# EXHIBIT A

**To**

***Chapter 961: Storm Water Management***

**Of the**

**City of Canton Codified Ordinances**

# CITY OF CANTON STORM WATER MANAGEMENT MANUAL

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## Section 1 INTRODUCTION

### 1.1 Overview

This manual, entitled "City of Canton Storm Water Management Manual", has been prepared mainly to supplement *Chapter 961: Storm Water Management* of the City of Canton Codified Ordinances by providing further standards, applicability, criteria, requirements, recommendations, and guidance for various regulated aspects of storm water management in the City of Canton that are not provided explicitly in Chapter 961. It is adopted as part of Chapter 961 and is referenced in Chapter 961 as "Exhibit A". Therefore, application and adherence to the contents within this manual are subject to all parts of Chapter 961. In addition, this manual summarizes and expounds upon some existing aspects of storm water management provided in other chapters of the Codified Ordinances of the City of Canton. Any conflicts with other City requirements or ordinances shall be resolved as per 961.08.

This manual has four main sections:

1. Introduction
2. General Storm Water Drainage
3. Storm Water Quantity Management
4. Storm Water Quality Management

Each section describes when and how it applies to various aspects of storm water management in the City of Canton. In general, Section 2 is always applicable regardless of the type of activity involved. Sections 3 and 4 are generally only applicable to development/redevelopment activities. Conditions for exemptions from specific standards and requirements are provided, as necessary.

This manual may be updated and expanded from time to time, at the discretion of the City Engineering Department, based on improvements in engineering, science, monitoring and local maintenance experience. The current content of this manual at the time in which respective activities take place shall apply. Any requirements of or revisions made to this manual may, upon request, be reviewed by the City of Canton Director of Public Service, who may affirm, modify, or rescind the same.

Unless otherwise stated, questions regarding the content, interpretation, or application of this manual should be directed to:

City of Canton
Engineering Department - Civil Division
2436 30th Street NE
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### 1.2 Definitions

Key terms used in this manual and not defined in *Chapter 961: Storm Water Management* of the City of Canton Codified Ordinances shall have the following meanings:

100-YEAR STORM: A storm event, based on statistics, that produces an amount of rainfall that can be expected to occur on the average of once every one-hundred (100) years. This same concept applies respectively to the 1-, 2-, 5-, 10-, and 50-year storm events that are commonly used in engineering design. The 100-year storm may also be expressed as having a one percent (1%) probability of occurrence in any given year.

ABOVE-GROUND STORM WATER DETENTION FACILITY: A storm water detention facility, such as a detention, retention, or infiltration basin, in which storm water runoff rate and volume is managed above-ground.

ACRE: A measurement of land area equaling 43,560 square feet.

ALTERNATIVE STRUCTURAL STORM WATER QUALITY BMP: Any structural BMP intended to satisfy post-construction storm water quality management that is not listed in the Structural Post-Construction BMP Table in the Current Ohio EPA NPDES Permit for Storm Water Discharges Associated with Construction Activity.

ANTI-SEEP COLLAR: A device constructed around a pipe or other conduit and placed into a dam, levee, or embankment for the purpose of reducing seepage losses and piping failures along the conduit it surrounds.

APPROVED: Having been officially accepted and documented as such by the governing authority, City department, or representative of the City of Canton.

AS-BUILT SURVEY: A survey of final conditions, resulting from the implementation of proposed construction, shown on a plan or drawing prepared and sealed by a Registered Surveyor indicating information such as, but not limited to: actual dimensions, elevations, and locations of any structures and their components, underground utilities, roads, storm water management systems, and other infrastructure and facilities.

DOWNSPOUT: A pipe used for conveying rain water from a roof or gutter to the ground or to a drain. Downspouts may also convey sump pump discharges containing groundwater or other non-illicit flows. "Downspout" is synonymous with "roof drain".

DRAINAGE AREA: An area, measured in a horizontal plane, enclosed by a topographic divide from which storm water runoff normally drains to a particular point of interest such as a stream, catch basin, detention basin, property line, etc.

DRAINAGE EASEMENT: A legally recorded plat and/or document executed by a property owner that conveys to another person, entity, etc. the right to access designated areas of a property that contain permanent storm water management systems, facilities, and/or BMPs for the purpose of repairing, maintaining, or providing some other specified responsibility.

DRAWDOWN TIME (DRAIN TIME): The minimum time required per Ohio EPA's Permit for Storm Water Discharges Associated with Construction Activity Under the National Pollutant Discharge Elimination System to drain a Structural Post-Construction BMP in order to provide adequate treatment.

FLOOD HAZARD DISTRICT: All lands within the jurisdiction of the City and shown on the Official Zoning Map within the boundaries of the Flood Hazard District, as described in the Planning and Zoning Code.

FLOODPLAIN: The areas adjacent to the main channel of a stream or watercourse that are subject to inundation by flood flows. Although all watercourses have floodplains, only those with FEMA-identified floodplains or otherwise identified as special flood hazard areas on the Official Zoning Map of the City of Canton are subject to Flood Hazard District regulations in the City Planning and Zoning Code.

INDIVIDUAL LOT GRADING PLAN: A plan for a residential lot showing proposed grading, downspout and sump pump discharge and/or connection points, existing storm sewers, swales, and open channels, and any other features relevant to the overall drainage of the site. As required by the City Zoning Inspector, individual lot grading plans are subject to the review of the City Engineer.

INFILTRATION BASIN: An above-ground storm water detention facility purposely designed and constructed to allow storm water runoff to infiltrate into the ground, thereby reducing the rate and volume of water flowing from a site.

LARGER COMMON PLAN OF DEVELOPMENT: A contiguous area where multiple separate and distinct construction activities may be taking place at different times and on different schedules but under one master plan.

LONG-TERM MAINTENANCE PLAN (LTMP): A document (A.K.A. "Post-Construction Operation and Maintenance Plan") provided by the owner/developer of a site, approved by the Stark County SWCD and the City Engineer, and accepted by the property owner(s) and/or other responsible party/parties (such as a Homeowner's or Industrial Park Association, public or private entities, etc.) that describes the permanent storm water quality BMPs on the site and the necessary long-term schedule of inspection, means of maintenance of those BMPs, and other necessary information as required. LTMPs shall include a copy of the approved SWP3 (and any corresponding plans and supporting documentation).

MAJOR FLOOD PATH: The designated pathway(s) within a site in which runoff from storms up through the 100-year event will travel along when the conveyance and storage capacities of the storm water management systems within the site are exceeded.

OFF-LINE STORM WATER DETENTION FACILITY: A storm water detention facility with contributing drainage areas from on-site areas only; storm water detention facilities are "off-line" or, in other words, not "in-line" with existing watercourses that originate off-site. Off-line storm water detention facilities may also be designed to serve the purpose of storm water quality management, if applicable.

ON-LINE STORM WATER DETENTION FACILITY: A storm water detention facility with contributing drainage areas from both on- and off-site areas; storm water detention facilities that are "on-line" or, in other words, "in-line" with existing watercourses that originate off-site. On-line storm water detention facilities may also be designed to serve the purpose of storm water quality management, if applicable, and must be designed to accommodate the volume of the *entire* contributing drainage area with the assumption that it is *fully* developed, in accordance with the current zoning map.

OPEN WATER CARRIER: A natural or artificial drainage conveyance such as a ditch, stream, concrete channel, etc. that has an obvious cross section used for water conveyance and is open to atmospheric conditions.

OUTFALL: The downstream termini area of a storm water management system where water flows out of or from, such as the outlet of a storm sewer into a creek or where a ditch connects into a stream; also known as "outlet".

OWNER/DEVELOPER: The owner and/or developer and/or his or her designated qualified representatives of a respective property.

PERPETUATION: To cause to continue indefinitely; to make perpetual.

POST-DEVELOPED: The conditions such as topography, land use, imperviousness, ground cover, and the rate, volume, quality, and flow patterns of storm water runoff that exist following completion of a construction project.

PRE-CONSTRUCTION MEETING: A meeting held between local government entities, owners/developers, contractors, utility companies, and/or other interested parties prior to the start of construction activities on a site to discuss various aspects of project coordination, inspection, construction phasing, regulatory issues, etc.

PRE-DEVELOPED: The conditions such as topography, land use, imperviousness, ground cover, and the rate, volume, quality, and flow patterns of storm water runoff that exist prior to the start of construction of a project.

PRE-WINTER STABILIZATION MEETING: A meeting held between owners/developers, contractors, Stark SWCD, and/or other interested parties prior to October 1st of a given year, to discuss how construction site storm water quality management BMPs and site stabilization will be implemented on the respective site during the upcoming winter months.

PRIVATE DRAINAGE EASEMENT: A right, represented on a legally recorded plat and/or easement document, granted to one private property owner, party, or entity, to make use of designated land of another for storm water drainage purposes for the benefit of the grantee, and in which ownership, rights, responsibilities, and restrictions are expressly assigned with respect to the designated land and storm water management systems represented by the easement.

PRIVATE STORM SEWER: A storm sewer located on private property or in a private drainage easement that is owned or operated by a private party and which is not the maintenance responsibility of a public entity such as the City.

PROFESSIONAL ENGINEER: An engineer registered by The Ohio State Board of Registration for Professional Engineers and Surveyors.

PROFESSIONAL LAND SURVEYOR: A surveyor currently registered to practice land surveying in the State of Ohio.

PUBLIC DRAINAGE EASEMENT: A right, represented on a legally recorded plat and/or easement document, granted to a public entity, to make use of designated private land for storm water drainage purposes for the benefit of the public, and in which ownership, rights, responsibilities, and restrictions are expressly assigned with respect to the designated land and storm water management systems represented by the easement.

PUBLIC STORM SEWER: A storm sewer located under a public street, in a public drainage easement, or within other public property that is owned by a public entity such as the City and in which the public entity has the responsibility to maintain unless otherwise expressly stated.

REGULATED ACTIVITY: An activity subject to any requirements of this Chapter.

SOIL-DISTURBING ACTIVITY: Any activity, such as but not limited to: clearing, demolition, grading, excavating, construction, filling, etc. that may alter the existing ground cover and which may result in or contribute to erosion and sedimentation.

STABILIZATION: The implementation of vegetative and/or structural measures to establish a cover over soil in order to prevent or reduce erosion.

STORM WATER DETENTION: The temporary storage and controlled release of water from a site.

STORM WATER DETENTION FACILITY: A facility such as a detention basin, retention basin, underground storage tanks or pipes, etc. used for the purpose of controlling the rate and volume of storm water from the site.

STORM WATER DETENTION VOLUME: The maximum volume required for storage in a storm water detention facility.

STORM WATER MANAGEMENT REPORT: A report that contains all documentation and supporting calculations for the storm water management on a site.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP; SWP3; SW3P): A plan, including supporting calculations and any other relevant information, showing the practices to be used for quality treatment of construction site storm water runoff and for post-construction storm water runoff, in accordance with applicable permits and storm water quality regulations.

