IOWA STORMWATER MANAGEMENT MANUAL

1.04 STORMWATER MANAGEMENT CRITERIA

IOWA Department of Natural Resources

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Refer to the glossary for words in **bold black text.**
Some items of emphasis are in **bold blue text.**

1.04-1 STORMWATER MANAGEMENT CRITERIA

A. DEVELOPMENT CRITERIA

INTRODUCTION

This section presents a set of recommended minimum criteria for stormwater management for development activities in the State of Iowa. **These criteria can be used by communities, counties and other regulatory jurisdictions or agencies to develop and enforce local policies and ordinances.** These criteria provide an integrated approach to address both the water quality and quantity issues associated with stormwater runoff due to urban development.

Water quality and quantity issues can be addressed by:

- Following Better Site Design principles, which maximize the use of site design and nonstructural methods to reduce the generation of runoff and pollutants
- Managing and treating stormwater runoff though the use of stormwater controls
- Implementing other pollution prevention practices to limit potential stormwater contaminants

Typically, state and federal agencies do not provide direct review or oversight of "post-construction stormwater management". Post-construction stormwater management is using strategies and/or practices that remain in place (permanently) after new developments are constructed. These are intended to reduce the potential for negative impacts caused by changes in stormwater runoff patterns.

There are state and federal permitting processes related to pollution prevention during site construction and other environmental and floodplain impacts, but those don't typically involve the review and approval of the design of stormwater post-construction management practices. Therefore, **local jurisdictions (cities, counties, etc.) are left to adopt and enforce post-construction management policies and ordinances.**

The minimum guidelines outlined in this section are designed to assist local jurisdictions in development of public policy. These guidelines may be used by any jurisdiction, regardless of size. However, some jurisdictions meet federal and state criteria to be regulated through the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit program. MS4 communities in Iowa often have specific responsibilities to develop and enforce various water quality and quantity standards that are established through their state MS4 permit requirements.

Before starting a new development project, property owners and their design consultants should consult with the local review authority to understand the local requirements they have adopted. Regardless of local requirements, **this manual advocates for designers to use these stormwater management criteria as a guideline for best design approaches.** Even if there are no local requirements, employing these guidelines will benefit the health, safety and welfare of the public by reducing the potential for channel erosion, flood damages and negative water quality impacts.

APPLICABILITY

Ordinances or policies that are adopted by local jurisdictions should define the criteria where a new development or redevelopment project would require compliance with their post-construction regulations.

- Applicability usually has some type of land area threshold. Some area threshold examples include 5,000 square feet, 10,000 square feet or one acre (43,560 square feet).
- The threshold limit is usually based on either **impervious area** created, land area disturbed or site area.
- Some jurisdictions have set different thresholds or design standards for new developments compared to redevelopment projects.

NOTE

See pages 2-4 for more information about Better Site Design principles.

NOTE

See the Construction Site Pollution Control heading of this section (on page 14) for more information about construction site stormwater management.

Local policies and ordinances should define the requirements for new developments and redevelopments and, in some cases, special requirements for hotspots may be considered.

DEFINITIONS

New development is defined as land disturbing activities and/or creation of impervious surfaces on a previously undeveloped site (a site without significant structures or impervious surfaces).

Redevelopment is defined as any of the following:

- Creation or addition of impervious surfaces
- Replacement of impervious surface not part of routine maintenance
- Land disturbing activities associated with either of the items listed above

Redevelopment is not intended to include maintenance activities, exterior remodeling or life cycle replacements that do not result in a net increase in impervious surfaces, compared to site conditions that exist immediately prior to project construction.

A **hotspot** is defined as a land use or activity on a site that produces higher concentrations of metals, hydrocarbons, hazardous materials or other pollutants than are normally found in urban stormwater runoff. Examples of hotspots include gas stations, vehicle service and maintenance areas, salvage yards, material storage sites and garbage transfer facilities.

STATE OR FEDERAL LIMITATIONS

In 2024, the Iowa Legislature passed new regulations that limited how cities and counties could enforce stormwater post-construction requirements. This action demonstrates that state and federal laws may affect how local jurisdictions enforce stormwater regulations. When such jurisdictions adopt or amend ordinances or policies based on the criteria and guidelines set forth in this manual, there should be a clause included that says that such standards will be enforced to the extent allowed under state and federal law. In that way, changes in state or federal law may not require repeated updates to local regulations.

SPECIAL REQUIREMENTS

New development or redevelopment in critical or sensitive areas, or as identified through a watershed study or plan, may be subject to additional performance and/or regulatory criteria. Such projects may need to utilize structural controls to protect a special resource or address certain water quality or drainage problems identified for a drainage area.

B. MINIMUM RECOMMENDED GUIDELINES

The following guidelines should be considered when establishing the recommended minimum stormwater management requirements for new development or redevelopment sites.

