## GUIDANCE MANUAL

# SURFACE & STORMWATER RULES OF THE DISTRICT

Guidance for sites adding ½ acre or more of net new imperviousness or disturbing 2 acres or more

MMSD
PARTNERS FOR A CLEANER ENVIRONMENT

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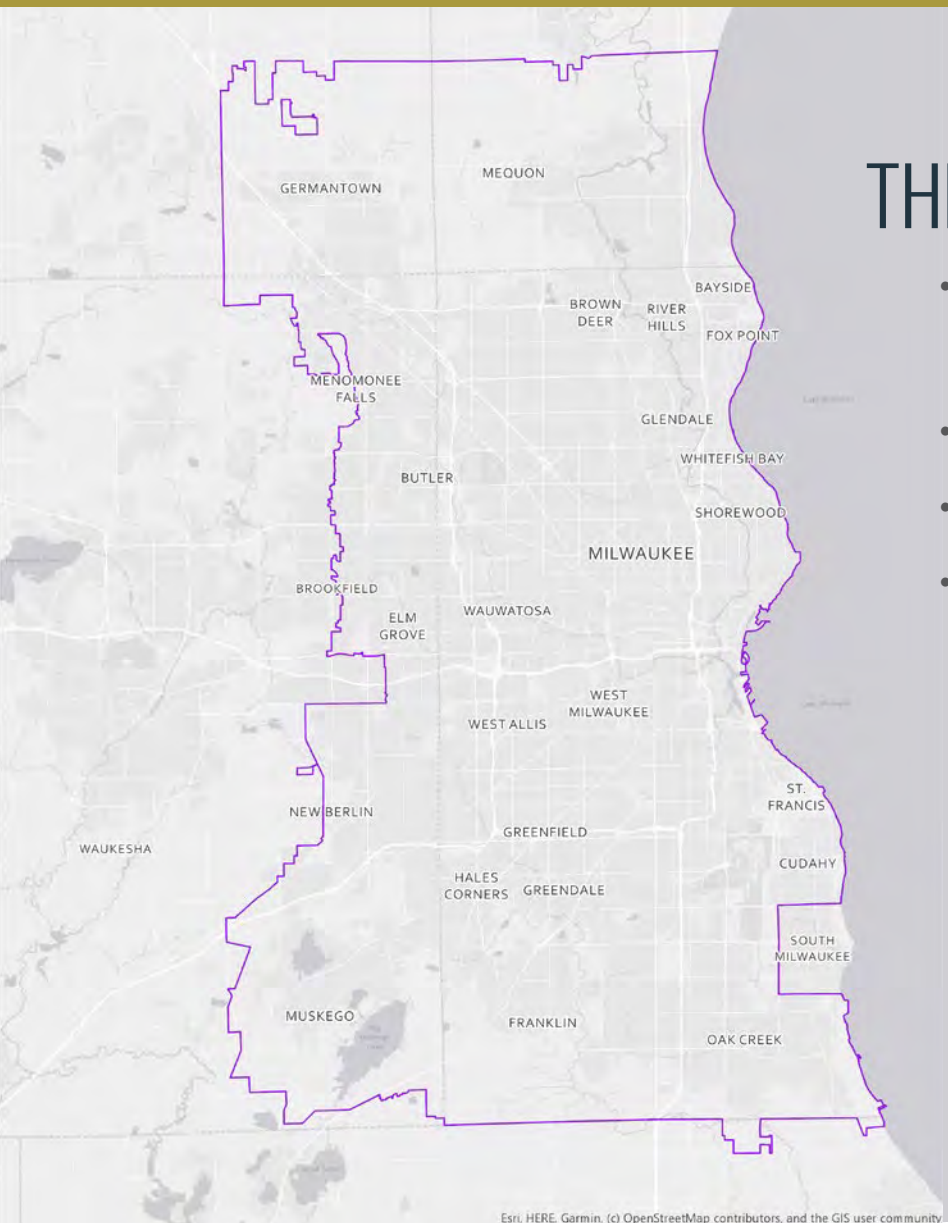
# OVERVIEW

**Chapter 13 Rules** are regulations that manage the increase in peak flow and runoff volume across the District's planning area.




## THE RULES

- Define stormwater management requirements for developments and redevelopments that meet or exceed minimum thresholds for net new imperviousness or land disturbance.
- Apply to all governmental units in the District's planning area.
- Describe the District's flood abatement activities.
- Define general requirements for local governments including:
  - Annual reports.
  - Notice of FEMA map revisions.
  - Obstruction prevention.
  - Watercourse connections.

**Figure 1**
The District's 411-square mile planning area

# THE DISTRICT'S ROLE IN STORMWATER MANAGEMENT

The District's mission is to *protect public health and the environment through world-class, cost-effective water resource management, leadership, and partnership.* In keeping with its mission, the District and its partners collaborate on projects that reduce flooding risks and stream-bank erosion rates caused by rainfall and snowmelt runoff.

The District has Watercourse Management Plans (WMPs) for six watersheds: the Kinnickinnic River, Lake Michigan Direct Drainage, Menomonee River, Milwaukee River, Oak Creek, and Root River (Figure 2). Watershed analyses showed development and redevelopment can increase peak runoff flows by two to three times and runoff volumes by 30% to 80%.