STORM WATER QUALITY VOLUME (WQv): The amount of storm water runoff from any given storm that should be captured and treated in order to remove a majority of storm water pollutants on an average annual basis. As defined in Ohio, the WQv results in capture and treatment of the entire volume for 85% of the average annual storm events. Specifically, it is determined as described in the current version of the Ohio EPA's NPDES Permit for Storm Water Discharges Associated With Construction Activity.

WATERCOURSE: A permanent or intermittent stream, creek, or other body of water, either natural or man-made, which collects and carries storm water runoff.

WETLAND: Land area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support (and under normal circumstances do support) a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas (40 CFR 232, as amended). There are three components that must be present in a wetland: hydrology source, hydrophytic vegetation, and hydric soils. Wetland delineations may be required (where these three components are indicative of possible wetlands) and submitted to Ohio EPA and/or US Army Corps of Engineers for concurrence and further regulation, as applicable.

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## Section 2 GENERAL STORM WATER DRAINAGE

### 2.1 Applicability

Section 2 and all subsections of Section 2 shall be applicable at all times and to all activities, sites, landowners, and other persons that discharge storm water runoff within the City of Canton. Section 2 shall be used accordingly and in conjunction with all other applicable sections of this manual.

### 2.2 Exemptions, Waivers, and Variances to Rules

1. Exemptions from general drainage standards and requirements

   There shall be no exemptions to the general storm water drainage standards and requirements provided in Section 2 of this manual.

2. Waivers from meeting applicable standards requirements

   If certain conditions exist which the owner/developer believes may make adherence to certain applicable general drainage standards, requirements, or recommendations difficult or impossible or create unnecessary hardship, the owner/developer may submit a waiver request in writing to the City Engineer. The waiver request shall state the specific waiver sought and the corresponding reasons with any supporting information. The City Engineer will review the waiver request and respond accordingly, in writing, with an approval or rejection. Approval will only be granted upon satisfaction that waiver requests have been justified by the reasons provided. Adverse economic conditions shall not be a valid reason to grant a waiver.

3. Variances to applicable standards and requirements

   If certain conditions exist which the owner/developer believes may make strict adherence to certain applicable general drainage standards, requirements, or recommendations difficult or impossible or create unnecessary hardship, and the owner/developer wishes to modify the applicable standards and/or requirement(s), the owner/developer may submit a variance request in writing to the City Engineer. The variance request shall state the specific variances sought, the corresponding reasons with any supporting information, and the desired modifications to the respective standards and/or requirements. The City Engineer will review the variance request and respond accordingly, in writing, with an approval or rejection. Approval will only be granted upon satisfaction that variance requests have been justified by the reasons provided. Adverse economic conditions shall not be a valid reason to grant a variance.

### 2.3 Permits and Fees

Various permits may be required for development or other activities regulated by *Chapter 961: Storm Water Management* of the City of Canton Codified Ordinances. Approvals issued in accordance with Chapter 961 do not relieve the applicant of responsibility for obtaining all other necessary permits and/or approvals from federal, state, and/or other local agencies. If requirements vary, the most restrictive shall prevail. These permits may include, but are not limited to: City Engineering Department permits, local building, zoning, and floodplain permits, Environmental Protection Agency National Pollutant Discharge Elimination System Permits for Storm Water Discharges Associated With Construction Activity, applicable state and federal permits for stream and wetland impacts, and applicable dam safety permits. Applicants may be required to show proof of compliance with certain applicable permits before the City Engineering Department will grant any necessary approvals.

Any construction that necessitates obtaining a City Engineering Department permit shall be pre-approved by and subject to the inspection of the City Engineer. The City Engineering Department permits applicable for storm water discharges or associated work are as follows:

1. A "Sewer Connection Permit" is required for:

A. Any storm sewer installation, connection, or repair work within City right-of-way or easement;

B. Any sanitary sewer or sanitary lateral installation, connection, or repair within City right-of-way or easement or on private property.

2. A "Street Opening Permit" is required for any necessary opening or excavation within City right-of-way.

Any necessary City Engineering Department permits must be obtained at the City Engineering Department. See *Chapter 909: Excavations* of the City of Canton Codified Ordinances for further details regarding the regulation of excavations and the associated permits, fees, inspections, etc. that are required by the City Engineering Department.

Any fees associated with applicable permits, coordination, reviews, or inspections of activities applicable to any requirements of this manual are the responsibility of the applicant. Contact the City Engineering Department at 330-489-3381 for the current fee schedule.

## 2.4 Approved Contractors for Sewer Work Within City Right-Of-Way

Only authorized and permitted persons are eligible to perform storm sewer and other associated work within City right-of-way. See *Chapter 939: Licensing of Sewer Tappers* of the City of Canton Codified Ordinances for further details. The City Engineer's Office maintains a current list of approved, licensed sewer contractors that meet such eligibility.

## 2.5 Downspout Discharges and Connections

1. Standards, Prohibitions, and Preferences

   A. Downspout installations, function, maintenance, repairs, and/or replacements are the property owner's responsibility.

   B. Downspouts shall not discharge directly onto a sidewalk, street, or public ground within the City, when in the opinion of the City Engineer a public nuisance is caused by doing so. See *Section 903.02: Discharge of Water From Premises* of *Chapter 903: Streets and Sidewalks Generally* of the City of Canton Codified Ordinances for further details.

   C. Discharges from downspouts shall contain only roof runoff, foundation water discharged from sump pumps, or otherwise permitted discharges. No "grey water" or other illicit (non-permitted) flows shall discharge through downspouts.

2. Unless otherwise approved or required by the City Engineer or City ordinance, the following preferences should be implemented:

   A. Preference #1: Downspouts are preferred to be discharged on the owner's property (outside of the public right-of-way) *if all of the following favorable conditions exist* on the site:

      1. Discharge will have positive flow away from structures; and
      2. Discharge can be absorbed by vegetation and/or be infiltrated into the ground; and
      3. Discharge will be in a responsible manner that will not cause adverse flooding, erosion, or related nuisance to adjacent and downstream properties; and
      4. Discharge is not otherwise required to be managed by other means; and
      5. Discharge will not occur over sidewalk.

      This preference will promote groundwater recharge and less off-site runoff and therefore less burden on existing drainage systems and water resources.

B. Preference #2: If the above preference is not possible or otherwise unfavorable, downspouts should be primarily discharged by direct connection into catch basins or storm manholes along the frontage of the property, or into storm sewers, ditches, or other water resources, if available. Direct connections into catch basins or manholes shall be by an approved core. When catch basins or storm manholes are not available, direct connections into storm sewers shall be by an approved wye or tap connection or by an approved core. In addition, the owner should install an overflow for the downspout system to discharge through a secondary outlet in case the primary outlet becomes blocked or otherwise becomes unable to discharge freely. The secondary outlet should be through a curb, if possible. If a curb is not available or is otherwise not possible to use as a secondary outlet, then the overflow should discharge on the owner's property (outside of the public right-of-way), in a responsible manner that will not cause adverse flooding, erosion, or related nuisance to adjacent and downstream properties.

   This preference should be implemented in instances in which ground water elevations are high, thus promoting frequent sump pump discharges.

C. Preference #3: If the above preference is not possible, downspouts should be primarily discharged through the curb (if available) and onto the street, if possible, unless, when in the opinion of the City Engineer a public nuisance is caused by doing so. In addition, the owner should install an overflow for the downspout system to discharge through a secondary outlet in case the primary outlet becomes blocked or otherwise becomes unable to discharge freely. The secondary outlet should be on the owner's property (outside of the public right-of-way), and should discharge in a responsible manner that will not cause adverse flooding, erosion, or related nuisance to adjacent and downstream properties.

   For downspouts that convey sump pump discharges (See Section 2.6), this recommendation does not apply. (Sump pumps that frequently discharge through downspouts that primarily outlet directly onto streets promote ice, algae growth, accelerated pavement and gutter deterioration, and aesthetic nuisances and therefore should be avoided).

Situations in which the discharge preferences above are not possible or are otherwise unfavorable may be reviewed on a case-by-case basis by the City Engineer for alternative recommendations.

## 2.6 Sump Pump Discharges and Connections

Sump pumps may be discharged per the same standards, requirements, and recommendations as downspouts (See Section 2.5) except as otherwise noted.

## 2.7 Storm Sewer Requirements Within Right-Of-Way

Except for private storm pipes, the minimum storm pipe size within public right-of-way shall be 12 inches in diameter. Acceptable pipe materials, methods, and specifications used for storm sewer and other storm water infrastructure installations shall be in accordance with City Engineering Department Standard Drawings and Notes (see Section 2.9). Necessary permits (see Section 2.3) shall be obtained, as applicable.

## 2.8 Flood Zone Requirements

For activities on sites located within FEMA-designated flood zones or as otherwise identified as special flood hazard areas within the City, all applicable Flood Zone requirements shall be met in accordance with the City of Canton's Flood Zone Ordinances. See *Chapter 1132: Flood Hazard District* of the City of Canton Codified Ordinances for further details.

## 2.9 City Engineering Department Standard Drawings and Notes

City of Canton Engineering Department standard drawings and notes shall be used and applied as necessary for all public projects and infrastructure unless otherwise approved by the City Engineer. Where City Standard Drawings and Notes do not address a specific application, the most recent versions of the State of Ohio

Department Of Transportation (ODOT) Standard Construction Drawings, Construction and Material Specifications, or other applicable ODOT resource shall govern, unless otherwise approved or required by the City Engineer. City of Canton Standard Drawings and Notes are available at the City Engineering Department.

## 2.10 Alternative Storm Water Management and Natural Preservation Concepts

"Green concepts", low impact development concepts, "smart growth", and other alternative planning, design, or development concepts that promote alternative approaches to storm water quantity and quality management and the preservation of natural resources may be encouraged or allowed upon the review and approval of the City Engineer and in accordance with applicable Planning and Zoning regulations.

## 2.11 Violations and Enforcement

Any violation to applicable standards or requirements in this manual are subject to enforcement as stated in *Chapter 961: Storm Water Management* or other applicable chapters of the City of Canton Codified Ordinances.

## Section 3 STORM WATER QUANTITY MANAGEMENT

Storm Water Quantity Management is the implementation of storm water management systems on a site for proper storm water runoff conveyance and/or volume and rate control. Storm water quantity management attempts to control the amount of runoff from a site so as to not cause flooding to adjacent properties or over-burden the capacities of existing natural and man-made water resources and storm water drainage infrastructure.

### 3.1 Applicability

The standards and requirements of Section 3 shall apply to the following:

1. All uses or activities requiring approval by the Site Plan Review Committee per the Planning and Zoning Code of the City of Canton

2. All uses or activities not requiring approval by the Site Plan Review Committee per the Planning and Zoning Code of the City of Canton but are otherwise required by the Planning and Zoning Code or Zoning Inspector to be reviewed and approved by the City Engineer;

3. Public roadway and/or public storm water drainage improvement projects, as per the discretion of the City Engineer.

Section 3 and all subsections of Section 3 are not intended to provide an exhaustive list and descriptions of all requirements necessary to prepare plans, specifications, reports, calculations, and other information needed for applicable storm water quantity management. The designer shall follow generally accepted standards for engineers, architects, and surveyors, as applicable.

