



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 Qualified Contractor substitutions, deletions and/or additions.

The City of Shelbyville 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 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. Any land disturbing activities that disturbs 0.5 acres of land or more is required to submit a SWPPP to the office of the City Engineer. For all sites that disturb 1 acre or more, the SWPPP is required by KYR10 and a Notice of Intent (NOI) must be filed with the Kentucky Division of Water prior to any land disturbance. The SWPPP 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. It includes the EPSC Plan and Stormwater Management Plan. The SWPPP shall be signed and certified in accordance with the signatory requirements in 401 KAR 5:065, Section 1(11). 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.

## 2.5 Stormwater Management Plan

The City of Shelbyville 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 Shelbyville's approach to the stormwater quality and quantity management program.

### **2.5.1 Stormwater Quantity Management Goals**

The following design requirements are applied to all proposed developments within the City of Shelbyville City Limits.

- Methods of determining storm water runoff discharge rate and volume. The volume of required storm water storage and discharge rate for drainage areas totaling 100 acres or less shall be calculated on the basis of the runoff from a 2, 10, 25, and 100-year frequency storm event with a 24 hour duration for pre and post development conditions. The calculations can be made in accordance with the instantaneous runoff factor method, the rational method, soil conservation service (SCS) method or other methods that may be deemed appropriate by the City Engineer. The Intensity Duration Curves for Louisville MSD may be used for Shelbyville. For larger drainage systems, the SCS hydrologic methods or the "Regional Method" of the Kentucky Transportation Cabinet, Department of Highways shall be used to determine peak runoff rates.
- Release Rate –
  - o All developments shall be done in such a way as to insure that storm water falling on a given site shall be absorbed or detained on site to the extent that the controlled release rate of storm water runoff from all developments shall not exceed the pre-development storm water runoff rate, unless it can be shown that no significant adverse downstream impacts will result from higher rates. The rate at which storm water runoff is delivered to a designated storm water storage area shall be unrestricted.
  - o In the event that the City Engineer determines that the natural downstream channel or storm sewer system is inadequate to accommodate the release rate provided above, then the allowable release rate shall be reduced to that rate permitted by the capacity of the downstream channel or storm sewer system.
- Development Design –
  - o Where it can be demonstrated by the developer that a higher storm water release rate will not be contrary to the purpose and intent of this manual and where such proposed release rate will not adversely affect properties in the downstream portion of the watershed, the City Engineer may permit such release to be used as deemed appropriate.
  - o Streets, blocks, lots, parks, and other public grounds shall be located and laid out in such a manner as to minimize the velocity of overland flow and allow maximum opportunity for infiltration of storm water into the ground, and to preserve and utilize existing and planned streams, channels, and detention basins, and include whenever possible, streams and floodplain within parks and other public grounds.



## Shelbyville, KY Stormwater Best Management Practices

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- Excess Storm Water Passage
  - o An excess storm passage shall be provided for all storm water areas. Such passage shall have the capacity to convey through the proposed development the excess stormwater. The capacity for a passage shall be that it will be able to transport the peak rate of run-off from a 100-year, 24-hour return frequency storm.
  - o There shall be no buildings or structures constructed within excess storm water passage or within the elevation of the flood of record. Parking lots, playgrounds and park areas, which shall not impair or endanger the water holding capability of a development, shall be considered compatible uses.
  - o Appropriate land planning shall be undertaken to preserve the existing natural drainage of a proposed development as part of the excess storm water passage.
  - o Open channels shall be protected from erosion by appropriate vegetative cover, lining or other treatment and earthen channel side slopes shall be no steeper than three to one (3:1). Open Channels with lining shall have a maximum gradient on side slopes of 67% and channel side slopes steeper than 67% shall be designed as structural retaining walls.
- Stormwater storage/detention areas – The increased storm water runoff resulting from the proposed development may be accommodated by the provisions of appropriate detention facilities. Storage areas shall be designed to the satisfaction of the City Engineer and if possible provide secondary purposes for recreation, open spaces, parking lot or other types of use that will not be adversely affected by intermittent flooding. The following shall govern the design of detention facilities:

### Storage Volume:

- o The detention facility must be designed for periodic maintenance and energy dissipaters shall be provided at points necessary.
- o The ponding of stormwater runoff shall not exceed 12 inches in parking lot areas. Where these areas are used for ponding the maximum depth should occur in the most remote and least used areas.
- o The drainage and grading design shall be prepared to insure that in a 100 year storm the depth of water runoff in any street, alley or pedestrian area will not exceed the level of the first floor of any building. The finish floor elevation shall be set two (2) feet above the 100 year flood elevation for all new development and the minimum finished floor elevations for homes shall be stated on the record plat.
- o For wet pond storage areas when calculating the storage capacity, only the volume available to store excess storm water shall be considered. Permanent water storage does not constitute control of excess storm runoff.