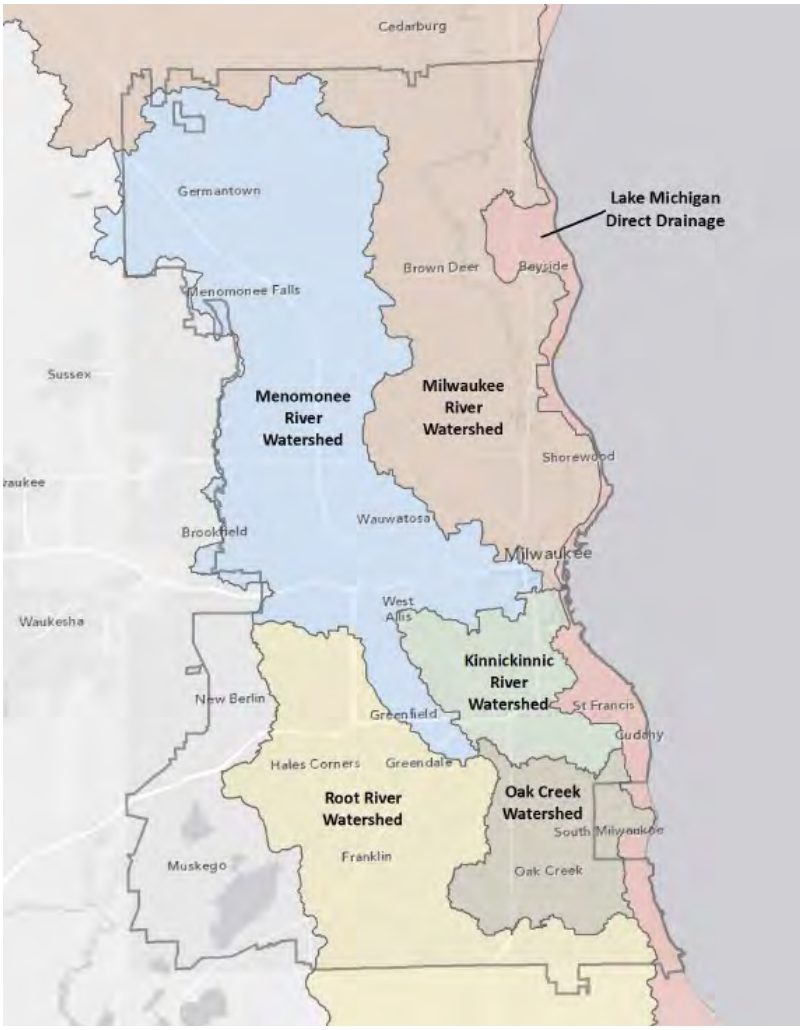



**Figure 2**

Watersheds in the District planning area: the Kinnickinnic River, Lake Michigan Direct Drainage, Menomonee River, Milwaukee River, Oak Creek, and Root River

# WHEN DO THE RULES APPLY?

Sites within the District planning area must comply with the Rule's runoff management requirements if:

- The development or redevelopment has a net increase of 5,000 sq ft or more of new impervious area.
- The redevelopment disturbs 2 or more acres but adds less than a ½ acre of net new impervious surface. Please note this applies to only redevelopments and not developments.
- None of the exemptions listed in Sec. 13.301(3) to (8) apply. Please refer to the Chapter 13 Rules.

# EXEMPTIONS

Four types of development and redevelopment are exempt from the Chapter 13 Rules, and these sites may not require runoff management. Please contact the District early in the deign process to discuss if an exemption is applicable. Before the plan is submitted for any municipal review, the Manager of Engineering Planning must approve the exemption.

## EXEMPTIONS LISTED IN SEC. 13.301 INCLUDE:

**A. Residential infill development – Sec. 13.301(6)**

These bullets are inclusive and the site must meet all of the requirements to be exempt.

- The site must be be 5 acres or smaller.

  AND
- The development must be exclusively residential.

  AND
- The new increase in imperviousness must be less than 20% of the total area of the site.

  AND
- Each boundary of the site must be contiguous to:
  - Sites that contain earlier development served by sanitary sewers, streets, or public water supply when the governmental unit receives the plans for new development.

    OR
  - Parkland, or other public land, a utility, or a watercourse.

**B. Recreational trails – Sec. 13.301(5)**

- Maximum width of trail is 10 feet.

  AND
- The trail must also have a pervious buffer that is at least 5-feet wide on each side.

**C. Public roadway or sidewalk construction or reconstruction – Sec. 13.301(7)**

- Increased impervious area less than ½ acre.

  OR
- Reconstruction of public roads does not change the area of impervious surface, regardless of area of disturbance.

If a project is adding ½ acre or more of net new imperviousness, then a SWMP will need to be submitted and approved.

**D. Parking lot reconstruction – Sec. 13.301(8)**

- Pavement maintenance activities (sealing, milling and overlaying).

  OR
- Pulverizing and compacting.

Parking lot projects that disturb down to the subgrade or bare soil must submit a SWMP if the area of disturbance is two acres or more.

# DISTURBANCE

## WHAT IS THE DISTRICT'S DEFINITION OF DISTURBANCE?

Disturbance is any construction activity that affects the subgrade or bare soil. Questions about disturbance are most frequently asked about parking lots (see Sec. 13.301(8)). In the case of parking lots, the area of disturbance excludes pavement maintenance activities such as sealing, milling and overlaying, or pulverizing and compacting.

## HOW IS THE TOTAL AREA OF DISTURBANCE DEFINED?

The total area of disturbance on a site is not cumulative. Unlike the total area of net new imperviousness (please see the next section), the summation of the total area of disturbance resets with each new redevelopment a site undergoes. In some cases, like shopping malls, a single redevelopment may span several years.

# IMPERVIOUSNESS

## WHAT IS IMPERVIOUSNESS?

Impervious surfaces have curve numbers equal to or greater than 98. Examples of impervious surfaces may include: pools, roofs, paved areas, compacted gravel, and stone areas.

On a case-by-case basis, the District determines if artificial turf, gravel, and porous pavement are considered impervious or pervious.

### GRAVEL

Gravel that experiences loading from vehicles is impervious. Gravel that is used for walking trails or other applications that have small loadings may be considered pervious.

### ARTIFICIAL TURF

Artificial turf with storage under the surface may be considered pervious. Municipalities are encouraged to call the District early in their review process.

### POROUS PAVEMENT

If porous pavement is providing storage with, for example, a large layer of rock with plenty of void space for water storage, the District may consider the surface to be pervious. If the porous pavement is placed on virgin compacted clay soil, the District will likely consider the surface to be impervious. Often, the District considers porous pavement to be pervious, with or without an underdrain, because it is usually designed to act like a pervious surface, providing storage for runoff, attenuating the flow.

Fondy Food Market, 2210 W Fond Du Lac Avenue

# COUNTING NET NEW IMPERVIOUSNESS

Sec. 13.302(3)(a) and (b) were adopted September 24, 2001. When a site adds a ½ acre or more of new imperviousness, all impervious area added before September 24, 2001 is existing. Impervious surface added after September 24, 2001 is new. When a site adds a total of a ½ acre or more of net new imperviousness, then a stormwater management plan (SWMP) is required.

# FOR SITES THAT REQUIRE A GI PLAN AND THEN A SWMP

When sites incrementally add impervious area by first reaching the 5,000 sq ft threshold and then later reaching the ½ acre threshold:

- Curve numbers (CN) for the SWMP's existing conditions are determined from the conditions right before any of the impervious surface that counts towards the ½ acre threshold was added to the site.

- The GI added for the previously-approved GI plan can be modeled. The detention volume or attenuation provided by that GI can then be used towards meeting the required detention or runoff release rate reductions.

# PHASED LAND DEVELOPMENT OR REDEVELOPMENT

The intent of the net impervious area threshold is to prevent incremental increases in imperious area from circumventing the stormwater management process. If impervious areas are added in phases, Chapter 13 looks at the total, cumulative amount of net imperviousness added after the applicable adoption date.

# WHY DO THE RULES REQUIRE RUNOFF MANAGEMENT FOR NEW IMPERVIOUSNESS?

When developments and redevelopments convert existing land convert existing land cover into impervious surface, then the site's runoff characteristics change. Infiltration is reduced, which increases both the amount of rainfall that is converted to runoff and the speed at which runoff enters storm sewer systems and receiving waterways.

The Rules seek to maintain existing flows and stages to:

- Minimize future flooding.
- Protect water quality and control erosion.
- Preserve the flood management capacity of constructed protection measures.

