- Do not disturb areas of the construction site and keep existing vegetation for as long as possible. Delay disturbing areas of the site until necessary for construction activities.
- Carefully schedule and phase construction. Avoid grading during wet months (December through May).

- Plan and implement permanent structures throughout the earlier phases of the project. This will maximize the BMP's effectiveness.
- Avoid delays and work expeditiously on any part of the site. Install landscaping and stabilize upon the completion of any sequence and prior to moving on to the next phase.

Focus on Erosion Control

- Erosion control is THE most effective practice used on a construction site. Temporary covers (mulch, temporary grains, plastic) are cost effective and should be used on any area of the construction site that has a high potential for discharging sediment off-site.
- Use temporary cover measures (seed or mulch) whenever construction ceases for 14 days.
- Phase site grading to limit the amount and time of an area is exposed. Exposed areas should be stabilized immediately following the completion of grading in that area.
- Any exposed soil is subject to erosion, even by a single rain drop. Designers and contractors should make every effort to stabilize the following highly susceptible areas at a construction site throughout construction:
    - Slopes
    - Highly erosive soils
    - Construction entrances and exits
    - Stream channels
    - Soil stockpiles

Manage Sediment

- Where erosion controls are impractical due to construction activities, sediment controls must be installed. Sediment controls are much less effective and have higher maintenance requirements than erosion control practices.
- The designer should consider sediment controls for the initial clearing and grubbing phase. Typically, these controls are perimeter controls, as follows:

Area of Concern	Site Perimeter Control
Disturbed areas or slopes that drain toward adjacent properties	Continuous berms, silt fences, sandbags
Stabilizing area after grading has been completed	Mulching, seeding, planting, emulsifiers, or a combination of two or more
Off site flows that enter the constructions site	Continuous berms, earth dikes, drainage swales and lined ditches
Concentrated flows that leave the construction site	Outlet control measures that will dissipate velocities
Construction traffic exiting onto a public right of way or other property	Construction exit to reduce mud tracking

Additional controls within the interior of construction site should supplement perimeter controls once rough grading is complete.

Internal Erosion and Drainage Design

Once the perimeter controls have been designed, the issue of internal erosion and drainage controls must be addressed for each phase or stage of construction. Internal practices are required early in the project until permanent practices can be implemented.

Some of the internal erosion and drainage design practices to be used include:

- Check dams, geotextile mats, and under extreme circumstances concrete channel lining.

- Terracing at regular intervals.
- Slope benches or ditches.
- Surface roughening or temporary seeding.
- Temporary sediment traps and basins.

Maintenance and Inspection of Measures

Constant inspection and maintenance of the BMPs is critical for successful prevention of erosion and sediment transport. Maintaining a daily or weekly checklist of practices to inspect for deficiencies is critical. All areas of the active construction site must be inspected at last once every 7 calendar days, and these inspections must be documented in an inspection report. When maintenance needs are identified in an inspection, they must be addressed before the next rain event or as soon as practicable.

A simple way to ensure that all practices are compliant is for the EPSC Certified Contractor to arrange a pre-construction meeting with the City of Bowling Green's Stormwater program. This meeting should take place after the Notice to Proceed, but prior to the mobilization of equipment.

All construction site BMPs require ongoing maintenance. At a minimum, sediment should be removed from the sediment storage area when the storage area is a third full. However, the contractor should demonstrate sound judgment and maintain the structures more frequently if necessary.

An inspection and maintenance strategy should include the following:

- ✓ Verify that sediment-laden stormwater flows to temporary sediment traps, basins or other sediment control devices.
- ✓ Runoff from undisturbed areas should be directed around disturbed areas and not directed into sediment control devices.
- ✓ Protect all existing or newly installed storm drainage structures from sediment clogging by providing inlet protection for area drains and curb inlets. Stormwater inlet protection can utilize sand bags, sediment traps, or other similar devices.
- ✓ Excavate permanent stormwater detention ponds early in the project, use them as sedimentation ponds during construction, remove accumulated sediment, and landscape the ponds when the upstream drainage area is stabilized.
- ✓ Inspect temporary sediment barriers such as silt fences, rock filters, and continuous berms after every rainfall. These barriers should only be used in areas where sheet flow runoff occurs. They are ineffective if the runoff is concentrated into rill or gully flow.
- ✓ Internal outlets must also be protected to reduce scour from high velocity flows leaving pipes or other drainage facilities.
- ✓ Protect sinkholes, drywells, yard inlets and other internal drainage features from sediment with inlet protection.

2.2.3 NPDES Phase II EPSC Requirements

New requirements for small municipalities, NPDES Phase II stormwater requirements, became effective on March 10, 2003. In these requirements, certain municipalities and agencies that are owners or operators of their stormwater systems were required to apply for coverage under the Phase II permitting program enforced by the State. The City of Bowling Green is an NPDES Phase II regulated municipality and has coverage under the NPDES Phase II general stormwater permit, KYG20.

One of the requirements of the Phase II program is to develop a construction site runoff control program for new developments and redevelopments affecting one acre or more. The City's Stormwater Ordinance was developed in an effort to comply with this requirement. It parallels KDOW's stormwater general permit for construction activities, called KYR10, as well as the requirements within KYG20.

2.2.4 Complying with KYR10 Requirements and the City of Bowling Green's Stormwater Requirements

The City's EPSC program mirrors KYR10. Whenever a construction site disturbs 1 acre or more, coverage under KYR10 is required, and the City will not issue a grading permit until a Notice of Coverage for the site in question has been submitted to the City. A summary of KYR10 requirements is in Table 2.2-1.

Table 2.2-1 Summary of Major KYR10 Components

Land disturbing activities affecting 1 acre or more are required to obtain coverage under KYR10. For common plans of development, contiguous construction activities that cumulatively equal one or more acres of disturbance must have coverage. Non-contiguous activities (activities that are separated by 0.25 miles or more) that disturb one or more acres are considered separate activities. An applicant is required to submit a Notice of Intent for Stormwater Construction Activities (NOI-SWCA) for coverage under KYR10 and wait for a Notice of Coverage prior to beginning construction.

The KPDES permit also requires permittees to develop and maintain stormwater pollution prevention plans (SWPPPs) for each permitted site. These plans do not have to be submitted with the NOI-SWCA. However, they must be made available to State and City inspectors during site inspections or as otherwise requested.

EPSC measures must be designed, installed and maintained to effectively minimize discharges up to and including the 2-yr, 24-hr storm event. EPSC maintenance must be completed before the next storm event.

Inspections must be performed by knowledgeable and qualified inspectors, either

At least once every seven (7) calendar days **OR**
At least every fourteen (14) calendar days and within 24 hours after any storm event of 0.5 inch or greater.

The City requires inspections once every 7 calendar days.

All inspections must be documented and inspection reports kept with the SWPPP. Areas where construction has temporarily or permanently ceased must be stabilized within fourteen (14) days of the cessation of construction activities. EPSC measures must be implemented on disturbed critical areas within 24 hrs after completion of grading/disturbance.

A 25-foot buffer zone must be maintained between construction activities and the edge of high quality and impaired streams. For sediment impaired streams, a minimum 50 foot buffer must be maintained.

The following sections provide detailed information regarding The City of Bowling Green's stormwater management program. These sections describe how the City's stormwater program meets the requirements of KYR10 and the City's Municipal Separate Stormwater System (MS4) Phase II permit, KYG20.