### 3.2 Exemptions, Waivers, and Variances to Rules

1. Exemptions from storm water quantity management

   Not all of the requirements of Section 3 may be applicable for all uses, activities, or projects, depending on the site's characteristics and the measures that may be used for the proposed management of the quantity of storm water runoff from the site. As necessary, details are provided for conditions that may exist or criteria that may be met which may exempt a respective regulated activity from meeting certain aspects of storm water quantity management.

2. Waivers from meeting applicable requirements

   If certain conditions exist which the owner/developer believes may make adherence to certain applicable storm water quantity management requirements difficult or impossible, create unnecessary hardship, or otherwise do not satisfy the intent of the storm water quantity management requirements, the owner/developer may submit a waiver request in writing to the City Engineer. The waiver request shall state the specific waiver sought and the corresponding reason(s) with any supporting information. The City Engineer will review the waiver request and respond accordingly, in writing, with an approval or rejection. Approval will only be granted upon satisfaction that waiver requests have been justified by the reasons provided. Adverse economic conditions shall not be a valid reason to grant a waiver.

3. Variances to applicable requirements

   If certain conditions exist which the owner/developer believes may make strict adherence to certain storm water quantity management requirements difficult or impossible, create unnecessary hardship, or otherwise do not satisfy the intent of the storm water quantity management requirements, and the owner/developer wishes to modify the applicable requirement(s), the owner/developer may submit a variance request in writing to the City Engineer. The variance request shall state the specific variance(s) sought, the corresponding reason(s) with any supporting information, and the desired modification(s) to

the respective requirement(s). The City Engineer will review the variance request and respond accordingly, in writing, with an approval or rejection. Approval will only be granted upon satisfaction that variance requests have been justified by the reasons provided. Adverse economic conditions shall not be a valid reason to grant a variance.

### 3.3 Preparation of Plans and Calculations by a Registered Professional Engineer

Construction plans, site plans, plats, and corresponding Storm Water Management Reports shall be signed and sealed (or stamped) by a registered Professional Engineer licensed to practice in the State of Ohio. Site surveys shall be signed and sealed (or stamped) by a registered Professional Land Surveyor to establish boundary lines, measurements, or land surfaces to the extent necessary for proper design and review, or as otherwise required by the City Engineer.

### 3.4 Alternative Approaches to Storm Water Quantity Management

"Green concepts", low impact development concepts, "smart growth", and other alternative planning, design, or development concepts that promote alternative approaches to storm water quantity management and the preservation of natural resources may be encouraged or allowed upon the review and approval of the City Engineer and in accordance with applicable Planning and Zoning regulations.

### 3.5 Storm Water Management Report

A Storm Water Management Report (SWMR) is required as part of the design information submitted along with the site plan/construction plans to the City Engineer for review of activities subject to any parts of Section 3 or Section 4 of this manual. A SWMR is not required to be submitted for preliminary/conceptual plans. The information contained in the SWMR is necessary for the City Engineer and Stark County SWCD (if applicable) to determine whether or not certain requirements of these regulations apply to the respective proposed development and to review and verify that the applicable requirements are met. All applicable design calculations and supporting documentation used to satisfy the storm water management requirements of this manual shall be included within the SWMR.

The Storm Water Management Report shall include, at a minimum:

1. A narrative/summary section which clearly describes the following:

   A. Existing and proposed land uses;

   B. Parcel size (in acres) in which the regulated activity is proposed to occur on (this is not necessarily the area of land disturbance);

   C. Total area (in acres) of land to be disturbed for the activity;

   D. Existing and proposed drainage conveyance and storage systems, including applicable names of streams, lakes, etc.;

   E. Calculation(s) determining the need or lack thereof for detention (see Section 3.12);

   F. Point(s) of analysis for estimating peak runoff rates and volumes;

   G. Size(s) of pre- and post-developed watershed(s) contributing to point(s) of analysis used for drainage design. This includes all contributing off-site areas;

   H. Methods used for estimating peak flow rates, runoff volumes, and required storage volumes, including any assumptions made and the names and versions of any computer programs used;

   I. Applicable post-construction water quality treatment practices;

J. Indication of whether the respective activity is within a Flood Hazard District according to the Official Zoning Map of the City of Canton, and if so, include the corresponding FEMA designated flood zones and Flood Insurance Rate Map (FIRM) and/or Floodway Map panel number. See *Chapter 1132: Flood Hazard District* of the City of Canton Codified Ordinances for further details;

K. Indication of whether there are or may be existing wetlands or other environmental concerns on the respective site;

L. Indication of types of storm water, environmental, or other permits that may need to be obtained for the proposed activity;

M. The date (amended version, as applicable) of the City of Canton Storm Water Management Manual that was used to determine storm water management requirements for the respective regulated activity/activities. This date is found on the cover page (page 1) of this manual.

N. Any waivers granted for any applicable requirements of this manual.

2. Summary (preferably a table) of the following applicable information, at a minimum, for all storms (2-, 5-, 10-, 25-, 50-, and 100-year events):

   A. Existing/pre-developed peak flows at existing point(s) where existing flows leave the site;

   B. Existing/pre-developed peak flows at point(s) where post-developed flows are proposed to leave the site, if different location than in "A" (this is necessary to determine detention applicability);

   C. Existing/pre-developed runoff volumes at point(s) where post-developed flows are proposed to leave the site (this is only necessary if storm water detention requirements apply);

   D. Descriptions of existing downstream storm water conveyance systems and/or water resources within approximately 200 feet of the respective site (or as otherwise required by the City Engineer) that will be used to convey post-developed runoff from the site and their *approximate* capacities. See Section 3.12.1.A.3 for details.

   E. Proposed/post-developed undetained peak flows at point(s) where post-developed flows are proposed to leave the site (this is necessary to determine detention requirements);

   F. Proposed/post-developed detained peak flows at point(s) where post-developed flows are proposed to leave the site (this is only necessary if storm water detention requirements apply);

   G. Proposed/post-developed runoff volumes at points(s) where post-developed flows are proposed to leave the site (this is only necessary if storm water detention requirements apply);

   H. Proposed water surface elevations in applicable storm water management facilities (this is only necessary if storm water detention requirements apply).

   I. Official flood elevations in accordance with all FEMA-designated flood zones and floodways on the site, as applicable.

3. Descriptions of the methods and detailed supporting calculations used for calculating existing and proposed peak flow rates, runoff volumes, and required detention volumes, including any assumptions made and applicable documentation or printouts of any computer programs used, as applicable. This information is required for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events.

4. Calculations and other supporting information showing how each storm water detention facility was designed, if applicable. This information should consist of:

A. Calculations showing how the volume capacity for each storm water detention facility was preliminarily estimated;

B. Stage – storage relationships/calculations for each storm water detention facility;

These show how much volume of storage is available at incremental elevations within the storm water detention facility. A stage interval of 1 foot is preferable but should not exceed 2 feet. The storage volumes at critical elevations within outlet structures (such as orifice and pipe inverts, weir crests, top of grates, emergency overflows, etc.) should be provided. The drainage drawings showing the storm water detention facility must provide contouring and/or any other detailed information needed to verify the stage – storage relationships.

C. Detention facility's outlet structure design information. This information shall consist of the following:

1. Outlet structure connectivity data;

This data must provide details of all orifices, weirs, pipes, grates, etc. proposed to be used for the outlet structure. All appropriate sizes, elevations, dimensions, areas, coefficients, descriptions, etc. of each component making up the outlet structure must be provided. The same details for any permanent water-quality structures that utilize storm water volume/rate control facilities must also be provided. This data may consist of a printout of the input data entered into the computer program used to design the outlet structure. Enough information must be provided to be able to verify the equations, coefficients, and other design values used.

2. A detailed sketch or drawing of each storm water detention facility's outlet structure.

This detail (which should be provided in the construction plan, at a minimum) must show the connectivity of all orifices, weirs, pipes, grates, etc. proposed to be used for the outlet structure. All appropriate sizes, elevations, dimensions, descriptions, etc. of each component making up the outlet structure must be provided. The same details for any permanent water-quality structures that utilize storm water volume/rate control facilities must also be provided.

D. Stage – discharge relationships/calculations for each storm water detention facility's outlet structure.

These show how much water is being discharged at incremental elevations within the storm water detention facility. A stage interval of 1 foot is preferable but should not exceed 2 feet. The discharges at critical elevations within the outlet structures (such as orifice and pipe inverts, weir crests, top of grates, emergency overflow, etc.) should be provided. Tailwater must be considered as it could affect the discharge rates of the outlet structure and therefore the outflow hydrographs. Where analysis of existing systems to determine tailwater would be excessive, appropriate tailwater assumptions may be made as approved by the City Engineer.

E. Routing calculations for each storm event.

These result in outflow hydrographs which give an indication of the time it takes to drain the facility as well as confirming that the allowable discharge criteria have been met. The routing calculations must be consistent with the outlet structure connectivity details and the emergency spillway design as shown on the construction plans. The following information must accompany the routing calculations:

1. Inflow hydrographs (for each storm event) into each storm water detention facility;

2. Outflow hydrographs (for each storm event) resulting from the routing calculations.

Note: For developments in which the Modified Rational Method is used to determine the required storage volumes, the "4-point trapezoidal hydrographs" that result from this method shall be used as the inflow hydrographs for routing calculations. Linear relationships shall be assumed along each of the three straight-line segments of these hydrographs.

F. Calculations of discharge velocities at the downstream outlet point and the supporting calculations and documentation for the design of appropriate velocity control measures.

### 3.6 Pre- and Post-Developed Drainage Maps

Pre- and post-developed drainage maps must be provided (preferably within the SWMR). Grading within new developments shall provide positive drainage for all areas, unless otherwise approved by the City Engineer, and indicated accordingly on the post-developed drainage map. The intent of these maps is to convey that the site as well as adjacent properties will not be adversely and unreasonably affected by runoff from the respective site for all storms up through the 100-year event.

Pre- and post-developed drainage maps shall provide the following, at a minimum:

A. Existing or proposed (as applicable) elevation contours with the contour interval not exceeding two feet. Contour lines shall be labeled with legible numeric text frequently enough to provide for easy interpretation of drainage patterns;

B. Natural and man-made drainage features and water resources;

C. Point(s) of analysis. Each point of analysis is an identified particular point on the earth's surface where storm water from the pre- and post-developed sites drain to or is otherwise evaluated. There is one point of analysis for each drainage area. For larger sites there may be several drainage areas and thus several points of analysis that have to be evaluated;

D. Delineated drainage areas (including off-site areas, as applicable) contributing to each point of analysis, including the size of each respective area (in acres). Enough contouring should be shown beyond the drainage divides to confirm the watershed boundaries;

E. The flow path of the hydraulically most distant point within each individual drainage area to the respective point of analysis. The segments of this path that are overland/sheet flow, shallow concentrated flow, open channel flow, and pipe flow shall be clearly indicated by using different colors, line types, or labeled accordingly. The upper and lower elevations along each respective flow segment and the length of each segment must be provided. Calculations showing how the time of concentration was determined for each area must be provided;

F. The various types of surface areas within each of the individual drainage areas and their associated runoff coefficients or curve numbers, etc. This shall be done by using different colors of shading or another pre-approved method. Calculations showing how weighted runoff coefficients or curve numbers were determined for each drainage area must be provided;

G. Indication of the downstream outlet(s) that will be used to convey flows from all proposed storm sewers/open channel systems must be provided. Calculations or assumptions of the capacity of this outlet must be provided to be used as a check for its adequacy to convey the proposed flows from the development;

H. The limits of any applicable existing or proposed FEMA-designated flood zones and floodways as well as Flood Hazard Districts on the respective site according to the Official Zoning Map of the City of Canton. All respective flood zones, floodways, and flood elevations must be labeled accordingly.