The pre- and post-development hydrographs (Figure 3) illustrate the dramatic increase in flow that can result from development. Stormwater management required by the Rules help control the timing or volume of runoff to preserve existing flows and stages downstream in the watershed.

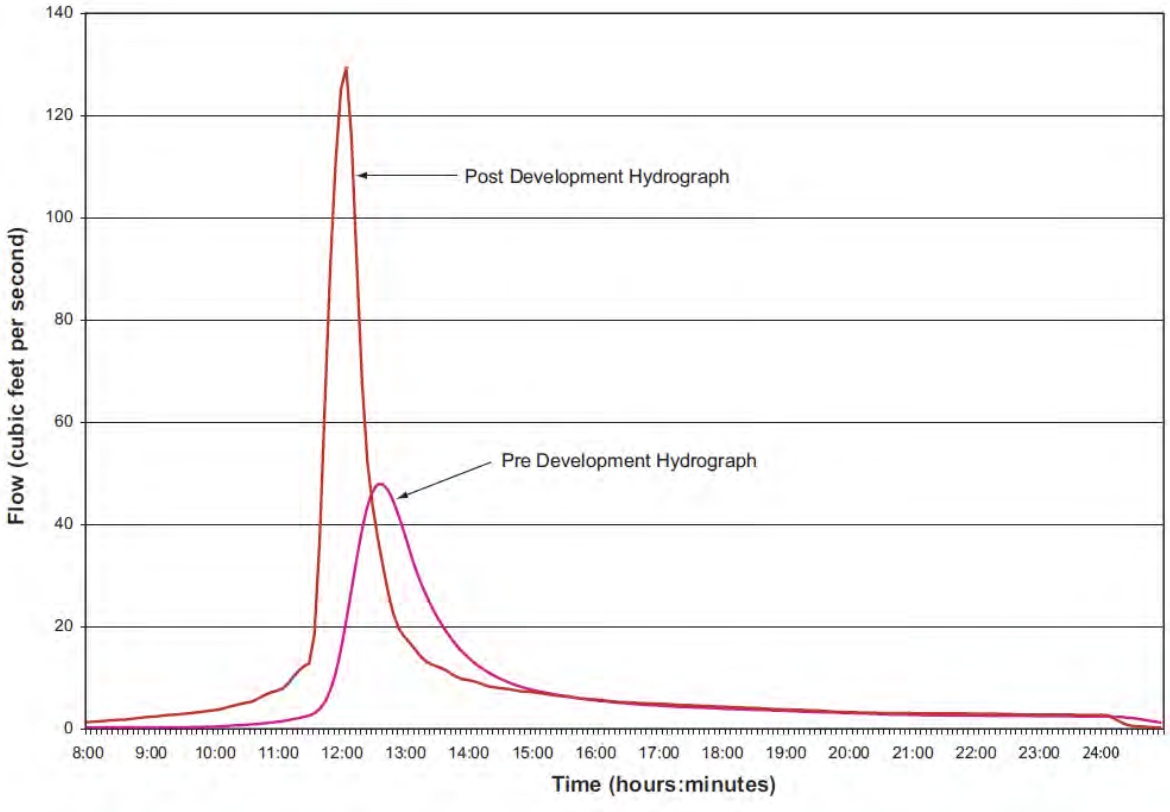



**Figure 3**

Example of pre- and post-development hydrographs

# SCS CURVE NUMBERS

The SCS curve number method is used in calculating the amount of rainfall that becomes surface runoff. The curve number is a measure of runoff potential that varies from about 30 to 100 (for examples, see Table 1). The CN for a site is based on soil type, pervious ground cover, and percent impervious area. Composite CN values are listed in TR-55 Curve Number Tables.

| Land Use Description | | Hydrologic Soil Group | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| Cultivated land: | | | | | |
| without conservation treatment | | 72 | 81 | 88 | 91 |
| with conservation treatment | | 62 | 71 | 78 | 81 |
| Feature or range land: | | | | | |
| poor condition | | 68 | 79 | 86 | 89 |
| good condition | | 39 | 61 | 74 | 80 |
| Meadow: | | | | | |
| good condition | | 30 | 58 | 71 | 78 |
| Wood or forest land: | | | | | |
| thin stand, poor cover, no mulch | | 45 | 66 | 77 | 83 |
| good cover | | 25 | 55 | 70 | 77 |
| Open spaces, lawns, parks, golf courses, cemeteries, etc.: | | | | | |
| good condition: grass cover on 75% or more of area | | 39 | 61 | 74 | 80 |
| fair condition: grass cover on 50% to 75% of area | | 49 | 69 | 79 | 84 |
| Commercial and business areas (85% impervious) | | 89 | 92 | 94 | 95 |
| Industrial districts (72% impervious) | | 81 | 88 | 91 | 93 |
| Residential: | | | | | |
| Average lot size | Average % of Impervious | | | | |
| 1/8 acre or less | 65 | 77 | 85 | 90 | 92 |
| 1/4 acre | 38 | 61 | 75 | 83 | 87 |
| 1/3 acre | 30 | 57 | 72 | 81 | 86 |
| 1/2 acre | 25 | 54 | 70 | 80 | 85 |
| 1 acre | 20 | 51 | 68 | 79 | 84 |
| Paved parking lots, roofs, driveways, etc. | | 98 | 98 | 98 | 98 |
| Streets and roads: | | | | | |
| paved with curbs and storm sewers | | 98 | 98 | 98 | 98 |
| gravel | | 76 | 85 | 89 | 81 |
| dirt | | 72 | 82 | 87 | 89 |

**Table 1**

Runoff curve numbers for selected agricultural, suburban, and urban land use (American Society of Civil Engineers (ASCE, 1997)

The CN for a specific site is calculated by taking a weighted average of the pervious and impervious area CN. Typical pervious area CN values are listed in Table 1. For simple, single subbasin sites, a composite CN should be used. For more complex sites, it may be appropriate to break the site into multiple subbasins. If the existing land use is agricultural, then use a maximum allowable curve number from Table 2.

| PREDOMINATE HYDROLOGIC SOIL GROUP | MAXIMUM PERVIOUS AREA CURVE NUMBER |
|---|---|
| A | 55 |
| B | 68 |
| C | 77 |
| D | 80 |

**Table 2**

Maximum curve numbers for existing conditions



# PROCEDURES FOR MEETING CHAPTER 13 REQUIREMENTS

## SITES ADDING ½ ACRE OR MORE OF NET NEW IMPERVIOUSNESS

Sites adding ½ acre or more of net new imperviousness can meet Chapter 13 through one of the following three procedures: unit release rate, volumetric, or watershed planning analysis.

### UNIT RELEASE RATE PROCEDURE

The unit release rate procedure limits outflows to a rate that does not increase stream flow or stage downstream. The flow draining from the site during the 1% probability (100-year) storm event is limited to a maximum rate of 0.50 cubic feet per second (cfs) per acre. For the 50% probability (2-year) storm event, outflows are limited to a maximum release rate of 0.15 cfs per acre. Any flow above the maximum release rates much be either stored on the site or infiltrated.