2.2.5 EPSC Plan Requirements

Different levels of EPSC plans are required for different types of developments. Simple Plot Plans, for example, that do not include sinkholes or other sensitive features can address EPSC by completing the form found in Appendix C, Standard EPSC Plan for Plot Plan. Larger, more complex sites, such as non-residential buildings and subdivisions, are required to submit detailed EPSC plans.

The level of detail shown on the drawings depends on the size and complexity of the project. For single lots, a sketch may be all that is required to show the inspector. However for larger developments, such as a shopping center or industrial park, a plan sheet (or several) at an appropriate scale shall be submitted to the City for review.

This is a list of required notes that must be added to every EPSC plan, large and small.

- ✓ As a minimum, all erosion prevention and sediment control practices will be constructed and maintained according to the standards located in the City of Bowling Green's BMP Manual, Stormwater Ordinances, and as required by state and federal laws.
- ✓ A copy of the approved Erosion Prevention and Sediment Control Plan shall be maintained at the project site at all times or shall be made available to the City upon request within one working day.
- ✓ Prior to commencing land-disturbing activities in any area not on the approved erosion prevention and sediment control plan, the contractor shall submit a supplementary erosion control plan to the City of Bowling Green for review and approval.
- ✓ All erosion prevention and sediment control measures are to be placed prior to or as the first step in clearing and grading. The contractor is responsible for any additional erosion control measures necessary to prevent erosion and sedimentation.
- ✓ During dewatering operations water must be pumped through an appropriate filtering device. The City of Bowling Green may suspend dewatering operations if pollution is observed.
- ✓ The contractor shall inspect all erosion and sediment control devices at least once a week. The contractor shall perform any repairs or maintenance prior to the next storm event or as soon as practicable in order to ensure effective erosion and sediment control.
- ✓ The contractor shall maintain a record of all inspections and maintenance activities. This record shall be made available to the City of Bowling Green upon request.

2.2.6 Plot plans

Plot plans are required with improvements meeting the following criteria:

a) Permanent structure greater than 750 square feet; and,
b) Increased impervious less than 3400 square feet; and,
c) Critical Slope not exceeded. Average drive slope does not exceed a twelve percent (12%) up slope or five percent (5%) down slope within 10 feet of back of sidewalk; or the average drive slope does not exceed a ten percent (10%) up slope or twelve percent (12%) down slope within 15 feet of back of curb or edge of pavement when no sidewalk is present or required.
d) Site is not in a critical flood area.

Items required to be submitted to the City with the plot plan are included in Appendix C. The required EPSC notes in Section 2.2.5 above also apply to EPSC plans for plot plans. For these sites, a standard EPSC plan form must be completed and submitted as part of the building or paving permit application. However, if features such as sinkholes, drainage inlets, or streams are located within the lot or permit area boundary, additional information may be required. A detailed EPSC plan completed by a design professional may be required that shows how that feature will be protected.

Once the permit has been issued, the completed standard EPSC plan form becomes part of the permit and the permittee is required to comply with the plan.

2.2.7 Grading and Drainage Plans

Grading and drainage plans (GDPs) are required for improvements meeting the following criteria:

a) An increase in impervious area greater than 3400 square feet and site disturbance less than one acre and which is not part of a Stormwater Master Plan (SWMP); or,
b) Construction is greater than 750 square feet and is less than 3400 square feet increase in impervious areas and lot slope exceeds critical slope limit; or,

c) Construction is greater than 750 square feet and is less than a 3400 square feet increase in impervious areas, slope does not exceed limits and site is located in a critical flood area and is part of a master SWMP.
d) Items required to be submitted to the City with the grading and drainage plan are in Appendix C. As part of the GDP submittal, an Erosion Prevention and Sediment Control (EPSC) Plan will also be required: EPSC plans must be signed and stamped by a licensed professional.

1. The EPSC plan shall include the following:

a) A natural resources map identifying
- soil types,
- forest cover,
- topography (1' contours), existing and proposed grades
- receiving stream and other natural features of concern on the property or immediately adjacent to the property
- location of sinkholes and drywells within the property or immediately adjacent to the property

This map should be to scale equivalent to balance of submittal.

b) A construction schedule for the development site, including stripping and clearing, rough grading, construction of utilities, infrastructure, final grading and landscaping. Sequencing shall identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, areas of clearing, installation of temporary EPSC measures and establishment of permanent vegetation.

a) All EPSC measures necessary shall be shown on the plan by location and referred to by a legend for all phases of construction. Depending upon the complexity of the project, the drafting of intermediate plans may be required for the close of winter season. Multiple EPSC plan sheets may be necessary to best convey requirements for each phase. Supporting calculations for the measures must be provided.

b) Seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, and type and quantity of mulching for both temporary and permanent vegetative control measures.

c) Provisions for maintenance of control facilities, including easements and estimates of the cost of maintenance.

2. Modifications to the plan shall be processed and accepted or denied in the same manner as the review and issuance of the original permit application and may be authorized by the City of Bowling Green by written authorization to the permittee, and shall include:

a) Major amendments of the EPSC plan require an engineer's signature and shall be submitted to the City of Bowling Green for acceptance prior to completion.

b) Field modifications of a minor nature shall require an engineer's signature and shall be noted and dated on the EPSC record drawings and available for review and acceptance by the City of Bowling Green within 14 calendar days after changes have been made in the field.

EPSC plans must be reviewed and approved prior to any land disturbing activity on the site.

The plan submittal checklist found in Appendix C contains a detailed list of the items that must be included with a grading and drainage plan AND detailed EPSC plans.

2.3 Inspections by an EPSC Certified Contractor

An EPSC certified contractor shall be responsible for overseeing the implementation and maintenance of all aspects of the plan and performing inspections. Whenever an Erosion Control Plan is required, a certified contractor must be identified in the permit application package. The following information must be submitted with the application:

- ✓ Certified Contractor's name, company name, address, phone number, and certification number.
- ✓ A statement signed by the contractor certifying that he/she will be the person responsible for the installation, inspection and maintenance of EPSC measures at the site and will be the point of contact for the City regarding EPSC questions or concerns for the permitted site.

On projects where numerous grading or site contractors are likely to be working, a representative of the contractor responsible for overseeing the initial grading and installation of initial EPSC practices must be identified as the Certified Contractor when the Stormwater Pollution Prevention Plan is submitted to the City for review and approval. However, prior to obtaining any permits, the applicant must identify any new Certified Contractor for the individual lot **or** certify that the overall Stormwater Pollution Prevention Plan (which includes the EPSC Plan) for the development will be followed and that the Certified Contractor for the overall development will also serve as the Certified Contractor for the individual lot.

Certified Contractors are responsible for the following within the City of Bowling Green's jurisdiction:

1. Understand when an Erosion Prevention and Sediment Control Plan is required by the City and inform developers prior to beginning land-disturbing activities of the requirement for a plan.
2. Install or oversee the installation of erosion prevention practices (EPP), sediment management practices (SMP) and good housekeeping practices (GHP) before land disturbing activities begin.
3. Inspect EPP, SMP and GHP controls every 7 calendar days. Document the findings of the site inspections, inform the developer of the findings, and maintain inspection documentation for the permitted site.
4. Maintain EPP, SMP and GHP controls for the duration of the construction activities. Maintenance of controls must be conducted in accordance with the requirements identified in the City's *Best Management Practices Manual*.
5. Act as the site contact for the City regarding the EPSC plan, relaying information to the permit holder from the City.
6. Inform the City in writing of Certified Contractor substitutions, deletions and/or additions. These forms can be found in Appendix E.