#1 – STORMWATER BETTER SITE DESIGN

Land development and associated increases in impervious cover alter the hydrologic response of local watersheds and increases stormwater runoff rates and volumes. These changes increase the risk of flooding, stream channel erosion and sediment transport and deposition. To better mitigate these effects, plans to address stormwater management need to be considered early in the design process. With a basic understanding of the proposed land use and site characteristics, a basic “game plan” of stormwater management can be created. Procedures in this manual can be used to calculate preliminary estimates of stormwater management volumes, which can allow designers to reserve proper space for practices when developing early design concepts.

Designers should implement stormwater Better Site Design and/or "low impact development" (LID) design techniques. These approaches can reduce the amount of stormwater runoff and pollutants that are generated, provide for natural on-site control and treatment of runoff, and optimize the location of stormwater management facilities.

Better site design concepts can be viewed as both water quantity and water quality management tools and can reduce the size and cost of required structural stormwater controls. As part of the early planning process, consider the following methods to reduce the negative stormwater impacts of urban development:

- **Evaluate natural resources before preparing a conceptual plan.** For a given site, complete a natural resource inventory, based on site visits and available online information. Review existing soils, vegetation, topography, wetlands, prairie landscapes, streams, floodplains and any other feature which could influence design. Evaluate areas which could be set aside to preserve high-quality soils, avoid excessively steep slopes, preserve wetlands, high quality woodlands or savanna, and/or prairie remnants and provide for adequate stream buffers. An effective "buildable footprint" can be created by considering these features. Develop a plan which avoids unnecessary disturbance to such sensitive areas. The ISWMM webpage includes examples of this type of natural resource inventory at the link below:

  https://www.iowadnr.gov/Portals/idnr/uploads/water/stormwater/manual/nrinv-maps.pdf

- **Prepare a soil management plan (SMP).** The SMP identifies where soils and vegetation will not be disturbed and the methods used to restore the health (quality) of disturbed or compacted soils. The plan should include technical assessments such as Web Soil Survey data and geotechnical reports (when available). Infiltration tests are required for areas where infiltration **BMPs** are planned (also consider how these soils may be affected by site construction). The SMP should identify where soils will not be disturbed. It should assess the existing depth of topsoil and make a plan for how that soil will be preserved and replaced. It needs to identify stockpile placement and methods used to replace or remediate the soils. Soil conditions shall be considered when preparing a site conceptual layout and when selecting and designing stormwater BMPs. The soil management plan should be integrated into any Stormwater Pollution Prevention Plan (SWPPP) prepared for the site.
- **Consider options which limit the area to be disturbed.** Once an area is disturbed, it can be difficult and expensive to prevent erosion and re-establish desired vegetation on that landscape. To the extent possible, create layouts for the desired use which minimize the disturbed area. If a project is to be built in phases, only disturb those areas necessary to build each phase. This limits the time that soils are exposed to erosion.
- **Review topography and work with the lay of the land.** Consider design options that reduce cuts and fills. Mass grading with heavy equipment compacts soil to the extent that it reacts almost like paved surfaces during rain events. Reducing cuts and fills will lessen subsoil compaction and the need for soil quality restoration techniques. Avoid disturbing steep slopes where possible. Reduce the length and grade of finished slopes as much as feasible to reduce the potential for sheet and rill erosion. Taller slopes may need to be divided by graded benches or with additional erosion and sediment controls to mitigate erosion.
- **Consider methods to reduce impervious surfaces.** Attempt to lay out a site to install fewer paved surfaces such as driveways, parking areas and streets, and to maximize the use of open spaces. Where that is not possible, practices such as permeable pavement systems may be considered.
- **Early in the conceptual design phase, select the desired BMPs to manage stormwater runoff.** Review the natural resources identified on the site to determine which practices are most applicable at a given site. Prepare preliminary sizing calculations so that proper space is left to build the practice, with consideration for paths for long-term maintenance access.
- **Treat stormwater as close to the source as possible.** Techniques which capture runoff near the source—or where rainfall hits surfaces—are most effective. Rain barrels, green roofs, permeable pavers and soil quality restoration are examples of practices which can be located close to the point where stormwater is generated. (Address runoff in upstream areas before the "snowball" gets too large.)
- **Consider a "treatment train" of distributed practices.** Employing multiple practices which act in parallel or series is also recommended. That way, a failure of any one practice would not allow runoff to leave a site untreated. Consider required maintenance for each selected practice and put a plan in place with a responsible party designated to carry it out.

NOTE

Be aware that many stormwater ordinance focus on controlling runoff rates. However, stormwater runoff volumes are also usually increased with urban development, which creates other negative impacts.