Pervious pavement Installation

## VOLUMETRIC DESIGN PROCEDURE

The total volume of runoff discharge from the proposed site must be equal to or less than the total volume of runoff discharging from the existing site during a prescribed critical time period for both the 1% and 50% probability (100- and 2-year) storm events. The critical time period is the time from slightly before the peak intensity of the design rainfall until the peak of the resulting hydrograph at the critical point in the watershed. The critical point in the watershed is the most often the watershed outlet. The critical point many be any point where the District determines that the flood stage increases must be prevented to protect structures or where stages are most sensitive to continued development.

## WATERSHED PLANNING ANALYSIS

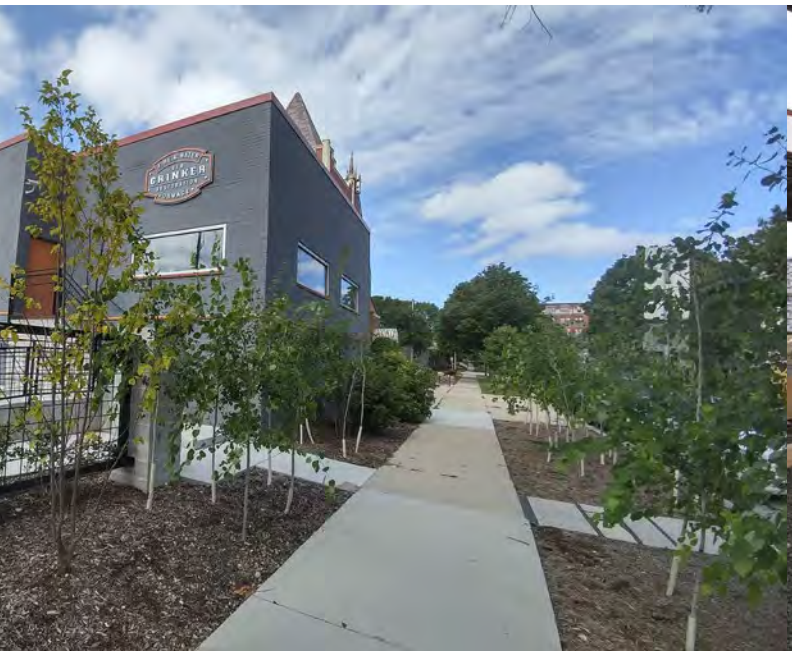
A comprehensive flood management plan can be developed for a subwatershed or watershed. A site can be covered by the comprehensive plan if it is in the plan's area and the plan:

- Has been approved by the District.
- Is based on future development and redevelopment conditions.
- Preserves runoff volumes during the critical time period of the watershed.
- Does not result in flow or stage increases downstream in the watershed.

Grinker native landscaping

# SITES ADDING 5,000 SQUARE FEET UP TO ½ ACRE OF NEW IMPERVIOUSNESS

Please refer to the *Guidance Manual for the Surface and Stormwater Rules of the District – Green Infrastructure Plans.*



Pervious paver install

# REDEVELOPMENTS DISTURBING TWO ACRES OR MORE

## RUNOFF RELEASE RATE REDUCTION PROCEDURE

The existing flow draining from the redevelopment site during the 1% probability (100-year) and the 50% probability (2-year) storm events is reduced by a percentage based on the area disturbed by demolition or construction.

| AREA OF DISTURBANCE BY DEMOLITION OR CONSTRUCTION | REDUCTION TO THE EXISTING RUNOFF RELEASE RATE |
|---|---|
| Between 2 acres and 3.5 acres | 10 % |
| From 3.5 acres to 5 acres | 15 % |
| Greater than 5 acres | 20 % |

**Table 3**

Required reductions to the existing runoff release rate for sites disturbing 2 acres or more

# STORMWATER MANAGEMENT PLANS

## REQUIRED RAINFALL DEPTHS

Detention requirements are determined from hypothetical 24-hour 50% and 1% probability (2-year and 100-year) rainfall events. The Rules require the use of the most recent rainfall depths and distributions as identified by the Southeastern Wisconsin Regional Planning Commission (SEWRPC). According to SEWRPC, the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 (NOAA, 2013) is the most current precipitation depth-duration-frequency information for the southeastern Wisconsin region. Sites can use NOAA Atlas 14, 24-hour location-specific rainfall depths or the mean rainfall depths by county. Government units have the option to require storm depths greater than NOAA Atlas 14 depths.

### NOAA ATLAS 14, 24-HOUR RAINFALL DEPTH (INCHES)

| COUNTY | 2-YEAR (50% PROBABILITY) | 100-YEAR (1% PROBABILITY) |
|---|---|---|
| Milwaukee | 2.64 | 6.06 |
| Ozaukee | 2.61 | 6.38 |
| Racine | 2.67 | 5.92 |
| Washington | 2.65 | 6.41 |
| Waukesha | 2.70 | 6.18 |

**Table 4**
Mean NOAA Atlas 14, 24-hour rainfall depths by county

# ACCEPTED RAINFALL DISTRIBUTIONS

Rainfall is arranged into hourly increments according to the SEWRPC 2006 Regional Rainfall Distribution or the Natural Resource Conservation Service (NRCS) distribution, MSE3. The SEWRPC 2006 Regional and NRCS MSE3 distribution can result in very different peak flows when used to evaluate objectives and assumptions. More information about these distributions is available from SEWRPC. As of May 2016, SCS Type II distribution is no longer accepted by the District. For the volumetric design procedure, the entire 24 hours of the design storm must be modeled.