The City of Bowling Green or its designated agent shall make inspections as deemed necessary to ensure the EPSC measures are being properly implemented and maintained during construction. If minimum requirements for the EPSC are not met, the permittee shall be notified and enforcement actions shall be taken.

2.4 Stormwater Management Plan

The City of Bowling Green is a permitted Phase 2 NPDES Municipal Separate Stormwater System (MS4) owner and is required to maintain coverage under the KPDES MS4 General Permit, KYG20. KYG20 requires all new development and redevelopment sites that disturb one acre or more (or less than an acre if part of a larger common plan of development) to develop and implement stormwater quality management plans. KYG20 provides minimal guidance to MS4s for developing stormwater quality treatment control programs. Instead, KDOW and EPA desire municipalities to develop programs that best suit each locale. The following criteria were established as minimum requirements in KYG20, issued in 2010:

- The City must develop a locally derived water-quality treatment standard that requires new development projects to implement controls to manage runoff through water-quality control structures. The standard shall be based, at a minimum, on an analysis of precipitation records to determine the equivalent surface depth of runoff produced from an 80th percentile precipitation event
- The City must develop procedures for the site-plan review and approval process and a required re-approval process when changes to stormwater management measures are required.
- The City must develop procedures for a post-construction process to demonstrate and document that post-construction stormwater measures have been installed per design specifications, which includes enforceable procedures for bringing noncompliant projects into compliance.
- The City must develop a long term maintenance program for new development and redevelopment to ensure structural controls are maintained and functioning perpetually.

KYG20 is primarily focused on stormwater quality. The City's stormwater management program is comprehensive and includes stormwater quantity management as well. The SWQMP encompasses both stormwater quality and quantity management goals. The following sections describe the City of Bowling Green's approach to the stormwater quality and quantity management program.

2.4.1 Stormwater Quality Management Plan Submittal Requirements

A SWQMP is required with improvements that meet the following criteria:

a) Disturb greater than one acre; and,
b) Create 10,000 square feet of impervious area; and,
c) Project is not part of a master SWQMP or the project changes the scope of a previous SWQMP.

2.4.2 Stormwater Quality Program Rationale

In developing the post construction stormwater quality program, the City considered numerous factors related to the environment and the type of development common to Bowling Green. The City's drainage system is dependent on sinkholes and an underground network of streams. It is the City's goal to protect surface and shallow subsurface drainages while minimizing flooding and maintenance needs. To that end, the City's post construction stormwater quality program has been built on the following premises:

1. As of June 2010, none of the streams within the City's jurisdiction had been identified as impaired by the Kentucky Division of Water, and no TMDLs had been developed. As such, no City-specific pollutant of concern had been identified. Therefore, sediment was determined to be the general pollutant of concern, and total suspended solids (TSS) was determined to be the indicator pollutant. Furthermore, TSS load reduction goals are common in many municipalities, and much information about TSS reduction by BMP is readily available.
2. Once the pollutant of concern was determined, the target pollutant load reduction had to be established to fully define stormwater quality treatment to the "maximum extent practicable". Research data and literature found in the comprehensive International BMP Database (http://www.bmpdatabase.org/) was reviewed, and the majority of the BMPs were capable of a TSS removal of 80% of the average annual post-development pollutant load. Therefore, the City determined that the stormwater quality treatment goal of 80% TSS removal of the average annual post-development pollutant load constitutes MEP.
3. TSS loading is directly tied to impervious surfaces; therefore, the City's stormwater quality program treatment goals are also directly tied to impervious surfaces. (Note: Some stormwater pollutants, such as pathogens and nutrients, are not as directly tied to impervious surfaces. Land management practices may be the cause of higher loadings of pathogens and nutrients, such as landscape area management or septic system or wastewater treatment system maintenance.)
4. Low impact development principles are encouraged by several mechanisms, including:

5. The City's Conservation Subdivision design (see Section 2.6.1). This design allows residential subdivisions that meet several low impact development guidance criteria to meet all stormwater quality objectives without installing structural BMPs. Note, however, that these subdivisions may still be required to design systems or structures that mitigate stormwater quantity increases.
6. Multi-purpose BMPs are encouraged. For example, bioretention facilities can serve landscaping and stormwater quality treatment requirements, and stormwater detention facilities can be included in a treatment train to meet both stormwater quantity and quality requirements.

2.4.3 Stormwater Quality Management Statement

All preliminary plats for residential and non-residential subdivisions that disturb more than 1 acre and add 10,000 ft^2 or more of new impervious surfaces must be accompanied by a Stormwater Quality Management Statement (see Appendix F). This statement describes the amount of imperviousness anticipated for the project, including driveways, roadways, rooftops, and sidewalks along roads. The developer must use a worst-case scenario for determining the maximum impervious surface possible at the site based upon the type of housing to be built at the site and the anticipated placement of each house. This initial analysis of the project allows City staff, the designer and the developer to have a better idea of the stormwater quality treatment criteria early in the development process.

2.4.4 As-Built Certifications and Inspections

In an effort to ensure that water quality management plans approved by the City are installed and maintained per the approved plans, the City requires certifications of the correct initial installation of BMPs, referred to as as-built certifications, as well as an annual certification of ongoing maintenance and operation of each BMP. This section describes the as-built certification requirements.

Prior to obtaining a Certificate of Occupancy, two (2) complete copies of as-built drawings with the appropriate professional certifications must be provided to Bowling Green for approval. The as-built drawings will be compared to the approved stormwater management plan for any irregularities or non-conformance with the approved plans. The as-built drawings must reflect the "as-constructed" condition of the development, and must include sufficient information to demonstrate conformance with the approved stormwater management plan. The City has the authority to request the submittal of additional information with the as-built plan as necessary to allow a thorough review of the as-constructed conditions. Omission of any required items shall render the plans incomplete, and they will be returned to the applicant, or their engineer, so that they may be completed. As-built certification checklists are provided in Appendix F and must be completed and submitted with the as-built certification.

As-Built Certifications must include sufficient design information to show that stormwater BMPs will operate as approved. This must include the existing (or before site development) peak flow discharges, the after site development peak flow discharges, and/or volumes of stormwater runoff based on the proposed site development, as well as all necessary computations used to determine the reduced peak flow rates for the design storms.

Plats, easements and BMP locations shown in the Operations and Maintenance Plan must be field checked by the property owner or developer prior to submitting the as-built certification to ensure that the field locations are approximately correct. A copy of the recorded Operations and Maintenance Plan must be submitted with the as-built certification to be released from the bond. Information required in the Operations and Maintenance Plan can be found in Appendix H.

2.4.5 Bonds for Stormwater Management BMPs

The purpose of a bond is to ensure that the person(s) responsible for completing the land disturbing activities and/or construction work consistent with the design plans of the City's or County's standards. The bond provides assurance that the City will be reimbursed if it must assume the costs of corrective measures and/or work not completed by the responsible person(s) according to the required specifications and approved plans.

Prior to the release of a bond, an As-Built Certification (see Appendix F) must be provided to the City, showing that all drainage structures or facilities, facility volumes, sizes, slopes, locations, elevations, and hydraulic structures related to the stormwater management BMPs have been field verified, represent the as-built field conditions, and comply with the approved stormwater quality management plan(s). Features such as roadway lines, grades, cross slopes, locations, contours, and elevations should be provided to verify approved plans as required by Bowling Green.