As required by the City Zoning Department as part of the individual home building permit for single or two-family residential development, an Individual Lot Grading Plan should be submitted to the City Engineer for

review and recommendation of applicable proposed downspout and sump pump discharge points and connections as well as general runoff patterns for the lot. Construction on the lot should not start until approval of the individual lot grading plan has been granted by the City Engineer. (These Individual Lot Grading Plans are not required to be submitted as part of the general subdivision development plans.)

### 3.7 Perpetuation of Existing Watercourses

Existing watercourses either originating in or flowing through a site shall be received onto and discharged from the site as nearly as possible with respect to the locations that existed prior to the applicable activity. Surface water draining from one watershed cannot be diverted, channeled, piped, or otherwise re-routed to another watershed unless otherwise approved by the City Engineer. For sites in which it is desired to "separate" off-site runoff, a storm water conveyance system must be provided and designed such that the existing contributing 100-year off-site discharge can be contained entirely within the conveyance system's section within the respective regulated site, and without presenting the possibility of causing adverse effects upstream or downstream of the respective regulated site.

### 3.8 "Adequate Outlet" Requirement

All storm water runoff from regulated sites shall be drained to an "adequate outlet". The adequate outlet shall consist of a stream, ditch, storm sewer, pond, lake, or other approved water body or water course having the capability to accommodate existing and proposed runoff rates and/or volumes without causing unapproved flooding or excessive erosion. If the adequate outlet is not accessible within the regulated site, the City Engineer may require that easements having adequate conveyance systems be obtained through the respective adjacent properties to provide means for the regulated site's runoff to ultimately discharge to the adequate outlet. The conveyance system from the site to the adequate outlet must consist of a culvert, storm sewer, or *defined* open channel having an obvious conveyance section able to adequately convey the respective 100-year post-developed flow from the site (calculations may be required). This reduces the potential for the formation of gullies and excessive erosion on lands that do not otherwise have defined conveyance systems. Certain measures may be required to protect the conveyance system and/or its outlet from erosion.

Other provisions *may* also need to be made, such as requiring more stringent detention criteria or making physical improvements to the downstream watercourse or drainage system, to ensure that the outlet can accommodate all post-developed runoff from the development and thus be determined to be "adequate" by the City Engineer. The City Engineer may require the design engineer to submit survey data and detailed calculations demonstrating the capacities (flow rate and/or volume) and/or the erosion potential of the downstream outlet in order to verify whether or not it can be justified as being "adequate".

### 3.9 Methods for Approximating Flow Rates

Methods that are acceptable to use to approximate peak flow rates of storm water runoff for various storm events are as follows:

1. Rational Method – suitable (and recommended) for small drainage areas (less than 100 acres);

2. Soil Conservation Service (SCS) Method;

3. USGS regression equations as described and referenced in the current edition of ODOT's L&D Manual – Volume II – Drainage Design;

4. Other methods may be used by the design engineer if pre-approved by the City Engineer.

### 3.10 Storm Water Conveyance Systems

1. Storm sewers – General standards

A. "Public Storm Sewers" shall be designed to flow "just full" for a 10-year frequency storm and shall satisfy a 25-year hydraulic grade line capacity unless otherwise approved by the City Engineer. Design guidance for storm sewers as well as their end treatments shall be in accordance with the current edition of the Ohio Department of Transportation's (ODOT's) Location and Design (L&D) – Volume II – Drainage Design Manual. Additional requirements pertaining to construction shall be in accordance with the current edition of ODOT's Construction and Materials Specifications.

B. "Private Storm Sewers" as well as their end treatments are *recommended* to be designed per the same criteria as "Public Storm Sewers" unless otherwise required by the City Engineer.

C. Major Flood Path criteria must be met in all cases, as applicable. The locations of storm sewers should coincide as much as possible with the route of the Major Flood Path. See Section 3.13 for details.

The following information is required:

A. A storm sewer drainage drawing must be provided. Additional field surveying may be required, when deemed necessary by the City Engineer, to ensure that this drawing is an accurate representation of actual field conditions. The overall scale of this drawing must be such that all of the following information is neatly presented and can be clearly read. The following information is required on the drawing:

   1. Existing and proposed elevation contours with the contour interval not exceeding two feet. Contour lines shall be labeled with numeric text frequently enough to provide for easy interpretation of drainage patterns;

   2. All of the individual surface areas that drain to each intercepting point of the storm sewer system must be clearly delineated and identified;

   3. The path of the hydraulically most distant point shall be indicated in each individual drainage area where the time of concentration is greater than 10 minutes. The portions of this path that are overland/sheet flow, shallow concentrated flow, open channel flow, and pipe flow shall be indicated by using different colors and/or line types. Calculations showing how the time of concentration was determined for each area where the time of concentration is greater than 10 minutes must be provided;

   4. The various types of surface covers and associated runoff coefficients and areas within each of the individual drainage areas contributing to each intercepting point must be clearly indicated. This shall be done by using different colors of shading or another method as long as the information can be easily read and understood. Calculations showing how weighted runoff coefficients were determined must be provided;

   5. Indication of the downstream outlet(s) that will be used to convey flows from all proposed storm sewer systems must be provided. Calculations or assumptions of the capacity of the downstream outlet(s) must be provided to be used as a check for its adequacy to convey the proposed flows from the site;

B. Storm sewer design calculations must be provided and must contain the same information required in the Storm Sewer Computation Sheet provided in the ODOT Location and Design (L&D) – Volume II – Drainage Design Manual. However, the design calculations do not have to be in the same format as the ODOT sheet. Hydraulic grade line calculations must be provided for the 25-year storm event for storm sewers under streets, in subdivisions, or in public drainage easements, or as otherwise required by the City Engineer. The starting water surface elevation for the required hydraulic grade line calculations must coincide with the downstream water surface elevation, if known. Otherwise, estimates of the downstream water surface elevations for the respective storm event must be made. Supporting calculations and/or other documentation used to determine the water surface elevations must be provided.

C. Pavement drainage for streets shall be designed in accordance with the criteria and requirements given in the current edition of the Ohio Department of Transportation's (ODOT's) Location and Design (L&D) – Volume II – Drainage Design Manual, with the following exceptions:

1. For Type 3 Concrete Curb and Gutter, the allowable depth of flow at the curb is permitted to be the top of the curb;

2. For catch basins located in street pavement sag vertical curves, both the grate and window opening capacities may be used for calculating the flow into the structure rather than the flow through the grate only;

3. As applicable, storm sewer inlet spacing/pavement spread calculations are required for all proposed public streets within proposed developments and are recommended for all proposed private streets. Pavement drainage calculations must be provided and must contain the same information required in the Gutter Spread and Inlet Capacity Computation Sheet provided in the ODOT Location and Design (L&D) – Volume II – Drainage Design Manual. However, the design calculations do not have to be in the same format as the ODOT sheet.

2. Open water carriers – General standards

Open water carriers as well as their associated linings and bank stabilization shall be designed and constructed in accordance with the design criteria and requirements given in the current edition of the Ohio Department of Transportation's (ODOT's) Location and Design (L&D) – Volume II – Drainage Design Manual, ODOT's Construction and Materials Specifications, or the Ohio Department of Natural Resources' Rainwater and Land Development Manual, as applicable.

The following information is required:

A. An open water carrier drainage drawing must be provided. Additional field surveying may be required, when deemed necessary by the City Engineer, to ensure that this drawing is an accurate representation of actual field conditions. The overall scale of this drawing must be such that all of the following information is neatly presented and can be clearly read. The following information is required on the drawing:

1. Existing and proposed elevation contours with the contour interval not exceeding two feet. Contour lines shall be labeled with numeric text frequently enough to provide for easy interpretation of drainage patterns;

2. All of the individual surface areas that drain to each intercepting point of the storm sewer/open channel system must be clearly delineated and identified;

3. The path of the hydraulically most distant point shall be indicated in each individual drainage area where the time of concentration is greater than 10 minutes. The portions of this path that are overland/sheet flow, shallow concentrated flow, open channel flow, and pipe flow shall be indicated by using different colors and/or line types. Calculations showing how the time of concentration was determined for each area where the time of concentration is greater than 10 minutes must be provided;

4. The various types of surface covers and associated runoff coefficients and areas within each of the individual drainage areas contributing to each intercepting point must be clearly indicated. This shall be done by using different colors of shading or another method as long as the information can be easily read and understood. Calculations showing how weighted runoff coefficients were determined must be provided;

5. Indication of the downstream outlet(s) that will be used to convey flows from all proposed open water carriers must be provided. Calculations or assumptions of the capacity of the downstream outlet(s) must be provided to be used as a check for its adequacy to convey the proposed flows from the site.

B. Open water carrier design calculations must be provided and must contain the same information required in the Ditch Computation Sheet provided in the ODOT Location and Design (L&D) – Volume II – Drainage Design Manual. However, the design calculations do not have to be in the same format as the ODOT sheet.

3. Culverts

Culverts as well as their end treatments shall be designed and constructed in accordance with the design criteria and requirements given in the current edition of the Ohio Department of Transportation's (ODOT's) Location and Design (L&D) – Volume II – Drainage Design Manual. Additional requirements pertaining to construction shall be in accordance with the current edition of ODOT's Construction and Materials Specifications.

The following information is required:

A. A culvert drainage drawing must be provided. Additional field surveying may be required, when deemed necessary by the City Engineer, to ensure that this drawing is an accurate representation of actual field conditions. The overall scale of this drawing must be such that all of the following information is neatly presented and can be clearly read. The following information is required on the drawing:

1. Existing and proposed elevation contours with the contour interval not exceeding two feet. Contour lines shall be labeled with numeric text frequently enough to provide for easy interpretation of drainage patterns;

2. All of the surface areas that drain to each culvert must be clearly delineated and identified;

3. Other information needed to support the respective method used to determine design flows for the culvert, or as otherwise required by the City Engineer;

4. Indication of the downstream outlet(s) that will be used to convey flows from all proposed culverts must be provided. Calculations or assumptions of the capacity of the downstream outlet(s) must be provided to be used as a check for its adequacy to convey the proposed flows from the site;

B. Culvert design calculations must be provided and must contain the same information required in the Culvert Computation Sheet provided in the ODOT Location and Design (L&D) – Volume II – Drainage Design Manual. However, the design calculations do not have to be in the same format as the ODOT sheet.