## SEWRPC 2006 REGIONAL RAINFALL DISTRIBUTION

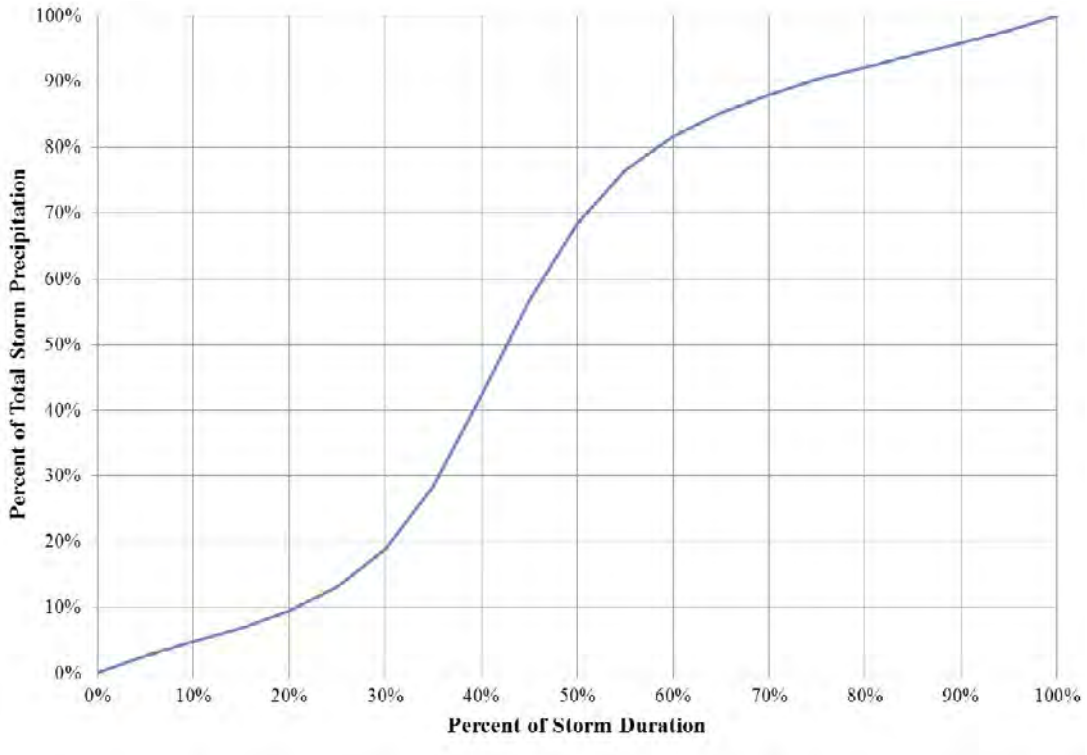



**Figure 4**
SEWRPC 2006 Regional Rainfall Distribution

## NRCS MSE3 RAINFALL DISTRIBUTION

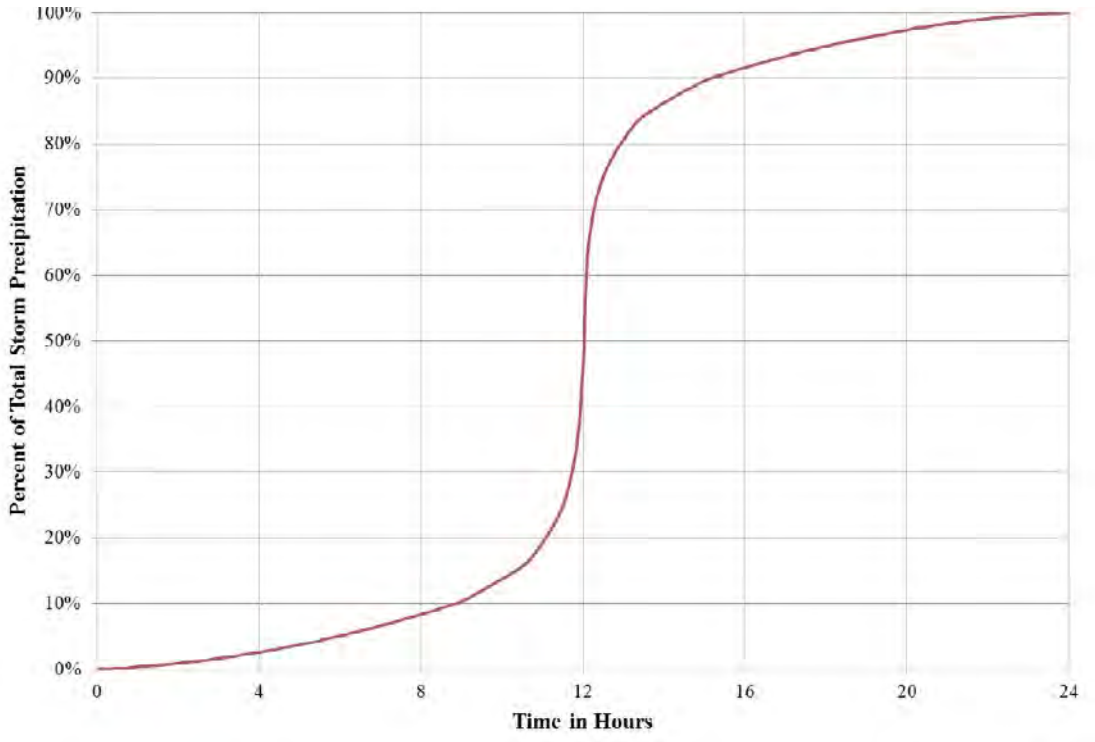



**Figure 5**
NRCS MSE3 Rainfall Distribution

## SEWRPC 2006 REGIONAL RAINFALL DISTRIBUTION

SEWRPC 2006 Regional Rainfall Distributions were developed for three- through 48-hour rain storms recorded at selected gauges within the SEWRPC seven-county region. The distributions were plotted as a percent of total rainfall (y-axis) versus percent of total time (x-axis) (see Table 5).

A critical duration analysis must be conducted to determine the proper storm duration for computing design flows. In a critical duration analysis, a range of storm durations are evaluated to identify the storm duration that produces the greatest peak flow or volume.

## SEWRPC 2006 RAINFALL DISTRIBUTION

| SEWRPC RECOMMENDED RAINFALL DISTRIBUTION | |
|---|---|
| PERCENT OF TOTAL STORM TIME | CUMULATIVE PREVENT OF TOTAL STORM RAIN |
| 0 | 0.0 |
| 5 | 2.7 |
| 10 | 4.8 |
| 15 | 5.9 |
| 20 | 9.5 |
| 25 | 13.2 |
| 30 | 18.9 |
| 35 | 28.5 |
| 40 | 42.2 |
| 45 | 56.6 |
| 50 | 68.4 |
| 55 | 76.5 |
| 60 | 81.6 |
| 65 | 85.2 |
| 70 | 88.0 |
| 75 | 90.3 |
| 80 | 92.2 |
| 85 | 94.0 |
| 90 | 95.8 |
| 95 | 97.7 |
| 100 | 100.0 |

**Table 5**
SEWRPC 2006 Rainfall Distribution

## NRCS MSE3 DISTRIBUTION

Natural Resources Conservation Service (NRCS) (Midwest/Southern States) MSE3 is an update to the Soil Conservation Service (SCS) Type II distribution. There are six rainfall distribution regions for the Midwestern and Southeastern States (MSE1 through MSE6). MSE3 is the distribution that fits the climatological data for al counties served by the District and is slightly more intense than SES Type II.

A nested distribution designed to generate extreme rainfalls at all durations when applied to a 24-hour storm was accomplished by centering each duration at 12 hours, starting from the 5-minute rainfall and continuing up to 24 hours. NCRS distributions should only be applied to 24-hour storms. These distributions can overestimate peak flows because thy push the envelop of statistical likelihood. Tabulated temporal distribution data and shapefiles for NOAA Atlas 14, Volume 8: Midwest States are available for download.