The following table provides guidance on determining the bond amount for each type of BMP. Note that these costs are for the initial installation only and do not take into consideration reinstallation due to failure (of filtering components, for example) or maintenance costs. A 25% surcharge has been included to cover the City's mobilization and project management, should the bond be forfeited and the City becomes responsible for installing the BMP(s).

Table 2.4-1. Bond Calculation for Water Quality BMPs

BMP Type	Cost Calculation	Notes
Bioretention facility	Bond = $(7.3WQv^{0.99})1.25$	WQv = ft^3
Wetland	Bond = $(30.6WQv^{0.71})1.25$	WQv= ft^3
Water Quality Swale (Wet or Dry)	Bond = 1.25(0.25 - 0.50)SA	SA = ft^2
Dry Detention	Bond = $(12.4WQv^{0.76})1.25$	WQv= ft^3
Wet Detention	Bond = $(24.5WQv^{0.71})1.25$	WQv = ft^3
Surface Sand Filter	Bond = $1.25(5000 - 10{,}000)A_{imp}$	A_{imp} = acre of impervious area treated
Underground Sand Filter	Bond = $1.25(10{,}000 - 14{,}000)A_{imp}$	A_{imp} = acre of impervious area treated
Oil/Water Separator	Bond = $1.25\ (7500A_{imp})$	A_{imp} = acre of impervious area treated
Other Proprietary BMP	Bond = 1.25 (cost provided by manufacturer)	Engineer or developer must provide the product specific cost from the manufacturer or distributor
Infiltration Trench	Bond = $(173WQv^{0.63})1.25$	WQv = ft^3
Infiltration Basin	Bond = $(16.9WQv^{0.69})1.25$	WQv = ft^3

In the table above, the bond for most BMPs is calculated based upon the treatment provided. WQv is the calculated treatment volume for each BMP (see section 2.6.2 for more on calculating WQv). For filters, the impervious area treated by the BMP in feet squared is used to calculate the bond. For manufactured BMPs, the engineer or developer should submit the actual BMP costs and then 25% is added to that cost to figure the bond. For water quality swales, the calculation is the same, whether it is a wet swale or dry. In the cost equation for water quality swales, SA (surface area) represents the treatment area assuming a 6" WQv treatment depth.

2.4.6 Operation and Maintenance Plan

All new developments with privately owned and operated stormwater BMPs must have an Operation and Maintenance (O&M) Plan recorded with the property. The Plan must contain enough information to locate the BMPs and perform inspections to

document the functionality of the BMP perpetually. This information must then be recorded with the Register of Deeds' office and track with the property so future property owners will be made aware of the locations of the BMPs and the requirement to perform inspections. The City will record the O&M plan after collecting the recording fee.

A draft final O&M Plan must be submitted with the construction plans for review. Once the plans are finalized and approved by the City and the BMPs constructed, an as-built certification must be completed. The O&M Plan must be recorded and submitted with the as-built certification.

The O&M Plan for a site with privately maintained BMPs contains the following elements:

1. An Inspection and Maintenance Agreement signed by the developer or BMP owner. This agreement states that the owner is responsible for maintaining the BMP perpetually and performing inspections.
2. A BMP location map clearly indicating the locations of all stormwater BMPs, drainage easements, access easements, roadways, and stormwater system components as they relate to the stormwater BMPs.
3. Schematics for each BMP. The schematics should be detailed enough to allow for future inspections of the BMP(s) and stormwater system. If more than one BMP is on the project site, schematics of each BMP must be provided.
4. Inspection and maintenance templates for each type of BMP. For manufactured BMPs, the template must have maintenance items filled out in the template prior to submission to the City.
5. Annual BMP report template. The form must be used by the BMP owner for the annual inspection of the BMP(s).

Templates and examples of these components can be found in Appendix H. All components must be included in the O&M Plan that is recorded with the Register of Deeds' office.

The City's NPDES Phase II permit (KYG20) requires the City to ensure that permanent water quality BMPs are maintained perpetually. Maintenance responsibilities are outlined below:

Table 2.4-2 BMP Maintenance Responsibilities

Water Quality BMP Maintenance Matrix	Owner Responsibilities	City Responsibilities
Residential developments	Mowing, trash and debris removal	Major maintenance and repair; routine inspections
Non-residential	All maintenance, routine inspections	Inspections based upon prioritization
City owned BMPs	All maintenance and inspections	All maintenance and inspections

2.4.7 Stormwater Quantity Management Goals

The City of Bowling Green has adopted the stormwater quantity management requirements found in Warren County Government's Subdivision Regulations (Appendix B). Specifically, the following requirements apply:

- Detention areas shall be sized based on 2.95 inches of precipitation. The maximum discharge shall not exceed the pre-development discharge. Discharge to areas of known flooding hazard shall be subject to approval by the City Engineer.

- Retention basins shall be designed for the 3-hour 100-year storm. Computed high water elevation shall be recorded on the subdivision map. In areas where a proposed basin is connected with an existing basin, the recorded high water elevation shall be maintained.

- Sinkholes and dry wells shall be assumed as having no outflow for purposes of computation.

2.5 SWPPP vs. EPSC Plan vs. Stormwater Management Plan

These terms can be confusing, but they reference components of the overall erosion prevention and sediment control, good housekeeping, and stormwater management plans. While stormwater management plans typically contain permanent treatment practices (PTPs) instead of temporary practices, the initial plan submittal must address permanent stormwater management including water quality. A general description of each type of plan follows:

Stormwater Pollution Prevention Plan. A Stormwater Pollution Prevention Plan (SWPPP) is a living document that is first submitted for approval to the City and to the KDOW. It should then be updated as development continues. It includes site map(s), an identification of construction/contractor activities that could cause pollutant discharges into stormwater and a description of measures or practices to control these pollutants. The SWPPP is required by KYR10. It includes the EPSC Plan and Stormwater Management Plan. Once the development plan has been approved, a copy of the SWPPP must be maintained onsite and should include copies of all permits issued for the site. Inspection documentation and plan revisions must also be documented in the SWPPP once site development has begun.

EPSC Plan. Once the erosion prevention and sediment control (EPSC) plan has been approved, it becomes a component of the SWPPP. The EPSC Plan is a set of plans prepared by or under the direction of a licensed professional engineer detailing the specific measures and sequencing to be used to control sediment and erosion on a development site during and after construction. It includes supporting calculations, a construction schedule, and schematics and cross-sections for clarification, as well as any other material in support of the EPSC plan. As the project progresses, revisions and modifications should be tracked in the SWPPP, with major modifications requiring prior approval by the City before implementation.

Stormwater Quality Management Plan. The stormwater quality management plan (SWQMP) contains permanent water quality treatment devices, such as detention structures, outlet protection, stormwater conveyance devices, and bioretention areas. Once approved, the SWQMP becomes a component of the SWPPP. Most of these components will not be installed during initial construction activities. However, knowing the proposed locations during early construction activities can be beneficial so areas can be appropriately staged. For example, permanent detention structures can first function as sediment basins. Once permanent controls have been installed, they should be protected from sediment laden runoff, as many permanent water quality treatment devices rely on infiltration for treatment and can easily be overwhelmed.