## 3.11 Bridges

Structures having a span of 10 feet or greater used to traverse water courses, ravines, roadways, etc. shall be considered bridges. Bridges shall be designed in accordance with the design criteria and requirements given in the current edition of ODOT's Bridge Design Manual. Additional requirements pertaining to construction shall be in accordance with the current edition of ODOT's Construction and Materials Specifications.

## 3.12 Storm Water Detention

1. Applicability

A. To determine if storm water detention is required for a regulated activity, the following calculations must first be performed (and provided in the SWMR):

1. "Calculation #1": Calculate the *existing* 2-, 5-, 10-, 25-, 50-, and 100-year *peak* runoff rates to the respective locations where *post-developed* flows will discharge from the site;

2. "Calculation #2": Calculate the *post-developed* 2-, 5-, 10-, 25-, 50-, and 100-year *peak* runoff rates at their respective points of discharge from the site (same locations as in "1");

3. Calculation #3": Identify and document the existing downstream storm water conveyance systems and/or water resources within approximately 200 feet of the respective site (or as otherwise required by the City Engineer) that will be used to convey post-developed runoff and calculate their respective capacities (conservative estimates may be acceptable).

   *For example: "The site will drain into an existing 120-ft long grassed roadside ditch with triangular cross-section that is approximately 2 ft deep and 3 ft wide with an average slope of 0.7% and an estimated capacity of 9 cfs. The ditch then discharges into a 60-ft long 15" HDPE culvert under the street having a slope of approximately 1% and an estimated capacity of 7 cfs (open channel flow conditions assumed). See calculations provided."*

   This information is crucial in identifying potential downstream capacity "choke points". It may indicate that even pre-developed flows from the site exceed downstream capacities and contribute to existing flooding problems. If such is the case, the existing downstream flooding could potentially be exacerbated by additional volumes from post-developed flows. Thus, more stringent detention criteria may need to apply;

B. Using the calculations above, storm water detention is required if *either* of the following apply, or as otherwise required by the City Engineer:

1. Any of the peak runoff rates in "Calculation #2" exceed those in "Calculation #1" for the same corresponding storm events;

2. Any of the peak runoff rates in "Calculation #2" exceed any of the capacities in "Calculation #3".

2. Waivers and Variances

Some or all applicable storm water detention requirements may be waived or modified by the City Engineer if any of the following conditions can be proven through detailed calculation and/or study approved by the City Engineer:

A. The proposed activity will result in new impervious areas less than or equal to 6,000 square feet and condition (B) applies as well;

B. The additional runoff rates and/or volumes resulting from the activity are negligible (as in the opinion of the City Engineer) or can be adequately accommodated by existing drainage systems, facilities, and/or water resources without adversely effecting other properties;

C. Storm water detention would actually exacerbate downstream flooding due to the timing of the peaks of the associated runoff hydrographs;

D. Alternative detention criteria have been established or recommended for the respective site.

3. Criteria

The flow rates and volumes of storm water runoff from a regulated site must be controlled so that the following criteria are met:

A. Generally, the peak flow rates of storm water from the site at appropriately selected points of analysis shall not exceed the peak flow rates of storm water from the pre-developed site at the same points of analysis for all storms up through the 100-year event.

The following cases may necessitate that other/more stringent storm water quantity management criteria apply:

1. If it is determined that there are "choke points" in the existing downstream storm water conveyance systems and/or water resources in which the respective flow capacities are less than pre-developed flows from the site.

2. If any portion of the site is proposed to immediately drain to a public street that has no existing drainage infrastructure available to tie into. In this case, unless other provisions are made to accommodate the post-developed flows, the City Engineer may require that all post-developed flows from the site be held at or below an appropriately selected rate to protect the public street from excessive flooding.

B. When a pre-developed site has more than one drainage outlet, the criteria used to determine the allowable peak flows from the site must be based on the respective pre-developed drainage areas contributing to those outlet points.

C. The peak flow of storm water from the site during construction at the point of analysis shall not exceed the peak flow of storm water from the pre-developed site at the same point of analysis for the same frequency storm. This requirement applies for all storms with a frequency of 10 years and less. For subdivision developments, when determining the area of land disturbed during construction, an allowance shall be included for lots that are also under construction at the same time the streets are being constructed.

4. Methods that are acceptable to estimate runoff volumes and to preliminarily estimate storm water detention volumes are as follows:

A. Modified Rational Method – suitable (and recommended) for small drainage areas (less than 30 acres). Note that volumes resulting from this method are <u>not</u> the same as those determined from calculating the difference in areas under pre- and post-developed "peak flow hydrographs" ("3-point triangular hydrographs") that can be created from the Rational Method. With the Modified Rational Method, the storm duration that *maximizes* the required storage volume must be determined and is typically <u>not</u> the same duration as the time of concentration. The Modified Rational Method uses a "3-point triangular pre-developed hydrograph" and allowable outflow data to produce a "4-point trapezoidal post-developed hydrograph". Calculations must be provided that show how the duration representing the maximized volume was determined. The City Engineering Department has a spreadsheet available for using the Modified Rational Method. The spreadsheet can be downloaded from the Engineering Department's website at www.cantonohio.gov/engineering.

B. Soil Conservation Service (SCS) Method

C. USGS regression equations as described in the current edition of ODOT's L&D Manual – Volume II – Drainage Design

D. Other methods may be used by the design engineer if pre-approved by the City Engineer

The pre- and post-developed volumes obtained from these methods are then typically compared for each storm event and the maximum difference is often used as the required storm water detention volume. However, this approach only results in a *preliminarily estimate* of the required storm water detention volume for layout purposes of the storm water detention facility. Detention routing calculations <u>must</u> still

be performed to determine the *actual* volume capacity requirements of storm water detention facilities to properly manage the storm water detention volume.

5. Storm Water Detention Facilities

Management of the volume and rate of storm water runoff from a site may be accomplished by using a storm water detention facility such as a detention, retention, or infiltration basin, underground storage tanks or pipes, storage or pavement areas, rooftop storage, or other means upon approval of the City Engineer.

"Off-line" storm water detention facilities are preferable over "on-line" storm water detention facilities because off-line facilities are easier to design and review, are smaller, and therefore will cost less to construct and maintain. If "on-line" detention is utilized, the detention facility must be designed to accommodate the volume of the *entire* contributing drainage area with the assumption that it is *fully* developed, in accordance with the current zoning map of the City of Canton and adjacent areas, as applicable.

In certain applications, alternative storm water detention facilities may be permitted and/or encouraged by the City Engineer.

A. General requirements

The following general requirements apply to all storm water detention facilities:

1. The design of all storm water detention facilities shall conform to all dam laws, permits, and other regulations, as applicable;

2. All supporting calculations must be provided in a Storm Water Management Report as described in Section 3.5;

3. Only above-ground detention facilities are acceptable for subdivision developments;

4. Underground detention facilities may, if approved by the City Engineer, be used for individual commercial or industrial developments only;

5. When parking areas are used for storage, the 100-year water surface elevation shall not exceed 6 inches at any point within the storage area and in no case shall it be within 6 inches of the finished floor elevation of any adjacent building. Slopes of parking areas used for storage shall be a minimum of 1% and a maximum of 10%;

6. When the storm water detention facility is to be used to also satisfy applicable post-construction storm water quality management, the following recommendations apply:

   a. The storm water detention volume should be "stacked" on top of the storm water quality volume. See Section 4.10 for details.

   b. The outlet invert elevations of any storm sewers or pipes discharging into a storm water detention facility should be set at or above the water quality volume elevation.

7. Outlet structures can consist of a single pipe (single stage) or multiple stages. In addition, the following apply:

   a. Multi-staged outlet structures should be constructed of reinforced concrete and be a fixed structure or non-operable. The structure shall be constructed such that public health, safety, and welfare are protected. Location of the outlet structure shall be selected for ease of maintenance;

b. For orifices or pipes less than 6 inches in diameter, anti-clogging measures (such as reverse flow pipes, trash racks, etc.) must be provided that do not reduce the designed discharge capacity of the orifice or pipe;

c. For multi-stage outlet structures, care must be taken in determining discharge rates through the various staged outlets since water could begin rising within the outlet structure itself. This rising water could have a tailwater effect on the discharge performances of the various stages. In order to avoid this potential tailwater effect within the outlet structure, the following recommendations should be implemented as best as possible:

   1. Keep the bottom elevation of the detention facility above the downstream 100-year tailwater elevation.

   2. Oversize the outlet structure's outlet pipe so that the 100-year routed flow depth in the outlet structure is below the outlet pipe's crown elevation. The 100-year water surface elevation should be the highest of:

      i. The 100-year head elevation (based on inlet control or orifice flow) of the outlet pipe;

      ii. The 100-year hydraulic grade line elevation in the outlet structure (thus downstream tailwater at the outlet of the outlet pipe would first need to be determined).

   3. Keep the invert of the primary stage outlet (and all others) above the crown of the outlet structure's outlet pipe.

d. For outlet structures such as ODOT standard catch basins with grates used as one of the discharge stages, making an assumption that the discharges through the grates can be approximated as a weir having a length of the perimeter of the grate is typically not accurate as this tends to over-estimate the flows. Rather, discharges through the grate should be based on Figure 1102-1 in the Ohio Department of Transportation's (ODOT's) Location and Design (L&D) – Volume II – Drainage Design Manual or another approved resource. Many computer programs allow for a user-defined rating curve to be entered;

e. Appropriate tailwater considerations at the downstream end of the outlet structure's outlet pipe must be made for each storm event and accounted for in the routing calculations and the design of the outlet structure. "Free outfall conditions", "no tailwater", or a "tailwater depth of 0.00 feet" are usually not acceptable as this inaccurately implies that the downstream drainage system or outlet will have no water in it during the respective storm events being considered;

f. Discharge velocities from outlet structures shall be controlled to prevent scouring and erosion of the downstream outlet. Appropriate measures, such as rock channel protection or other approved measures, must be provided where scour velocities are present.

8. Detention *routing* calculations must be performed.

   Routing calculations are <u>not</u> the same as stage-storage-discharge relationships or preliminary volume estimates used for the initial layout and preliminary sizing of the detention facility. Routing calculations result in an outflow hydrograph for each respective storm event. Proper detention routing calculations are based on an inflow hydrograph for each respective storm event and the facility's stage-storage-discharge relationships. Unlike preliminary detention volume estimates, routing calculations consider crucial factors such as tailwater effects, stage-storage-discharge relationships, hydrograph timing, etc. that could necessitate increasing the storage volume of detention facilities beyond the preliminary estimate. Sufficient information must be provided to indicate the outlet structure's configuration and performance.