# HYDROGRAPH GENERATION

A unit hydrograph approach is often used to determine the distribution of runoff over time. Other methods are the kinematic wave and surface flow methods. The SCS dimensionless unit hydrograph method uses the basin lag time, which is calculated from the basin's time of concentration. The procedure for computing this parameter is documented in TR-55. The time increments used to develop the computed hydrograph must be less than ¼ of the basin lag time and cannot be greater than 15 minutes.

## WATERSHED OUTLET HYDROGRAPHS

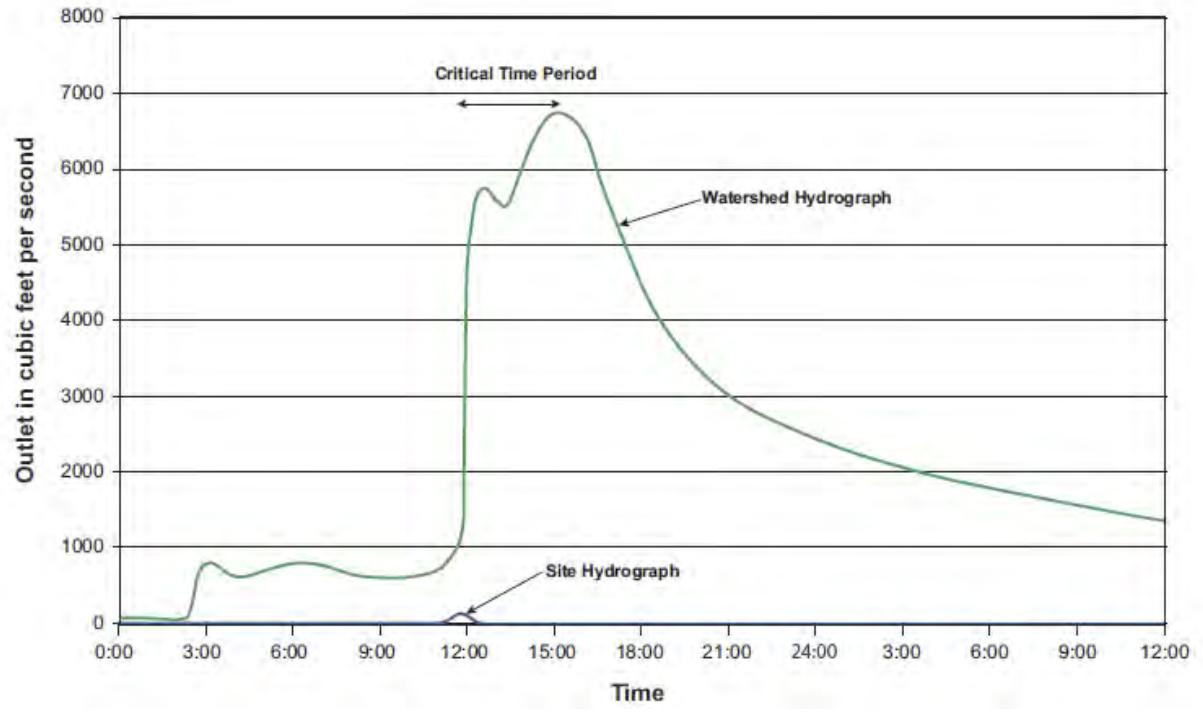



**Figure 6**
Example of a critical time period on a hypothetical hydrograph



# CRITICAL TIME PERIOD

Critical time periods apply to sites using the volumetric design procedure. The critical time period begins slightly before maximum rainfall intensity and ends at the time of pack flow at a critical downstream location (for a hypothetical example, see Figure 6). The selection of a critical location is based on sensitivity to future flow increases. Critical time periods for each major watercourse are listed in Table 6. All critical time periods start at 11:45.

## CRITICAL TIME PERIODS FOR WATERCOURSES IN THE DISTRICT'S PLANNING AREA

| BASIN | LENGTH OF CRITICAL PERIOD (HR.) |
|---|---|
| Fish Creek | 1.5 |
| Fox River | 12.0 |
| Kinnickinnic River | 1.75 |
| Lake Michigan Direct Drainage | 1.50 |
| Lincoln Creek | 12.0 |
| Menomonee River | 9.5 |
| Milwaukee River [1] | 12.0 |
| Oak Creek | 15.0 |
| Oak Creek [2] | 6.0 |
| Root River | 7.75 |

[1] Includes Brown Deer Park Creek, Indian Creek, South Branch Creek and Beaver Creek.

[2] Upstream of Puetz Road in the City of Oak Creek.

**Table 6**

Critical time periods for watercourses in the District's planning area

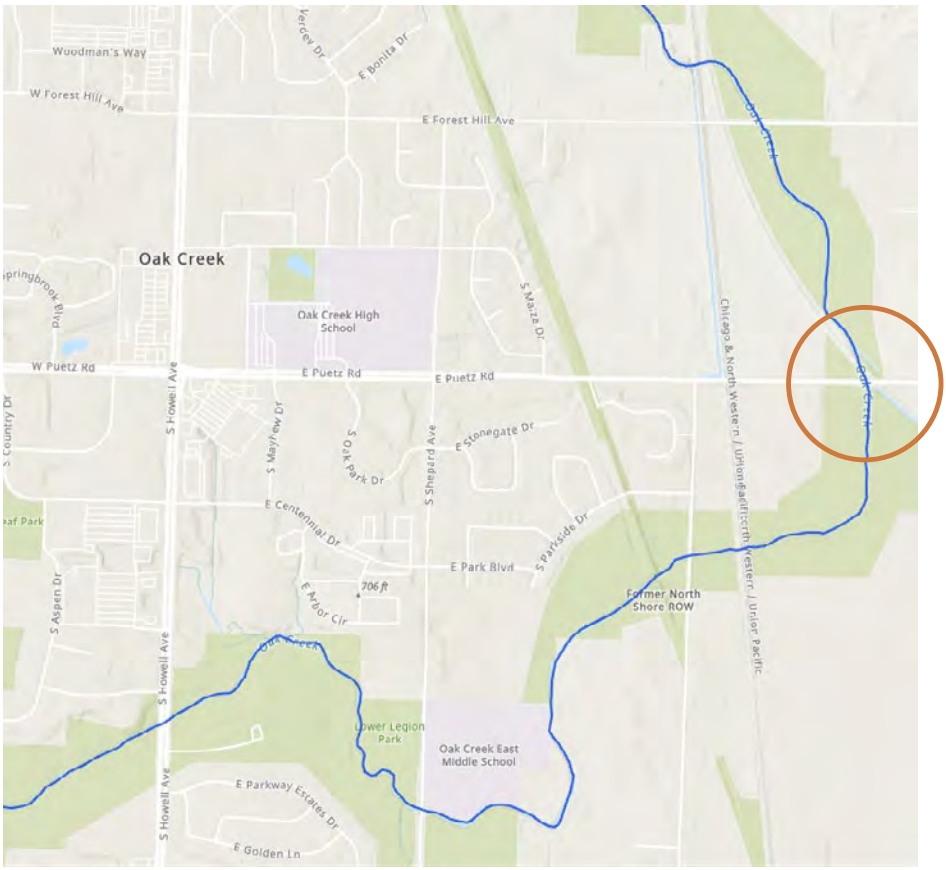



**Figure 7**
Oak Creek River upstream of Puetz Road in the City of Oak Creek

## OAK CREEK UPSTREAM OF PUETZ ROAD IN THE CITY OF OAK CREEK

Oak Creek (2) upstream of Puetz Road applies to areas upstream of the creek crossing in the City of Oak Creek. This 6-hour critical time-period is not limited to sites in Oak Creek. Any site upstream of this creek crossing is governed by 6-hour time period. Sites downstream of this crossing should use the 15-hour critical time period.