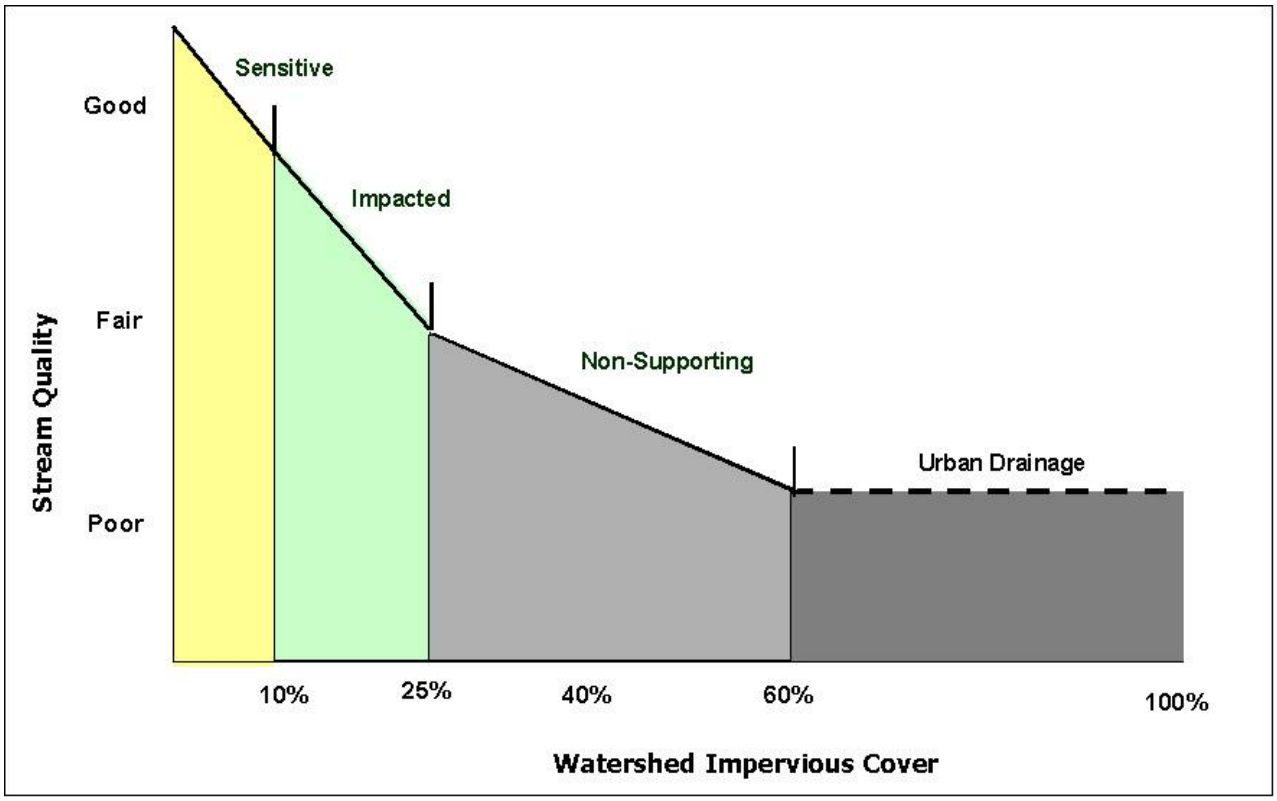
2.6 Stormwater Quality Treatment

The City has established a two-tiered approach to stormwater quality treatment, based upon land use. Some residential developments can meet their stormwater quality treatment requirements by developing in accordance with the requirements of the Conservation Subdivision Design principles, as described in Section 2.6.1. All other types of development must provide treatment of the water quality volume, as described in Section 2.6.2.

2.6.1 Conservation Subdivision Design

The City has established its stormwater quality management program based upon total suspended solids, which can be directly correlated to the amount of impervious surfaces within a watershed. As described in the Center for Watershed Protection's article, "Importance of Imperviousness" (2000), as the impervious cover increases in a watershed, stream quality begins to degrade. When the total watershed impervious cover approaches 10%, streams begin to lose sensitive stream features.

Figure 2.6-1 Impervious Cover Model



(Figure from Center for Watershed Protection)

The City has developed a Conservation Subdivision design that focuses on preserving surface and subsurface stream water quality. When a residential subdivision meets **all** of the requirements of the Conservation Subdivision, no further stormwater quality treatment will be necessary. The Conservation Subdivision must incorporate the following design principles:

- Clearly defined disturbed area limits on the design plans and in the field, limiting the disturbed area on the total project to the smallest areas possible and preserving natural vegetation. Failure to follow these disturbed area limitations could forfeit a residential development's designation as Conservation Subdivision and require structural stormwater quality treatment best management practices to be designed and installed.
- The total impervious cover on the development cannot exceed 15%. Impervious surfaces include rooftops, roadways, gravel (parking lots or driveways), paved driveways, and sidewalks.
- Lot sizes must be a minimum of 1 acre each.
- Roof drains must be disconnected from the storm drain system. Instead, roof drains should be discharged as sheet flow onto vegetated surfaces.
- Sinkhole basins must be protected and stabilized. If a sinkhole throat must be improved or maintained to facilitate drainage, all disturbed areas within the sinkhole basin must be stabilized with vegetation. During the disturbance, the sinkhole throat must be protected from sediment, as described in the BMP Manual.

2.6.2 Structural Stormwater Quality Treatment Design

Stormwater quality treatment for Bowling Green is defined as a goal of 80% total suspended solids (TSS) removal of the average annual post-development load. All stormwater BMPs shall be designed in a manner to minimize the need for maintenance and reduce the chances of failure, while maintaining the required function. The City's stormwater quality program requires new development and redevelopment to treat the runoff from up to the 85th percentile rain event in Bowling Green to a load reduction goal of 80% of the average annual post-development total suspended solids (TSS) based upon data in the Nationwide Urban

Runoff Program. Treatment may be achieved using a single treatment method, such as a wet pond, or by using a treatment train. A treatment train achieves 80% removal of TSS using a combination of pretreatment and/or treatment methods.

It is presumed that a stormwater management system complies with this performance standard if:

- It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the runoff volume resulting from the first 1.1 inches of rainfall from a site (see Equation 1).
- Appropriate structural stormwater controls are selected, designed, constructed, and maintained according to the specific criteria in this Manual to provide an 80% TSS removal of the average annual post-development load.
- Runoff from hotspot land uses and activities is adequately treated and addressed through the use of appropriate pre-treatment stormwater controls and pollution prevention practices.

Permanent BMPs should be proposed by the developer early in the planning stage of a project. For most projects, there will be no single BMP which addresses all the long-term stormwater quality problems. Instead, a multi-level strategy will be worked out with P&Z, which incorporates source controls, a series of on-site treatment controls, and community-wide treatment controls.

The Water Quality Volume (WQv) equation, which forms the foundation of the City's stormwater quality management program, establishes the volume that must be treated. The WQv is storage required to capture and treat stormwater runoff from 85% of the average annual rainfall, which is considered the "first flush". The 85th percentile storm event in Bowling Green is 1.1 inches. All storms greater than 1.1 inches must be routed non-erosively through the water quality treatment device or routed around it. The following equation shows that this value is equal to the product of precipitation, volumetric runoff coefficient and site area, divided by twelve.

Equation 1 Water Quality Volume Calculation

$$WQv = \left[P\,Rv\right)\left(A\right)\left]/12\right.$$

Where,

P is the average rainfall in inches, (in the case of Bowling Green, is 1.1 inches);
Rv is the volumetric runoff coefficient, which is:
Rv = 0.05 + 0.009(*I*), where I is the percent impervious cover; and
A = the area in acres

In the equation above, I is based upon the percent impervious cover proposed for the area to be disturbed, and A is the total area to be disturbed.