### Release Rate:

- o At no time during the design storm shall the storm water runoff release rate exceed the allowable release rate as forth in the release rate requirements.
- o Detention basins shall be fully discharged within 36 hours after the storm event

### Release Velocity:

- o Detention facilities shall release stormwater at a non-erosive velocity. The protected channel receiving the detention discharge shall incorporate features to reduce velocity to non-erosive levels at the point where such discharge enters the unprotected channel. If release into a subsurface conduit the energy gradient in the receiving facility shall not be increased beyond the slope of the conduit.

### Spillway:

- o Overflow for each storm water storage area shall be provided in the event a storm in excess of the design capacity occurs.
- o Emergency spillways shall be sized to accommodate a flow equal to the design overflow of the 100 year storm post development discharge without overtopping the dam. The spillway dimensions shall be clearly dimensioned and protected from erosion.



Dam:

- o Detention facilities shall have adequate capacity to contain storage volume of tributary storm water runoff with at least one foot of freeboard above the water surface of flow in the emergency spillway in a 100 year storm or as required by state law.
  - o The dam slopes shall not exceed three to one (3:1) on the interior of the pond. The minimum width of the top of the dam shall be two (2) feet, and the back side of the dam shall not exceed a slope of two to one (2:1).
  - o The top of the dam shall be at least one foot below the lowest opening of any structure adjacent to and upstream of the dam.
  - o Discharge control structures shall be multi-stage and capable of limiting the 2, 10, 25 and 100 year post development discharges to predevelopment peak discharge rates or downstream system capacity.
  - o The basin outlet pipe must be placed no closer than 15 ft from an adjacent property line.
- .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.

**2.5.2 Stormwater Quantity Management Performance Standards**

Storm water channel location. Generally acceptable locations of storm water channels in the design of a subdivision may include but are not limited to the following:

- a) Adjacent to roadways
- b) In a depressed median of a divided roadway, provided the median is wide enough to permit slopes of one foot drop in six feet horizontal or flatter.
- c) Centered on lot lines or entirely within the rear yards of a single row of lots or parcels
- d) In each of the forgoing cases, a drainage easement with sufficient width to facilitate maintenance and design flow shall be provided and shown on the plat.

Storm Sewer Outfall. The storm sewer outfall shall be designed to provide adequate protection against downstream erosion and scouring.

Lot Lines. Whenever the plans call for the passage and/or storage of storm water runoff along lot lines, the grading of all such lots shall be prescribed and established for the passage and/or storage of waters, and no structure or vegetation which would obstruct the flow of storm water shall be allowed, nor shall any change be made to the prescribed grades and contours of the specified storm water channels.

Manholes. All utility sewer manholes constructed in an area designed for the storage or passage of storm water, shall be provided with either a watertight manhole cover or be constructed with a rim elevation of a minimum of one foot above the high water elevation of the design storm.

Easements. Permanent easements for the detention and conveyance of storm water, including easements of access to structures and facilities, shall be dedicated to the city.

Obstruction of drainage. The keeping or disposal of grass clippings, trash debris, obstructions or unwanted materials into the storm sewers or within or along storm water channels or in adjacent flood plain areas which may wash into sewers and channels is prohibited.

Maintenance. Required maintenance for detention basins or other structures shall be permanently provided by the developer with responsibility becoming that of the private landowner after complete development, subject to inspection of the City Engineer. Every detention basin or structure shall be legally defined on both deed and plat and the maintenance entity shall be specified.



### 2.5.3 Stormwater Quality Program Rationale

Land development projects and associated increases in impervious cover alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, flooding, stream channel erosion, and sediment transport and deposition; Stormwater runoff contributes to increased quantities of water-borne pollutants. Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulations of stormwater runoff from development sites. The goal is to maintain or improve the quality of all streams within the MS4 boundaries and corporate limits, to meet their designated use.