## THE BENEFITS OF CONTROLLING VOLUMES DURING THE CRITICAL TIME PERIOD

When the volume is controlled during the critical time-period, increases in downstream flows and elevations are also controlled (see Figure 8). The pre- and post-development hydrographs illustrate the flood hydrograph response, at the site level, when volumetric control is applied. The volumetric design procedure limits the outflow from the site so that the post-development volume released during the critical time period is the same or less than as the pre-development volume released during the same time period.

## HYDROGRAPH DURING CRITICAL TIME PERIODS

### HYPOTHETICAL EXAMPLE

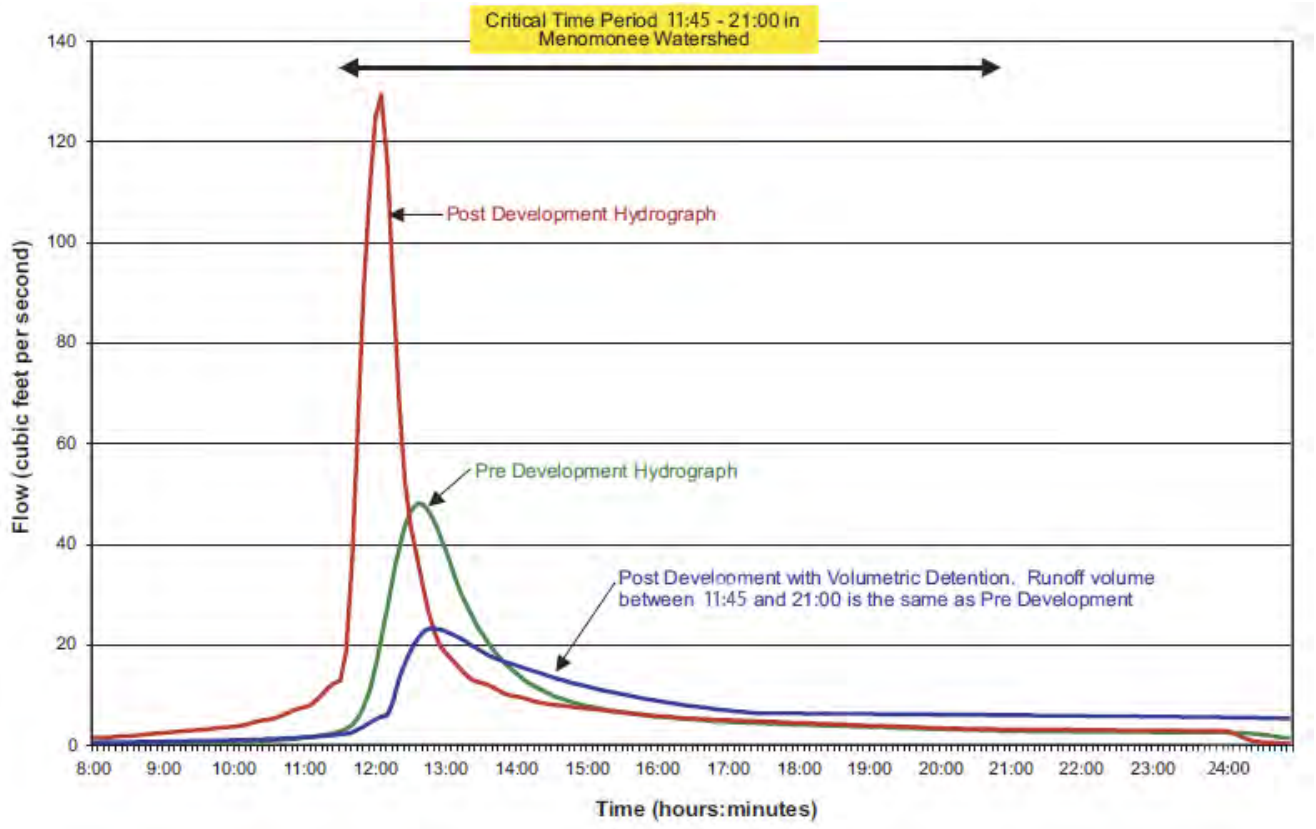



**Figure 8**

Hypothetical example illustrating the difference between pre- and post-development hydrographs during the critical time period

# ANSWERS TO COMMONLY ASKED QUESTIONS

## WHAT IS A SINGLE SITE?

Single site means one development or redevelopment by one owner at a time. The drainage area is either contained on the site or the developer has chosen to also include and manage an offsite drainage area.

## WHAT AREA IS USED FOR CALCULATING THE ALLOWABLE RUNOFF RELEASE RATE?

Areas of disturbance is only considered for redevelopments. For redevelopments, the drainage area for runoff management is only required to include the newly developed area in determining the allowable release rate. While the area of net new imperviousness is cumulative from the time the applicable section of the Rule was adopted, area of disturbance is per site redevelopment. In some cases, it is only necessary to provide detention for a portion of the site if:

- A limited contiguous portion of the site is being developed or redeveloped
  AND
- Runoff from the developing portion can be isolated from the runoff from the rest of the site.

# WHAT IS REQUIRED FOR SINGLE SITES WITH OFFSITE DRAINAGE?

When a development or redevelopment site has significant tributary inflow from upstream offsite properties, offsite flows can be either:

1. Routed around or through the development or redevelopment but only if the bypass flows do not increase downstream flows and do not impact other properties. This approach uses the unit release rate procedure (see Figure 8).
2. Captured in a single detention basin or other BMP. When flows from an offsite drainage area is captured, the stormwater management plan must account for all offsite drainage and an acceptable future land use condition.


**Figure 9**
Example of a single site with offsite drainage

# WHAT IS REQUIRED FOR MULTI-SITE DEVELOPMENTS AND REDEVELOPMENTS?

Multi-site developments or redevelopments may have runoff management facilities (sometimes called regional detention facilities). Multi-site facilities are sized to manage the runoff from the entire tributary area upstream plus multiple developments or redevelopments. Tributary developments or redevelopments must convey increased runoff flows and volumes to the multi-site facility without any adverse impacts. This often requires design and construction of overland flow paths and may require up-sizing of facilities (see Figure 9).