As noted, the pollutant of concern for the City is total suspended solids, or TSS. TSS loading is associated with impervious surfaces, such as parking lots, roof tops, and roadways. Therefore, when designing water quality treatment BMPs, only impervious surfaces need to be routed through the BMP for water quality treatment. Drainage areas containing *only* pervious surfaces can bypass BMPs designed solely for water quality treatment.

2.6.3 Choosing the Right Permanent Treatment Practice (PTP)

Table 2.6-1 is an "at-a-glance" table of all of the Permanent Treatment Practices found in Section 3. Use Table 2.6-1 for initial screening of potential measures based upon site constraints such as drainage area, landuse, pollutant removal needed, long term maintenance requirements, and surface area available. Once potential measures have been identified for a site, the design sheets in Section 3 outline detailed design criteria.

Table 2.6-1 At-A-Glance Permanent Treatment Practices Decision Matrix

Structural BMP Category	BMP Type	Stormwater Treatment		Water Quality Performance		Drainage Area (ac)	Implementation Considerations			
		Water Quality	Water Quantity	TSS/Sediment Removal Rate	Hotspot Application		Residential	Commercial / Industrial	Unit Cost	Maintenance Burden
Fitration Systems	Surface Sand Filter	✓		80	✓	≤10		✓	Moderate	Moderate to High
	Underground Sand Filter	✓			✓	≤5		✓		
	Perimeter Sand Filter	✓			✓	≤2		✓		
	Organic Sand Filter	✓				≤5		✓		
	Pocket Sand Filter	✓			✓	≤5		✓		
	Bioretention	✓				≤5	✓	✓		Low
Open Channel System	Dry Swale	✓		90		≤5	✓	✓	Moderate	Low
	Wet Swale	✓		75		≤5		✓		
Stormwater Ponds	Micropool Extended Detention Pond	✓	✓	80		≥10	✓	✓	Low	Low
	Wet Pond	✓	✓			≥25	✓	✓		
	Wet Extended Detention Pond	✓	✓			≥25	✓	✓		
	Multiple Pond System	✓	✓			≥25	✓	✓		
	Pocket Pond	✓	✓			≥25	✓	✓		
Stormwater Wetlands	Shallow Wetland	✓		75		≥25	✓	✓	Moderate	Moderate to High
	Extended Detention Shallow Wetland	✓				≥25	✓	✓		
	Pond/Wetland System	✓				≥25	✓	✓		
	Pocket Wetland	✓				5-10	✓	✓		
Infiltration Systems[1]	Infiltration Trench	✓		90		≤5	✓	✓	Moderate to High	Moderate
	Infiltration Basin	✓						✓		
Water Quality Units	Hydrodynamic Separators	✓		TBD[2]	✓	Minimal		✓	Moderate	Moderate to High
	Filtration	✓			✓			✓		
	Continuous Deflection	✓			✓			✓		
Grease Management					✓			✓	Low	High
Extended Detention/Retention Dry Basins	Detention Basin with Gravity Outfall	✓	✓	60		≤75	✓	✓	Low	Low
	Retention Basin with Drywell Outfall	✓	✓				✓	✓		
Oil & Grease/Water Separator				40	✓			✓	Low	Moderate

Notes: 1) Limited application due to karst topography; 2) To be determined based upon City-approved testing

2.6.4 Weighted total suspended solids reduction

The City's stormwater quality management program is designed to give the developer flexibility in meeting the 80% TSS reduction goal on each site. The BMPs identified in Section 3 of this manual as Permanent Treatment Practices (PTPs) give the developer options to meet the water quality requirements in numerous ways. Calculations to verify the TSS reduction for each site are provided below.

The percent TSS removal (%TSS) that is achieved on a site can be calculated using the equation below. This equation is an area-weighted TSS reduction equation which accounts for the TSS reduction that is contributed from each stormwater treatment BMP that is utilized on the site.

Equation 2 Weighted TSS Reduction

$$\%TSS = \frac{\sum_n^1 (TSS_1 A_1 + TSS_2 A_2 + ... + TSS_n A_n)}{\sum_n^1 (A_1 + A_2 + ... + A_n)}$$

where:

TSS_n = TSS removal percentage for each structural BMP located on-site (%);
A_n = the area draining to each BMP (acres).

An example calculation of weighted TSS reduction on a project is provided below.

Example 1: Weighted TSS reduction example: Wetland and Dry Detention

A 20 acre site is divided into 2 subwatersheds: Subwatershed 1 has 12 acres and contains a constructed wetland for stormwater quality treatment. Subwatershed 2 has 8 acres and contains a dry detention facility. What is the %TSS reduction?

TSS reductions from Table 2.6-1:
Wetland = 75%
Dry detention = 60%

Step 1: Calculate % TSS removal for the site:

$\%TSS = ((TSS_{dry} \times 8 \text{ acres}) + (\%TSS_{wetland} \times 12 \text{ acres})) \div 20 \text{ acres}$

$\%TSS = ((60\% \times 8 \text{ acres}) + (75\% \times 12 \text{ acres})) \div 20 \text{ acres} = 69\%$

Therefore, the % TSS removal for the site is 69%. Additional BMPs must be constructed at the site to bring the TSS removal to 80%.

When two or more BMPs are used in series (stormwater discharges from one BMP into another), a different calculation is necessary. This scenario is called a **treatment train**. Stormwater discharging from the upper most BMP will be considerably "cleaner" than the influent, meaning TSS particle sizes will be much smaller. Pollutant removal rates for BMPs used in a treatment train are not additive. For pollutants in particulate form, such as TSS, the actual removal rate (expressed in terms of percentage of pollution removed) varies directly with the pollution concentration and sediment size distribution of runoff entering a facility. For example, a stormwater treatment pond will have a much higher pollutant removal percentage for very turbid runoff

than for relatively clear water. When two stormwater ponds are placed in series, the downstream pond will treat an incoming TSS load that is very different from the upstream pond. The upstream pond easily captures the larger solids, and discharges an outflow that has a lower concentration of TSS, but with a relatively higher proportion of fine particle sizes. Therefore, further TSS reduction will be difficult for the second and subsequent BMPs. Hence, the TSS removal capability of the downstream pond is considerably less than the upstream pond. Recent studies suggest that the downstream pond in a series can provide as little as half the removal efficiency of the upstream pond.

Note that manufactured treatment devices such as oil water separators and hydrodynamic units must be a first treatment BMP when used in a treatment train design. These units are most effective at capturing gross solids.

To calculate the total % TSS removal for a treatment train comprised of two or more structural BMPs, the following equation should be used.

Equation 3 Treatment Train Calculation

$$TSS_{train} = A + B - \frac{(A \times B)}{100}$$

where:

TSS_{train} = total TSS removal for treatment train (%);
A = % TSS removal of the first (upstream) BMP, from Table 2.6-1 (%)
B = % TSS removal of the second (downstream) BMP, from Table 2.6-1 (%).

For development sites where the treatment train provides the only stormwater treatment on the site, TSS_{train} must be greater than or equal to 80%. For development sites that have other structural BMPs for stormwater treatment that are not included in the treatment train, TSS_{train} must be included in Equation 2 in the calculation of the overall % TSS removal for the site. An example application of the latter situation is presented below.