Exception: Routing calculations are not necessary if *all* of the following conditions are met:

a. The entire volume under the 100-year post-developed hydrograph (determined by an acceptable method for estimating runoff volumes) is used to size the volume of the detention facility; and

b. The detention facility's stage-storage-discharge relationships clearly demonstrate that applicable detention criteria can still be met with respect to allowable discharge rates; and

c. A minimum of one (1) foot of freeboard is provided between the 100-year water surface elevation and the emergency spillway elevation; and

d. The upstream invert elevation of the outlet pipe from the detention facility's outlet structure is set above the 100-year tailwater elevation. If the 100-year tailwater elevation is unknown, conservative estimates must be used.

9. Care shall be taken to ensure that back-up of water from any detention facility does not result in or exacerbate unapproved flooding.

10. Access to outlet structures for maintenance and inspection shall be provided and shall follow current OSHA standards.

11. An as-built survey must be performed then signed and sealed (or stamped) by a registered surveyor and submitted to the City Engineer showing the locations, elevations, and other relevant information as required by the City Engineer for all storm water detention facilities that will be publicly owned or maintained or located within drainage easements.

B. Types of Storm Water Detention Facilities

1. Above-Ground Facilities

In addition to the general requirements for storm water detention facilities, the following requirements apply for the respective type of above-ground facility:

a. Detention Basins

1. Soil borings and testing, when required, shall be performed by an approved soils testing laboratory. A report certifying suitability of any on-site soils for use as embankment material and basin construction shall be submitted. A minimum 6-inch clay layer may be required where soils are highly permeable;

2. The grading of basins shall be such that it reflects the surrounding topography as best as possible;

3. For safety considerations, the interior side slopes of a basin shall not be steeper than a 4:1 slope unless a fence with at least one gate is installed around the basin's perimeter. The type of fence and gate installed as well as the size, number, and location of the gate(s) shall be approved by the City Engineer;

4. The bottom slope of a basin shall be a minimum of 0.75% at any location. Low flow channels should be designed into the bottom of the detention/retention basin. Paved low flow channels are not permitted. These bottom slope and low flow channel requirements do not apply to basins that are also designed as water quality basins;

5. The top width of the side embankments shall be a minimum of 8 feet for non-vehicular traffic and 12 feet for vehicular traffic;

6. An emergency spillway must be provided in case the outlet structure becomes blocked, the basin otherwise fails, or the capacity of the facility is exceeded. The following criteria apply:

   i. The emergency spillway shall, whenever possible, be constructed on virgin ground. When not possible, stabilization of the non-virgin soils must be approved by the City Engineer;

   ii. The emergency spillway must be designed to convey the 100-year post-developed rate that discharges into the detention facility (that is, the undetained 100-year post-developed rate);

   iii. The spillway must be set at an elevation that will not allow water to back up into applicable upstream, off-site storm water conveyance systems in which prior backups have not occurred;

   iv. The bottom elevation of the emergency spillway shall be a minimum of 1 foot below the lowest elevation of the top of the facility;

   v. At least 6 inches of freeboard must be provided. Freeboard is measured from the designed 100-year water surface elevation to the lowest elevation of the emergency spillway;

   vi. The emergency spillway must be lined with rip-rap or soil stabilization fabric to protect against erosion.

   vii. The alignment of the emergency spillway must be such that discharges through the spillway will be conveyed downstream in such a manner as to not pose a threat of flooding or nuisance to downstream buildings or properties.

7. All pipes through embankments shall have the appropriate number of anti-seep collars sized accordingly.

b. Retention Basins

The requirements listed for detention basins shall also apply to retention basins with the following additional requirements:

1. The outlet invert elevations of any storm sewers or pipes discharging into a retention basin should be kept at or above the permanent pool elevation.

2. Provisions shall be made to prevent the permanent pool of water in the retention basin from becoming stagnant, such as by installing aeration devices or implementing other measures as approved by the City Engineer;

3. Provisions should be made for draining the retention basin to allow for periodic cleaning or other maintenance;

4. At the City Engineer's discretion, an aquatic safety bench may be required having a minimum width of 10 feet, maximum cross slope of 3%, and maximum water depth of 1 foot along portions of retention basins adjacent to and within close proximity to public roadways and/or other vehicular traffic;

5. At the City Engineer's discretion, fences with gates may be required to be constructed around retention basins. If applicable, the type of fence and gate installed as well as the size, number, and location of the gate(s) shall be approved by the City Engineer.

c. Infiltration Basins

The applicable requirements for detention basins shall apply to infiltration basins with the following additional requirements:

1. Only soil classes with infiltration rates greater than 0.30 in/hr can be considered for use;

2. The infiltration rate for an existing soil must be tested and certified by a Soils Scientist.

2. Below-Ground Storm Water Detention Facilities

a. Underground storage tanks or pipes shall be of sufficient strength to carry all surface loads due to vehicles or other potential surface loading. The load-bearing capacity of the adjacent soil must also be taken into account to ensure surface loads can be supported.

b. An access hatch shall be provided of sufficient size to provide for maintenance access to the underground facility.

c. As-built information must be provided certifying the underground facility was constructed in accordance with designer/manufacturer construction specifications.

## 3.13 Major Flood Path

A "Major Flood Path" is a route within a site in which runoff from storms up through the 100-year event will travel along when the conveyance and storage capacities of the storm water management systems within the site are exceeded. Major Flood Path components can consist of, but are not limited to, the following:

- Streets and parking lots
- Swales
- Storm water conveyance systems
- Storm water detention facilities
- Natural creeks, streams, lakes, and other water resources

The easiest way to grasp the concept of a Major Flood Path is to ask "What path(s) will water from the 100-year storm take?" If the proposed site grading and buildings, etc. indicate that runoff from the 100-year storm will result in unwanted or unapproved flooding along the way, then steps should be taken to modify the route of the Major Flood Path or to relocate proposed buildings, etc. accordingly.

Another issue to consider is the fact that most storm sewers are designed for a 10-year storm event and sometimes a 25-year hydraulic grade line. Since the City's detention criteria requires that detention facilities be designed for the 100-year storm event, care must be taken to ensure the 100-year runoff can actually get to the detention facility. This can be accomplished by providing a Major Flood Path along the route of the storm sewer to direct all surcharged flows from the storm sewer safely downstream to the detention facility.

Depending on topography and runoff patterns, a site may have a single Major Flood Path or multiple Major Flood Paths. All sites should be designed with the intent of providing appropriate Major Flood Paths. This can usually be accomplished by ensuring positive and continuous grading and a safe drainage route to the downstream adequate outlet such that inundation of buildings and/or property damage along the way will be avoided.

1. Applicability

The Major Flood Path is required on all activities subject to Storm Water Quantity Management. There may be certain circumstances that prevent strict application in all cases. The City Engineer will use discretion in application of requirements in such circumstances.

2. Standards and requirements

   A. The combination of the Major Flood Path(s) and storm water conveyance system(s) shall have the capacity to carry runoff from the 100-year storm through the site to a detention facility or other adequate outlet. The site's post-developed grading plan should clearly portray that the 100-year runoff can be safely and acceptably conveyed through all portions of the site while meeting the intent of the Major Flood Path. If not, calculations indicating the capacity of the Major Flood Path may be required.

   B. Major Flood Paths should be considered in the initial design layout of the site.

   C. At a minimum, the Major Flood Path should start at the most upstream portion(s) of the respective storm water conveyance system(s) on the site.

   D. Where a street or parking lot is designated as a portion or all of the Major Flood Path, the depth of flow shall not exceed 6" at the edge of pavement.

   E. In general, the locations of catch basins should coincide as much as possible with the Major Flood Path.

   F. In subdivisions, when any portions of the Major Flood Path are located outside of a public road right-of-way, the City Engineer may require drainage easements to be provided of sufficient width to contain the estimated limits of the Major Flood Path. Calculations justifying the width of such easements may be required.

   G. If storm water detention facilities are required, Major Flood Paths should be designed so as to direct the 100-year runoff from any point within the development into the respective facility.

   H. In general, grading throughout the site and especially around buildings should promote positive drainage to a Major Flood Path.

   I. Depth of flow or pooling within Major Flood Paths shall not exceed levels that could cause inundation of building foundations or below-grade levels of non-flood-proofed houses, buildings, or other structures, or, as in the opinion of the City Engineer, unacceptable flooding of roadways.

## 3.14 As-Built Surveys

An as-built survey must be performed under the supervision of a qualified registered Professional Land Surveyor and submitted to the City Engineer showing the locations, elevations, and other relevant information as required by the City Engineer for all storm water management systems that will be owned or maintained by the City of Canton or located within public or private drainage easements.

## 3.15 Maintenance of Storm Water Management Systems

All storm water management systems approved pursuant to the requirements of this manual must be properly maintained in order to satisfy the purposes of Chapter 961 of the City of Canton Codified Ordinances. Depending on the drainage characteristics of the site, there may be documentation necessary to assist in the proper maintenance of storm water management systems on a site, such as Long-Term Maintenance Plans and/or Drainage Easements.

1. Long-Term Maintenance Plan (LTMP)

   A. Applicability

A LTMP shall be submitted to and approved by the City Engineer (and Stark SWCD, as applicable) for activities in which any of the following are required in accordance with this manual:

1. When Post-Construction Storm Water Quality BMPs are required per Section 4.10 of this manual (also see Section 4.12 for additional details);

2. When a private drainage easement is required for any part of the site's storm water management.

   A LTMP is necessary in this case because drainage easement grantees must be formally informed of the necessary maintenance expectations of and responsibilities for their storm water management systems so as to not allow the possibility of causing adverse effects to the easement grantor's property due to a lack of maintenance or negligence. Maintenance responsibilities described in the LTMP should also be included on the drainage easement.

Any necessary approvals by the City Engineer of plans or activities subject to Section 3 of this manual may not be granted until the LTMP is approved.

B. At a minimum, the content of LTMPs must:

1. Describe the site location (address, lot number, subdivision name, etc.) in which the respective BMPs/systems are located;

2. Name the party (person(s), association, or other entity) designated responsibility for the long-term operation and maintenance of the BMPs/systems, and state that in the absence or dissolution of the designated party, all responsibilities are collectively assigned to the owner(s), successors, or assigns of the respective site(s) or other designated lands;

3. Include contact information (name(s), title(s), address(es), telephone number(s), etc.) for the designated responsible party;

4. Describe the location, nature, and function of the respective BMPs/systems used on the site;

5. List the storm water management system(s) that will *directly receive* discharges from the respective BMPs/systems. *For example, "Receiving storm water management system for extended detention basin = Middle Branch of the Nimishillen Creek" or "Receiving storm water management system for 18" private storm sewer = City of Canton public storm sewer (MS4)", etc.*

6. Include any critical design and/or construction information necessary for the proper maintenance and performance of the respective BMPs/systems;

7. Describe how the BMPs/systems will be inspected, including a list of inspection tasks and frequency of inspections;

8. Describe how the BMPs/systems will be maintained, including a list of maintenance tasks;

9. Describe how the long-term operation and maintenance of the BMPs/systems will be ensured by the responsible party;

10. State that any pollutants collected by respective BMPs/systems are to be disposed of in accordance with local, State, and Federal guidelines;

11. Acknowledge the City's inspection and enforcement rights under Chapter 961 of the City of Canton Codified Ordinances;

12. Prohibit alterations of BMPs/systems unless otherwise approved by the City Engineer;

13. Include any other provisions or requirements for LTMPs (A.K.A. "Post-Construction Operations and Maintenance Plans" as per Ohio EPA's Permit for Storm Water Discharges Associated with Construction Activity under the National Pollutant Discharge Elimination System).