In developing the post construction stormwater quality program, the City considered numerous factors related to the environment and the type of development common to the City of Shelbyville. 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. The Kentucky Division of Water's 2010 Integrated Report, 305 (b) addressed the waters in the City of Shelbyville MS4 Community. Clear Creek is listed as having Impaired use of Aquatic Life (nonsupport) with pollutants of concern being sedimentation/siltation; organic enrichment (sewage) biological indicators; nutrient/Eutrophication Biological indicators with suspected sources of Livestock (grazing or feeding operation); crop production (crop land or dry land) and unspecified Urban Stormwater. No TMDL's have been developed but one is currently under development within the City of Shelbyville MS4 Community for Clear Creek into Bullskin from river mile 0.0 to 11.0.
2. The City must develop a locally derived water-quality treatment standard that states the water quality of stormwater produced from the 80<sup>th</sup> percentile rain event shall be addressed with best management measures that are built and maintained to treat, filter, flocculate, infiltrate, screen, evapo-transpire, harvest, and reuse stormwater runoff, or otherwise manage the runoff for all new and redeveloped sites. (The 80% rain event is based on past rainfall data and will continually change with future rain events, however it is not anticipated to vary drastically from one year to another.)
3. BMP's shall be designed to remove pollutants and reduce runoff volume. The designated use and any existing in-stream use of the stream being discharged to shall be protected. Some land uses produce higher concentrations of certain pollutants such as hydrocarbons or heavy metals, than those normally found in urban areas. These areas will be reviewed for effective removal of the particular pollutant which they discharge. Effective removal will be that which existed prior to development.
4. The City determined that the stormwater quality treatment goal of 80% TSS removal of the average annual post-development pollutant load constitutes MEP.
5. Low impact development principles are encouraged.
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.

### 2.5.4 Stormwater Quality Management Plan

A Stormwater Quality Management Plan (SWQMP) shall be required for any new single-family residential developments having a gross aggregate area, including roads, utility right-of-way, and any other dedicated lands of five or more acres, and having a density of greater than one dwelling unit per acre or for any new commercial, multi-family residential, industrial, institutional, or utility development having a gross aggregate area of 0.5 acres or more. A plan shall also be required for any new development or redevelopment of fully developed areas.



A SWQMP may be required for the following:

- a) Any grading or excavation which would fill, obstruct, or otherwise alter any creek, storm water channel, or drainage facility.

### **2.5.5 Stormwater Quality Management Plan Submittal Requirements**

The required Storm Water Quality Management plan shall contain, but not be limited to, the following information unless specifically excluded by the City Engineer.

- a) Total area of the site and total area of disturbance
- b) A topographic map of the project site and adjacent areas, of suitable scale and contour interval, which shall define the location of streams, the extent of flood plains and calculated high water elevations, the shoreline of lakes, ponds, swamps and detention basins including their inflow and outflow structures, if any.
- c) The location and flow line elevation of all existing sanitary or storm sewers.
- d) Detailed determination of runoff anticipated for the entire project site following development indicating design volumes and rates of proposed runoff for each portion of the watershed tributary to the storm drainage system, the calculations used to determine said runoff volumes and rates and restatement of the criteria which have been used by the project engineer throughout the calculations.
- e) A layout of the proposed storm water management system including the location and size of all drainage structures, storm sewers, channels and channel sections, detention basins, and analyses regarding the effect said improvements will have upon the receiving channel and its high water elevation.
- f) The slope, type and size of all existing and proposed storm sewers and other waterways impacting or impacted by the proposed development on the site.
- g) For all detention basins, a plot or tabulation of storage volumes with corresponding water surface elevations and of the basin outflow rates for those water surface elevations.
- h) For all detention basins, design hydrographs of inflow and outflow for the 2-year, 10-year 25-year and 100-year, 24 hour events for the site under existing and developed conditions.
- i) A profile and one or more cross sections of all existing and proposed channels or other open drainage facilities, showing existing conditions and the proposed changes thereto, together with the high water elevations expected from storm water runoff under the controlled conditions called by these regulations and the relationship of structures, streets, and other utilities to such channels.

### **2.5.6 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 Bond Release, two (2) complete copies of as-built drawings with the appropriate professional certifications must be provided to the City of Shelbyville 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 G 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. Information required in the Operations and Maintenance Plan can be found in Appendix H.

#### **2.5.7 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 G) 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 the City of Shelbyville.

#### **2.5.8 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 Shelby County Clerk's 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 or approved equivalent. 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 or approved equivalent. 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 Shelby County Clerk's Office.

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

## 2.6 Stormwater Quality Treatment

All types of development must provide treatment of the water quality volume.

### 2.6.1 Structural Stormwater Quality Treatment Design

Stormwater quality treatment for Shelbyville 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 80<sup>th</sup> percentile rain event in Shelbyville 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 0.6 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 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 80% of the average annual rainfall, which is considered the "first flush". The 80<sup>th</sup> percentile storm event in Shelbyville is 0.6 inches. All storms greater than 0.6 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.