Example 2: Treatment Train Example: Wetland, Dry Pond, Bioretention
A 20 acre site is divided into 2 subwatersheds: Subwatershed 1 has 12 acres and contains a constructed wetland for stormwater quality treatment. Subwatershed 2 has 8 acres and contains a bioretention area that discharges into a dry detention facility. What is the %TSS reduction?

TSS reductions per Table 2.6-1:
Control A (wetland) = 75%
Control B (bioretention) = 80%
Control C (dry detention) = 60%
Controls B and C are part of a treatment train.

Step 1: Calculate TSS_{train}:
TSS_{train} = B + C – (B x C)/100 = 80 + 60 - (80 X 60)/100 = 92% removal

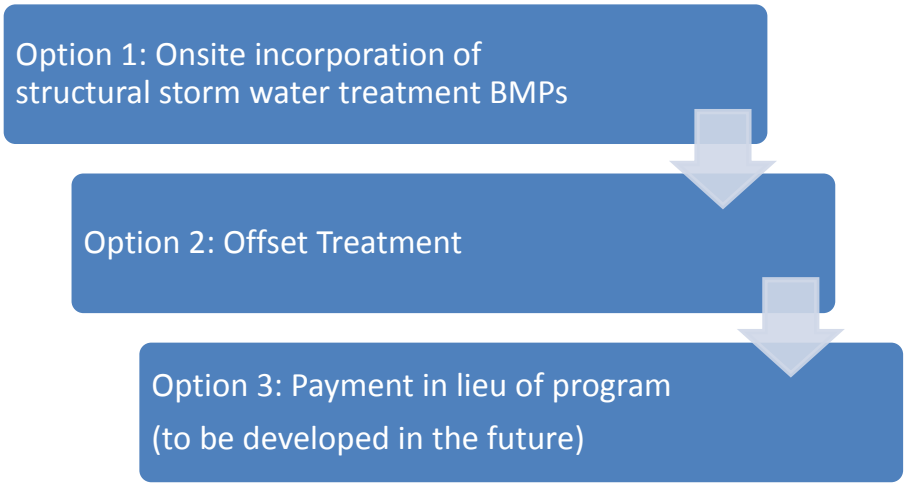
Step 2: Calculate % TSS removal for the site:
%TSS = ((TSS_{train} x 8 acres) + (%$TSS_{wetland}$ x 12 acres)) ÷ 20 acres
%TSS = ((92% x 8 acres) + (75% x 12 acres)) ÷ 20 acres = 82%

Therefore, the % TSS removal for the site is 82%. No other BMPs need to be constructed at the site.

2.6.5 Redevelopment stormwater quality treatment strategies.

Redevelopment projects in highly urbanized, built-out environments are desirable and encouraged forms of development, in that redevelopment projects typically do not need new infrastructure such as roadways to be constructed, reduce urban sprawl, and keep the overall imperviousness of a watershed the same. For the purposes of the Stormwater Quality Treatment Program, "redevelopment" is defined as any new construction on a site that has a pre-existing use on it. The preferred stormwater quality treatment strategies are outlined in Figure 2.6-1 below, in a prioritized order.

Figure 2.6-2 Stormwater Quality Treatment Strategy Steps



These strategies are described below.

Option 1: Onsite incorporation of structural stormwater treatment BMPs.

Structural stormwater quality treatment BMPs (PTPs) include bioretention, wet ponds, dry/wet swales and other practices as outlined in Section 3. These types of practices typically require some amount of surface land area for treatment, unless the system is a manufactured underground system. The WQv calculation in section 2.6.2 shall apply. Where a site has significant constraints such as limited surface area, setbacks, etc., option 2 or 3 (when developed) may be chosen for treating water quality.

Option 2: Offset treatment.

In the 2010 KYG20 Phase 2 MS4 Permit, KDOW included an allowance for developers to provide offset treatment where onsite treatment isn't feasible. The language from the permit is as follows:

> *The off-site mitigation option entails infiltration/evapotranspiration/reuse measures that may be implemented at another location in the same sewershed/watershed as the original project, approved by the permittee(s). The permittee shall identify priority areas within the sewershed or watershed in which mitigation projects can be completed.*

The City of Bowling Green acknowledges the benefits of and need for pollutant trading credits, mitigation and/or offsets. Pollutant trading or offset isn't a new concept, as it has been applied to point source dischargers, specifically wastewater treatment facilities, for many years. Typically, trading or offsets occur within watersheds where a TMDL has been approved. However, the same approach for pollutant trading applied to TMDL watersheds can be applied to non-TMDL watersheds. The following section outlines the City's policy on pollutant offsets for new development or redevelopment. This policy is consistent with EPA's policy on water quality trading.

Redevelopment typically occurs in highly urbanized areas, where surface area for treatment of the WQ_v is typically minimal or non-existent. In such areas where the developer can demonstrate the site limitations cause the first option to be impractical or infeasible, the City Engineer has the ability to approve on a case-by-case basis pollutant treatment offsets. Pollutant treatment offset is defined as providing water quality (WQ_v) treatment adjacent to the existing redevelopment site such that, from a water quality perspective, there is no net gain of new impervious surfaces or TSS discharges. Note that the preference for water quality treatment is onsite treatment. The following factors will be considered when reviewing applications including pollutant treatment offsets:

1. The engineer and/or developer must provide an alternatives analysis that demonstrates the site constraints that make the onsite treatment of water quality impractical or infeasible. While the economic feasibility of onsite treatment versus offsite treatment can be considered, it cannot be the only constraint identified for treatment onsite.
2. The preferred pollutant treatment offset is to provide treatment of an equivalent amount of impervious surface on land contiguous to **and** within the same subwatershed of the redevelopment project. Subwatersheds have been identified by the City of Bowling Green.
3. Pollutant treatment offsets must occur within the same subwatershed as the location of the redevelopment site.
4. The pollutant treatment offset BMP must be located within a drainage easement, with access from a public right-of-way. An Operation and Maintenance Plan (O&M Plan) must be submitted to and approved by the City. In addition, the O&M Plan must be recorded with the deed for the offset treatment BMP. The City will not assume ownership of the offset BMP. All other components of the Post Construction Stormwater Quality Program Standard Operating Policies and Procedures (December 2007), the City's Stormwater Ordinance and BMP Manual shall be followed.
5. For pollutant treatment offsets providing treatment of impervious surfaces located contiguous to the development site and within the same subwatershed, the offset WQ_v treatment shall be 1:1.
6. Pollutant offset treatment is NOT allowable for new subdivisions of land, residential or non-residential.
7. Pollutant offset treatment it NOT allowable when areas on the development site are available, either above ground or below ground, to provide full treatment of the required WQ_v.

2.6.6 Hot Spot Landuse Treatment Requirements

In addition to the treatment standards noted above, the City requires post construction stormwater management BMPs for "hot spot" locations. "Hot spot" landuses include the following:

Table 2- 1 Hot Spot Landuse Treatment Recommendations

Landuse	Additional Treatment Type
Automotive fueling and/or repair facilities	Oil water separator
Restaurants with outside grease collection and disposal areas	Oil water separator, water quality unit
Other landuses as determined to have a high potential of pollutant discharge into the MS4 as determined by the City Engineer	As approved by City Engineer

Hot spot BMPs shall be designed to remove targeted pollutants based on land use and typical pollutant for the land use. This hot spot landuse treatment requirement is in addition to the 80% TSS reduction goal established for all new development. For example, automotive fueling facilities are likely to have higher than normal loads of petroleum products, and the appropriate hot spot treatment device would likely be an oil/water separator in additional to other PTPs installed to meet the 80% TSS treatment

goal. Most hot spot landuse treatment BMPs are pre-treatment devices, designed to remove gross solids, floatables and oils and grease. A 50% TSS reduction can be assigned to pre-treatment devices and included in the site's overall treatment train.