14. Be signed by the owner. Signatures of the City Engineer and/or the Stark SWCD may also be required.

15. Include a copy of any respective easement plat(s) associated with storm water management for the site.

2. Drainage Easements

A. Applicability

Permanent, recorded drainage easements shall be provided in the following cases, or as otherwise required by the City Engineer:

1. When the "adequate outlet" for the site's proposed drainage is not located on site and is not in public right-of-way. The easement shall be from the respective site to the "adequate outlet";

2. When, in the opinion of the City Engineer, a sufficient amount of runoff from public right-of-way is managed outside of public right-of-way before discharging to the "adequate outlet". The easement shall be from the public right-of way to the "adequate outlet" or as otherwise determined by the City Engineer;

3. When any portion of a respective site's storm water management system(s) is to be located off-site (on another property).

4. When, in the case of subdivisions, it is necessary to convey storm water runoff from uphill lots through downhill lots and the runoff path through such lots (based on final grading) will not drain through public streets or public drainage easements. This provided the ability for all lots within the subdivision to have positive and legal means to adequately discharge water from the sites. The location of the easement should coincide as much as possible with the respective Major Flood Path (see Section 3.13 of this manual)

5. When required by the City Engineer for post-construction storm water quality BMPs (see Section 4 of this manual).

B. Exemptions

In general, regulated activities in which the "adequate outlet" is located on-site and in which negligible (as in the opinion of the City Engineer) amounts of off-site runoff is conveyed to do not need to have drainage easements provided.

C. General standards and requirements for all drainage easements

1. The limits and respectable dimensions of drainage easements must be shown on an approved easement plat and/or otherwise described on an approved easement document, which must be recorded with the property deed. It is recommended that both a plat and document be recorded;

2. The limits and respectable dimensions of drainage easements must be shown on the applicable site plan, construction plans, and/or storm water pollution prevention plan for the respective site;

3. Drainage easements shall cover the footprint of any respective storm water detention facilities and/or storm water quality BMPs. The limits of the easement shall extend at least 20 feet beyond facility's/BMP's outside perimeter, unless otherwise required or approved by the City Engineer;

4. Drainage easement shall be a minimum of 20 feet in width and should be centered over any respective storm water conveyance systems, unless otherwise required or approved by the City Engineer;

5. Private utility/owner easements shall not overlap with drainage easements, except where such easements intersect or are otherwise approved by the City Engineer and respective private utility/owner;

6. Wherever possible, in subdivisions, the drainage easements shall be placed along and adjacent to property lines and in straight alignment without angle points;

7. Restricted grading provisions may be necessary as determined by the City Engineer;

D. "Public" versus "Private" drainage easements

Depending on drainage characteristics of the site and the origins of any runoff from off-site drainage areas that may be conveyed through the site, any necessary drainage easements will need to be recorded as either "Public Drainage Easement" or "Private Drainage Easement". Since various scenarios are possible for each site, the following shall be used as general guidelines, and the final determination of "public" or "private" in each case shall be subject to the City Engineer's discretion.

1. "Public Drainage Easements"

   a. Easements shall be recorded as "Public Drainage Easements" in the following cases:

      1. When the drainage area contributing to the respective storm water management system is substantially comprised (as in the opinion of the City Engineer) of runoff from public right-of-way;

      2. When considered by the City Engineer to be for the health and welfare of the general public or otherwise in the best interests of the City of Canton to be recorded as a "Public Drainage Easement".

   b. Additional standards and requirements for "Public Drainage Easements"

      1. If necessary, public access from the nearest public street shall be provided in the form of a separate access easement and shall coincide with the drainage easement where possible. This access shall consist of a gravel access drive or gravel base topped with topsoil, seed, and mulched (per City standards).

      2. Public Drainage Easements should include a Long-Term Maintenance Plan or at least language on the easement plat and/or easement document describing how long-term maintenance of the respective storm water management system(s) will be performed. This language should coincide with the information required for LTMPs.

2. "Private Drainage Easements"

   a. Easements shall be recorded as "Private Drainage Easements" in the following cases:

1. When the drainage area contributing to the respective storm water management system is substantially comprised (as in the opinion of the City Engineer) of runoff from private properties;

2. When considered by the City Engineer to not be for the health and welfare of the general public or otherwise to be in the best interests of the City of Canton to be recorded as a "Private Drainage Easement".

b. Additional standards and requirements for "Private Drainage Easements"

1. Private Drainage Easements shall include a Long-Term Maintenance Plan or at least language on the easement plat and/or easement document describing how long-term maintenance of the respective storm water management system(s) will be performed. This language shall coincide with the information required for LTMPs.

2. All Private Drainage Easements need to expressly state that the City has the right to enter and perform such functions as deemed necessary as described in Chapter 961 of the Codified Ordinances of the City of Canton.

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## Section 4 STORM WATER QUALITY MANAGEMENT

Storm Water Quality Management is the implementation of storm water management systems on a site for proper management of the quality of construction site and post-construction storm water runoff. Storm water quality management attempts to reduce or eliminate erosion and sedimentation caused by storm water runoff as well as the transportation of pollutants in storm water runoff to water resources.

### 4.1 Applicability

All development, soil-disturbing activities, or other activities that disturb greater than or equal to one acre of land, including projects less than one acre that are part of a larger common plan of development or sale, regardless of whether or not a site plan is required to be submitted per the Planning and Zoning Code of the City of Canton, shall be subject to all applicable requirements and specifications of Section 4 of this manual.

Section 4 and all subsections of Section 4 are not intended to provide an exhaustive list and descriptions of all requirements necessary to prepare plans, specifications, reports, calculations, and other information needed for applicable storm water quality management. The designer shall follow generally accepted standards for engineers, architects, and surveyors, as applicable. All requirements of Section 4 shall be designed and prepared in conformity with other sections of this manual, as applicable.

The City of Canton utilizes Stark SWCD to review Storm Water Pollution Prevention Plans and supporting calculations as well as conduct construction site inspections for storm water quality management on applicable sites. The Stark SWCD can be contacted as follows:

Stark Soil & Water Conservation District
2650 Richville Drive SE, Suite 103
Massillon, OH 44646
Phone: 330-830-7700 extension 5
Fax: 330-830-7731
Website: www.starkswcd.org

The City of Canton's requirements for storm water quality management are based on the Stark County Storm Water Quality Regulations, as written by the Stark SWCD.

### 4.2 Exemptions, Waivers, and Variances to Rules

1. Exemptions from storm water quality management

   Not all of the requirements of Section 4 may be applicable for all uses, activities, or projects, depending on the site's characteristics and the measures that may be used for the proposed management of the quality of storm water runoff from the site. As necessary, details are provided for conditions that may exist or criteria that may be met which may exempt a respective regulated activity from meeting certain aspects of storm water quality management.

   Specific Exemptions from the standards and requirements of Section 4 of this manual are as follows:

   A. Activities related to producing agricultural crops regulated under the Ohio Agricultural Sediment Abatement Rules (House Bill 88);

   B. Silviculture operations regulated under the Ohio Agricultural Sediment Abatement Rules (House Bill 88);

   C. Activities regulated by Ohio Agricultural Sediment Abatement Rules;

   D. Strip-mining and surface mining operations regulated under Ohio Revised Code 1513.01, 1514.01;

   E. Normal landscape maintenance activities and gardening/horticulture;

F. Any emergency project that is immediately necessary for the protection of life, property, or natural resources;

G. Any activity described by the EPA as being exempt from the current EPA NPDES Permit for Storm Water Discharges Associated with Construction Activity.

2. Waivers from meeting applicable requirements

If certain conditions exist which the owner/developer believes may make adherence to certain applicable storm water quality management requirements difficult or impossible, create unnecessary hardship, or otherwise do not satisfy the intent of the storm water quality management requirements, the owner/developer may submit a waiver request in writing to the Stark SWCD and City Engineer. The waiver request shall state the specific waiver sought and the corresponding reason(s) with any supporting information. The Stark SWCD and City Engineer will review the waiver request and respond accordingly, in writing, with an approval or rejection. Approval will only be granted upon satisfaction that waiver requests have been justified by the reasons provided. Adverse economic conditions shall not be a valid reason to grant a waiver.

3. Variances to applicable requirements

If certain conditions exist which the owner/developer believes may make strict adherence to certain storm water quanlity management requirements difficult or impossible, create unnecessary hardship, or otherwise do not satisfy the intent of the storm water quality management requirements, and the owner/developer wishes to modify the applicable requirement(s), the owner/developer may submit a variance request in writing to the Stark SWCD and City Engineer. The variance request shall state the specific variance(s) sought, the corresponding reason(s) with any supporting information, and the desired modification(s) to the respective requirement(s). The Stark SWCD and City Engineer will review the variance request and respond accordingly, in writing, with an approval or rejection. Approval will only be granted upon satisfaction that variance requests have been justified by the reasons provided. Adverse economic conditions shall not be a valid reason to grant a variance.

## 4.3 General Requirements

All activities meeting the applicability for storm water quality management requirements shall satisfy all applicable requirements and specifications of Section 4 of this manual as well as the following:

1. Current Ohio EPA NPDES Permit (No. OHC000003) for Storm Water Discharges Associated with Construction Activity. Note: The property owner or designee is responsible for filing a Notice Of Intent (NOI) and Notice Of Termination (NOT) to Ohio EPA accordingly;

2. Current edition of Ohio Department of Natural Resources' Rainwater and Land Development Manual;

3. Other applicable requirements as described or referred to within Chapter 961 of the City of Canton Codified Ordinances or this manual.

## 4.4 Performance Standards

Any person who undertakes any applicable land-disturbance activity shall ensure that soil erosion, sedimentation, increased pollutant loads, and changed water flow characteristics resulting from the activity are controlled so as to minimize pollution of receiving waters. All properties, buildings, infrastructure, roadways, and water resources adjacent to and downstream of the applicable activity shall be protected to the maximum extent practicable from erosion, sedimentation, and other storm water pollution caused by or resulting from the respective site in which storm water quality management is required.

Section 4 of this manual provides minimum standards, requirements, and recommendations. A person's compliance with the same shall not relieve such person from the duty of enacting all measures necessary to minimize pollution of receiving waters.