Regional detention basins are always designed according to the volumetric design procedure. The stormwater management system associated with these sites and the SWMPs must meet the following additional requirements:

- The ultimate development in the tributary watershed must be incorporated in the detention facility design.
- The overall plan must assure full volumetric control at each stage of development.
- The overall plan must include appropriate conveyance facilities to ensure safe drainage of the 1% probability (100-year) storm event flow to the BMP.
- At the time each site is developed or redeveloped, the SWMP for the new phase must conform to the original overall plan.

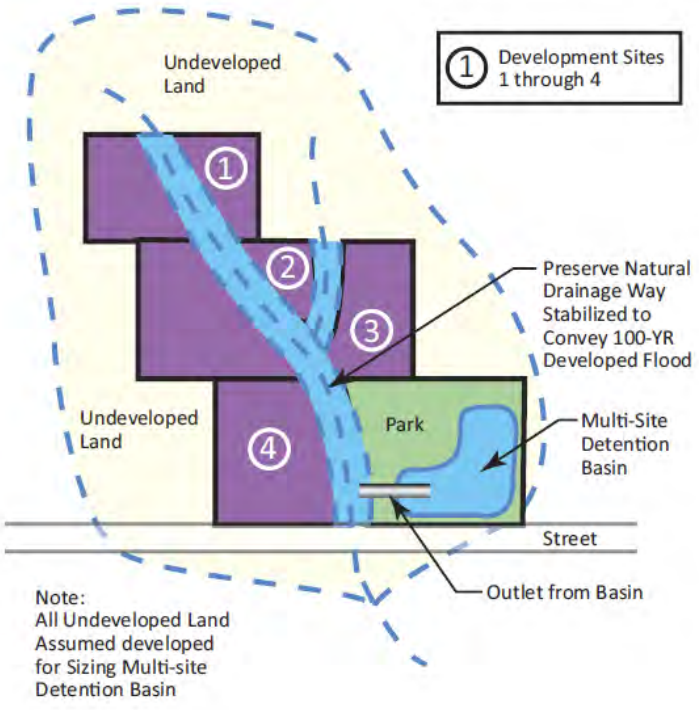



**Figure 10**
Example of flow paths through a multi-use site.

# WHAT IS REQUIRED FOR COMPREHENSIVE WATERSHED OR SUBWATERSHED PLANS?

A comprehensive watershed or subwatershed plan can be developed by a unit of government to provide regional detention that meets the standards of the Rules and must:

- Define potential future development served by the BMP.
- Demonstrate that there will be no downstream increases in stages or flows for the 50% and 1% probability (2- through 100-year) storm events.
- Preserve runoff volume during the critical time period.
- Provide sufficient conveyance capacity for upstream flow to reach the regional detention facility.
- Account for the entire upstream tributary area.
- Be functional prior to the construction of any new development.
- Demonstrate compliance with the Rules for each development stage.
- Use future land use conditions as defined by SEWRPC. When SEWRPC issues an update to watershed future land use modeling, the comprehensive plan must be changed to address the new flows.
- For instance, plans that currently use flows based on 2020 land use must be updated with SEWRPC 2035 land use

# SUBMITTALS

## SUBMITTAL AND APPROVAL PROCESS

Governmental units with local jurisdiction over the zoning and development process are responsible for implementing Chapter 13 Rules.

### SUBMITTAL PROCESS

#### STEP 1

The municipality determines if Chapter 13 Rules apply by looking at net new impervious area, area of disturbance, and if the site is within the District planning area.

#### STEP 2

The municipality reviews and approves the SWMP. For sites that require a GI Plan rather than a SWMP, please see the *Guidance Manual for the Surface and Stormwater Rules of the District – Green Infrastructure Plans*.

#### STEP 3

The municipality electronically submits SWMP for District review.

## STEP 4

The District reviews the plan to make sure the submittal is complete. Incomplete submittals are returned to the municipality. The District has 10 working days to review complete submittals. This time frame may be extended if the District notifies the local governmental unit about requested changes, missing information, or request a time extension. If the District requests missing information or changes, the review time frame resets after the plan is re-submitted, and the District is then allowed up to 20 days to complete the review (Sec. 13.303(9)).

## STEP 5

The District electronically provides the municipality with an approval letter.

## STEP 6

The municipality informs the site owner that the SWMP is approved.

# SUBMITTAL CHECKLIST

1. **Municipality cover letter stating that the SWMP has been reviewed and approved**
2. **The Chapter 13 cover sheet is available on the MMSD Municipal Portal**
3. **Narrative that includes:**
   - a. Project description
   - b. Project address
   - c. Procedure used to meet Chapter 13
   - d. Table listing pre- and post-development or redevelopment runoff volumes or runoff release rates
   - e. Local ordinance requirements or offsite drainage constraints that may be more restrictive than District's Rules
   - f. Stormwater management facility description
   - g. Site maps that show:
     - i. Boundary of the drainage area tributary to the project site
     - ii. General roads, pedestrian ways, access to site, adjacent land uses, existing man-made structures, and public facilities
     - iii. Existing and proposed contours at a minimum of two-foot intervals, extending a minimum of 200 feet beyond the limits of the proposed development and flow path for each subbasin
     - iv. Streams, lakes, ponds, existing drainage swales, floodplains, wetlands, natural storage, and other physical features within or adjacent to the project area
     - v. Locations of existing and proposed utilities, sewers, and water lines
     - vi. Areas to be cut or filled
     - vii. Proposed area of any construction or demolition activity that disturbs native soil or the soil under a base course or sub-base course
     - viii. Locations of proposed buildings, roads, parking areas, and other permanent structures
   - h. Percent void space of engineered soils

4 **Modeling that includes:**

a. Hydrologic and hydraulic design calculations including all assumptions and criteria for the existing and post-development conditions for the design storms

b. Maximum depth and elevation, design, volume, peak outflow for the 50% and 1% probability (2- and 100-year) storm events, area, and time to drain (based on hydrograph routing computations)

c. For volumetric design procedure calculations, existing and post-development hydrographs, critical time period and existing and post-development outflow volumes for the 50% and 1% probability (2- and 100-year) storm events during the critical time period

d. The full 24 hours of the design storm must be run for the volumetric design procedure

e. For multi-site facilities, analysis of ultimate development in the tributary watershed, consideration of multiple phases of construction, use of the volumetric procedure, identification of required drainage improvements between the developments or redevelopments of the multi-site facility, and effective conveyance to multiple storage facilities

f. For plans using the volumetric design procedure, please include a summation of the time steps for the existing and proposed volumes during the critical time period

5 **Operation, maintenance, and inspection plan**

6 **Existing and proposed conveyance system including:**

a. Design drawings and details for all conveyance facilities

b. System inlet details

c. Outlet and outfall designs and details

d. Hydraulic grade line calculations and plots developed in the design of the stormwater facilities

e. Calculations of outlet conditions at site discharge point

# QUESTIONS ABOUT CHAPTER 13?

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# STORMWATER MANAGEMENT PLANS

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