2.6.7 Pre-Application Meeting

Developers desiring to subdivide property should contact P&Z and make an appointment for a pre-application conference. Note that a pre-application conference is not required, however, it is strongly recommended. A Sketch Plan showing the location of the property, surrounding area, and the proposed development activities should be submitted in advance of the meeting. This submittal is not a formal plan submittal. The purpose of the pre-application conference is to discuss compliance with the Comprehensive Plan, Zoning Ordinance, the Subdivision Regulations and stormwater management requirements. Specifically, PW staff can work with a developer or engineer early in the plan development process to identify constraints and limitations of each development. PW staff can provide general recommendations on stormwater quality and quantity management for the development, as well as discuss the necessary approvals and permits required for the development as proposed. This meeting is intended to identify immediate or potential problems and avoid time-consuming and expensive rework.

2.7 Approval and Design of Proprietary Stormwater Treatment Devices

The standard PTPs included in Chapter 3 of this manual are non-proprietary BMPs and can be designed to meet the water quality treatment design. The City of Bowling Green allows the use of other types of PTPs, though the approval and review process is more rigorous. Many proprietary treatment devices are designed based upon a peak flow rate as opposed to a volume of treatment. Non-proprietary treatment devices, such as detention ponds, bioretention, and wetlands, are designed based upon a treatment volume (for stormwater quality treatment) and peak flow (for flow attention). Therefore, a slightly different design approach is necessary for proprietary treatment devices. In addition, pollutant reduction rates are significantly impacted by the design flow rate.

2.7.1 Approval of manufactured treatment devices

All treatment devices designed for stormwater quality or quantity treatment in the City of Bowling Green must be approved by Stormwater staff prior to installing them. Many manufactured stormwater treatment devices are available to treat stormwater runoff. However, some of these BMPs do not have established pollutant removal data based on standardized testing methods. The City of Bowling Green considers proprietary BMPs as **Limited Application BMPs** because of a lack of historic pollutant removal data or because of high maintenance requirements.

The City of Bowling Green accepts treatment devices that have been reviewed and approved for use by the Metropolitan Nashville and Davidson County Metro Water Services for manufactured treatment devices (see http://www.nashville.gov/stormwater/ for the most current listing of approved treatment devices). Therefore, if a treatment device is approved for full treatment in Metro, Bowling Green will also accept the same treatment device based upon the data accepted by Metro, including the treatment limitations.

Proprietary devices must be approved before they can be considered for use in the City of Bowling Green. Should a manufacturer desire to test a BMP for acceptance by Bowling Green, the manufacturer must contact Bowling Green's Stormwater staff for information on the testing and application process. Manufacturers' claims for BMP performance must be verified through data that is obtained in independent third party testing.

The City of Bowling Green recognizes two levels of treatments:

1. Pretreatment. Pretreatment devices do not meet the full 80% TSS reduction goal; however, they can be used in a treatment train approach with other BMPs to fully meet the treatment goal. In addition, pretreatment BMPs are required for hot spot landuse applications, as described in Section 2.6.6.
2. Full Treatment. Manufactured treatment devices that show through testing that they meet the full 80% TSS reduction goal are considered full treatment devices if approved as such through Metro Nashville. If the manufactured treatment device is a flow-based device, the peak flow rate for the TSS reduction must be provided and cannot be exceeded in the design.

2.7.2 Design of Manufactured Treatment Devices

As noted above, most manufactured treatment devices are flow based devices. Applying the WQv equation (see Equation 1) is therefore not possible. The City developed the following design tools for use in sizing manufactured treatment devices. This design methodology is considered to provide an equivalent treatment as the treatment provided with the WQv methodology.

Most proprietary BMPs are flow based BMPs and rated for TSS removal based upon a specified flow rate. The WQv equation, which forms the foundation of Bowling Green's stormwater quality program, establishes a volume that must be treated. In an effort to simulate the WQv approach for proprietary BMPs, the following peak flow design equation must be used to develop the stormwater quality treatment required.

Equation 4 Manufactured Device Stormwater Quality Design

$$Qp = C * I * A$$

Where:
Qp = the peak flow through the proprietary BMP in cfs
C = runoff coefficient
I = rainfall intensity, 2.45 in/hr
A = the contributing drainage area for the BMP, in acres

2.8 Utility Work

In December of 2004, the City of Bowling Green adopted a stormwater ordinance (21-2 of the City's Code of Ordinances) that included a requirement to develop and implement a utility general permit. The ordinance includes the following requirement and definition:

> 21-2.03.b.5: Utility General Permit. Utility companies shall apply for a general permit from the City for land disturbance operations. This permit shall be renewable every three (3) years.
>
> 21-2.01 Definitions: "Utility General Permit" shall mean the agreement between the MS4 Municipality and the local municipal separate storm sewer system utilities stating that Phase II regulations shall be applied and implemented.

The utility general permit applies to any land-disturbing activities conducted by utility companies that do not require building permits. Such activities include but are not limited to water and sewer line construction, installation, or repair; gas line construction, installation, or repair; power, cable television, internet, or phone line construction, installation, or repair; or other linear utility construction, installation or repair activities within the jurisdiction of the City of Bowling Green. A company may obtain coverage under the utility general permit by petitioning the City for coverage and abiding by the terms and conditions of this permit. ***Note that coverage under the utility general permit does not preclude coverage under other similar permits***

required by the County or State, including the Kentucky construction stormwater general permit (KPDES permit number KYR10).

To gain coverage under the utility general permit, the utility company must submit an application to the City. The permit requires each utility company to perform the following:

1. For sites that disturb less than 1 acre, EPSC controls must be installed and maintained.
2. For sites disturbing 1 acre or more, coverage under KYR10 and Bowling Green's grading permit is required.
3. Inspection must be performed pursuant to Bowling Green's requirements for all development sites.
4. Pollution prevention must be addressed on site.
5. An EPSC Certified Contractor must be provided on all sites disturbing 1 acre or more.
6. Where utility work damages existing EPSC controls on another development, the utility contractor must repair or reinstall the controls, including stabilization measures.

2.9 Other Permits

Various types of permitting can be required at different levels depending upon the project type. Both local permits as well as state permits can be required on construction projects.

Local Permits. The City of Bowling Green has developed processes to obtain a variety of permits. Examples of permits issued by the City are building permits, grading permits, paving permits, swimming pool permits, fence permits, etc. Anytime grading or excavation of material is involved it is important to determine which permit is applicable to the project and what plan submittals will be necessary for the level of construction proposed.

In addition to formal permits that are required by the City of Bowling Green, private developments such as subdivisions and detailed development plans require approval through the City. Because these projects will involve land disturbance, all necessary plan submittals as described in the previous section shall apply. Additional requirements for subdivisions and detailed development plans can be obtained at the City-County Planning Commission.

State Permits. The Kentucky general permit for construction stormwater is KYR10. It is required for improvements involving site disturbances of one acre or more, or less than one acre is part of a larger common plan of development. Note that violations of KYR10 may also result in violations of the City of Bowling Green's stormwater management ordinance and vice versa. The City will not issue approval of any land disturbing plans without having the Notice of Coverage under KYR10 where applicable.