## 4.5 Acceptable Best Management Practices (BMPs)

1. BMPs used to satisfy storm water quality management requirements shall conform, at a minimum, to the current Ohio EPA NPDES Permit for Storm Water Discharges Associated with Construction Activity, the current edition of Ohio Department of Natural Resources' Rainwater and Land Development Manual, and the current requirements of Chapter 6111 of the Ohio Revised Code;

2. Any new or innovative BMP not found in the current edition of Ohio Department of Natural Resources' Rainwater and Land Development Manual and proposed to be used to satisfy any storm water quality management requirements must be reviewed and approved by Stark SWCD before incorporating them into an SWP3 or implementing on a regulated site;

3. "Green concepts", low impact development concepts, "smart growth", and other alternative planning, design, or development concepts that promote alternative approaches to storm water quality management and the preservation of natural resources may be encouraged or allowed upon the review and approval of the City Engineer and in accordance with applicable Planning and Zoning regulations.

## 4.6 Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan (SWP3) shall be prepared for all activities applicable to Section 4 of this manual. The following criteria shall be satisfied:

1. SWP3s shall be prepared by a registered Professional Engineer (PE) licensed to practice in the State of Ohio, a Certified Professional in Erosion and Sediment Control (CPESC), or a Certified Professional in Storm Water Quality (CPSWQ);

2. At a minimum, SWP3s shall meet all applicable requirements of Section 4 of this manual as well as SWP3 requirements described in the current Ohio EPA NPDES Permit for Storm Water Discharges Associated with Construction Activity;

3. Copies of the SWP3 must be submitted to both the City Engineer and the Stark SWCD no less than thirty (30) days before any proposed soil-disturbing activity. No applicable soil-disturbing activities shall occur without approval of the SWP3 by the Stark SWCD;

   A. The following information must accompany the SWP3:

      1. The Storm Water Management Report (SWMR) for the applicable activity, as required per Section 3.5 of this manual.

      2. One (1) full set of construction plans for the applicable activity.

      3. Proof of compliance with the current Ohio EPA NPDES Permit for Storm Water Discharges Associated with Construction Activity;

      4. A copy of Ohio EPA's acceptance letter for NPDES permit, including the permit number. (To receive Ohio EPA's acceptance letter, a Notice Of Intent (NOI) for coverage under Ohio EPA's general permits must first be submitted to Ohio EPA) ;

      5. Proof of compliance with any other applicable permits or laws, as required by the Stark SWCD and/or City Engineer.

B. The Stark SWCD must be notified by the City of Canton that the SWMR and site plan/construction plans have been approved before the Stark SWCD can approve the SWP3.

C. The Stark SWCD will review the SWP3 and approve, reject, or return for revision with comments and/or recommendations for revision within thirty-five (35) working days of receipt of said plan. Any SWP3 rejected because of deficiencies shall receive a narrative report stating specific problems and procedures for filing a revised plan. At the time of receipt of a revised plan, a new 35-day review period shall commence.

D. The Stark SWCD and/or City Engineer may require revisions to the SWP3 as necessary to achieve compliance with storm water quality management requirements.

E. The owner/developer shall pay any respective SWP3 review fees as required by the Stark SWCD.

4. Approved SWP3s shall remain valid for two (2) years from the date of approval or as otherwise allowed by Stark SWCD and/or Ohio EPA. A variance for an extension may be requested in writing before the 2-year termination or a revised/updated SWP3 may be submitted.

### 4.7 Pre-Construction Meeting

The owner/developer of the respective site shall meet with the Stark SWCD for a Pre-Construction Meeting no less than seven (7) days prior to soil-disturbing activity at the site and only after Stark SWCD has approved of the respective SWP3.

It is the responsibility of the owner/developer to contact the Stark SWCD to arrange a Pre-Construction Meeting.

### 4.8 Pre-Winter Stabilization Meeting

If the site is active or is planned to remain active through the winter months, a pre-winter stabilization meeting shall be held by the owner/developer prior to October 1st.

### 4.9 Monitoring for Compliance During Construction

1. Inspections and Violations

A. The owner/developer shall perform the first inspection of construction site storm water quality BMPs to certify that they comply with the approved SWP3 no less than two (2) working days after the start of the project. An inspection report confirming this should be completed by the owner/developer, and if requested, sent to the Stark SWCD confirming said inspection.

B. Following the initial inspection of storm water quality BMPs by the owner/developer, regular inspections will be performed by the Stark SWCD for compliance with requirements. If it appears that violations of any applicable requirements have occurred, the owner/developer will be notified accordingly in writing through a Notice Of Violation (NOV). The NOV will either establish a deadline for the owner/developer to rectify the violation(s) or require the submission of revised plans indicating appropriate corrective measures. If the violation(s) are not rectified accordingly, a second NOV will be issued. If the requirements of the second NOV are not met, the site may be referred by the Stark SWCD to the City of Canton for an immediate Stop Work Order. Note, however, that the City of Canton has the authority to issue a Stop Work Order at any time if, in the opinion of the City Engineer, conditions or circumstances warrant doing so without first issuing a NOV.

C. A final inspection will be performed by the Stark SWCD to determine if all applicable storm water quality management requirements and standards have been satisfied. The Stark SWCD will send a report to the City of Canton upon satisfaction that full compliance with the respective requirements and standards has been achieved.

D. The owner/developer shall pay all respective inspection fees as required by the Stark SWCD.

2. Regulated activities may be immediately considered in violation for any of the following reasons:

   A. Activities being conducted without an appropriate NPDES permit;

   B. Activities being conducted without an approved SWP3;

   C. Activities being conducted without other applicable permit(s);

   D. Activities being conducted without having a pre-construction meeting.

3. Written Notification to Stark SWCD upon Construction Completion

   Upon completion of all construction and final stabilization of the entire site, the owner/developer shall notify the Stark SWCD, in writing, that construction is complete and final stabilization, as specified in the current edition of Ohio Department of Natural Resources' Rainwater and Land Development Manual, has been achieved.

## 4.10 Post-Construction Storm Water Quality Management

1. Applicability

   Post-construction storm water quality management BMPs shall be provided, as applicable, per the current Ohio EPA NPDES permit for Storm Water Discharges Associated with Construction Activity. All post-construction storm water runoff quality management BMP designs shall be submitted to and approved by Stark SWCD before construction. All associated design calculations and necessary plans and details shall be provided with the Storm Water Management Report and Construction Plans submittal, respectively.

2. Exempt activities

   Activities otherwise regulated by Section 4 of this manual shall be exempt from meeting post-construction storm water quality management requirements if:

   A. It can be demonstrated that post-construction storm water quality management has been satisfactorily provided for the respective activity:

      1. As part of a larger common plan of development;

      2. By a local or regional post-construction storm water quality BMP.

   B. Proof can be provided that a waiver has been obtained from or exemption has been granted by Ohio EPA.

3. Public road and highway project requirements

   Public road and highway projects that fall under storm water quality management requirements may follow the post-construction storm water requirements and specifications provided in the current edition of ODOT's L&D Manual – Volume II – Drainage Design, unless otherwise required by Ohio EPA.

4. Additional standards and requirements:

   A. When a post-construction storm water quality management BMP is to be used to also satisfy applicable storm water detention requirements, the entire storm water detention volume should be "stacked" on top of the storm water quality volume. This means that the lowest invert elevation of any

orifice, weir, pipe, or other outlet used to discharge the storm water detention volume into the outlet structure must be set at or above the water quality elevation. There are three reasons that justify this requirement:

1. It generally keeps the storm water detention design and review separate from the post-construction storm water quality design and review.

2. It allows the BMP to continue to fully function as a detention facility in case the water quality orifice becomes clogged, resulting in a pool of water that fills the BMP to the lowest detention outlet elevation. Thus, until the clog is removed, the storage capacity reserved for the water quality volume is lost, resulting in only the capacity for the detention volume and the function of a storm water detention facility only.

3. It results in an additional factor of safety to the BMP/facility by providing additional storage capacity.

B. The *combined* storm water quality and storm water quantity discharge rates at the point of analysis shall not exceed allowable/pre-developed discharge rates for each respective storm event;

C. Post-construction storm water quality orifices shall not be less than 2½" in diameter, unless it can be demonstrated that specific measures will be implemented to prevent clogging. It is recommended that alternative BMPs be used rather than BMPs having orifices smaller than 2½" in diameter;

D. Unless it can be demonstrated that upstream on-site or off-site areas or connections will not be adversely affected, the outlet invert elevations of any storm sewers or pipes discharging into the BMP must be set at or above the water quality volume elevation. This prevents the slow-draining water quality volume from backing up into the storm sewer which may result in flooding or other nuisance to upstream areas and/or connections;

E. Any alternative structural storm water quality BMPs must be approved by the Stark SWCD and the City Engineer.

5. Additional guidance

Ohio EPA has prepared a Post-Construction Question and Answer Document for guidance regarding post-construction storm water management requirements of Ohio EPA's Storm Water Construction General Permit #OHC000002.

## 4.11 As-Built Surveys

An as-built survey must be performed by a qualified registered Professional Land Surveyor and submitted to the Stark SWCD and City Engineer showing the locations, elevations, and other relevant information as required by the Stark SWCD and/or City Engineer for all structural post-construction storm water quality BMPs. As-built surveys must be submitted prior to filing the Notice Of Termination (NOT) for the activity to accompany the approved Long-Term Maintenance Plan for the site's post-construction storm water quality BMPs.

## 4.12 Maintenance of Post-Construction Storm Water Quality BMPs

All permanent storm water quality BMPs approved pursuant to the requirements of Section 4 of this manual should be properly maintained in order to satisfy the purposes of Chapter 961 of the City of Canton Codified Ordinances. Depending on the drainage characteristics of the site and vicinity, there may be documentation necessary to assist in the proper maintenance of storm water management systems on a site, such as Long-Term Maintenance Plans and/or Drainage Easements.

1. Long-Term Maintenance Plan (LTMP)

A. A LTMP shall be prepared any time Post-Construction Storm Water Quality BMPs are required because:

1. The site's owner and/or other responsible parties need to be aware of and how to meet long-term maintenance expectations and responsibilities to ensure the proper operation and function of the post-construction storm water quality BMPs on the site. A LTMP assures the City that the owner and/or responsible party is aware of such expectations and responsibilities;

2. Ohio EPA's NPDES Small MS4 Permit requires the City of Canton to "...ensure adequate long-term operation and maintenance of [permanent post-construction storm water quality management] BMPs [that discharge to the City's municipal separate storm sewer system (MS4)]." The City believes that LTMPs assist in satisfying this permit requirement.

B. The LTMP should be submitted for review with the SWP3. The content of Long-Term Maintenance Plans necessary for post-construction storm water runoff quality management shall be the same as that described in Section 3.15 of this manual, at a minimum, or as otherwise required by Stark SWCD and/or the City Engineer.

2. Drainage Easements

The applicability, standards, and requirements for Drainage Easements necessary for post-construction storm water runoff quality management shall be the same as that described in Section 3.15 of this manual, at a minimum, or as otherwise required by Stark SWCD and/or the City Engineer.

## 4.13 Long-Term Inspection

Each year, the Stark SWCD performs periodic inspection of permanent post-construction storm water quality BMPs for maintenance status, even on sites that are no longer under construction. Notification of the inspections and any required actions are sent to the responsible party and the City of Canton. Inspections by the Stark SWCD do not relieve the responsible party from their obligation to inspect and maintain respective post-construction storm water quality BMPs.

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