Considering Better Site Design Principles early in the design process can reduce stormwater runoff rates and volumes, as well as reduce development costs by the following:

- **Reduced volumes** of earthwork and topsoil respread (or cost of Soil Quality Restoration)
- **Reduced cost of erosion and sediment control practices** (such as mulching, seeding, silt fence, filter socks, wattles, turf reinforcement mats, sediment basins, etc.)
- **Reduced cost of installing paved surfaces** (and perhaps underground utilities)
- **Reduced surface area devoted to stormwater management BMPs** (such as biocells, bioswales, constructed wetlands, wet ponds, etc.) and reduced cost for their installation and maintenance

These principles also are consistent with the following goals of the Iowa Stormwater Management Manual, including:

- **Minimizing increases in stormwater runoff** from development to reduce flooding, siltation, increases in stream temperature and stream bank erosion, and to maintain the integrity of stream channels
- **Minimizing increases in non-point-source pollution** caused by stormwater runoff from development, which would otherwise degrade local water quality
- **Minimizing the total annual volume of surface water runoff**, which flows from any specific development project site after completion
- **Reducing stormwater runoff rates and volumes, soil erosion and non-point-source pollution**, wherever possible

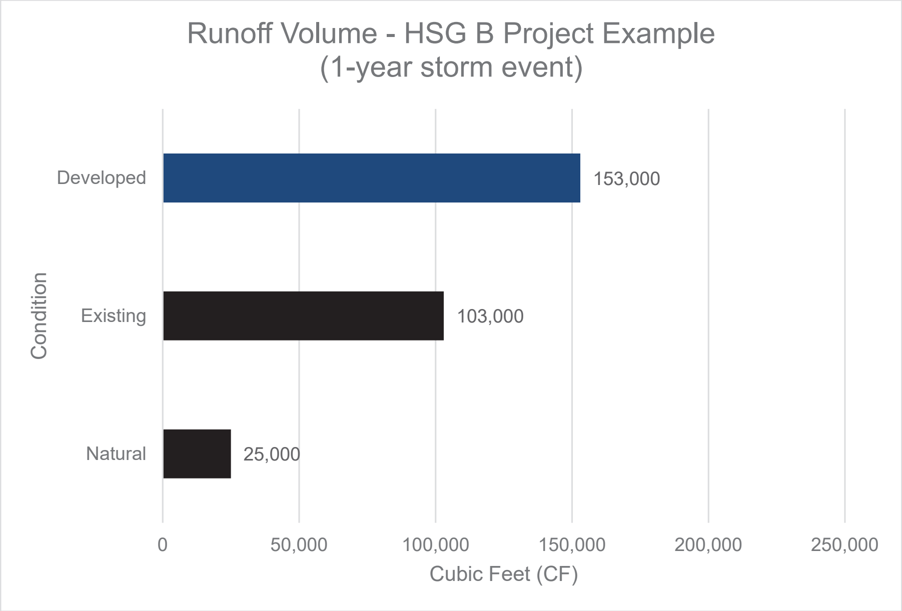
Through the use of these practices and techniques, the impacts of urbanization on the hydrology of the site and water quality can be significantly reduced.

#2 – RUNOFF REDUCTION

Land development activities increase the quantity of stormwater runoff. This is caused by the addition of new impervious surfaces, soil compaction during site grading and reduced presence of healthy topsoil materials. These factors lead to increases in both the rate and volume of stormwater runoff. **The changes in runoff patterns are largest during the smallest, most frequently occurring storm events.**

The graph below shows the expected runoff volumes that would be caused by a 1-year storm event in Central Iowa (2.67" of rain in 24 hours) for a 40-acre single-family residential site example. For this example, the developed site is predicted to generate almost **50% more stormwater volume** than the agricultural (existing) condition. Comparing agricultural to developed conditions, **there is an increase of 50,000 cubic feet** (CF) from this type of storm event. This is equal to 374,000 gallons of additional runoff from this development area. The volume increase in this example **would fill more than half of an Olympic sized swimming pool** (660,000 gallons).

The runoff volume increases are even greater when comparing the developed condition to conditions that would have been present prior in Iowa's natural prairie and savanna landscapes. The developed site in this example would be expected to generate more than five (5) times as much runoff volume during the 1-year storm event, an increase of 128,000 CF or 960,000 gallons.



- Values based on a **NRCS TR-55** model simulation.
- The developed condition is proposed to be single-family land uses, with 40% impervious cover and 4" topsoil in a site area with **Hydrologic Soil Group** (HSB) B soils
  - NRCS **Curve Numbers** (CN): Impervious Cover (98), Open Spaces (69), **Weighted Average** CN with 40% impervious cover (81)
- The existing condition (immediately prior to development) is row-crop agriculture (CN=74)
- The natural condition was prairie or savanna, (represented by meadow, CN=58)

NOTE

Rainfall data for this example is taken from the Rainfall and Runoff Analysis section of ISWMM, based on data for Iowa Region 5 (Central Iowa). These rainfall values are based on NOAA Atlas 14 rainfall data.

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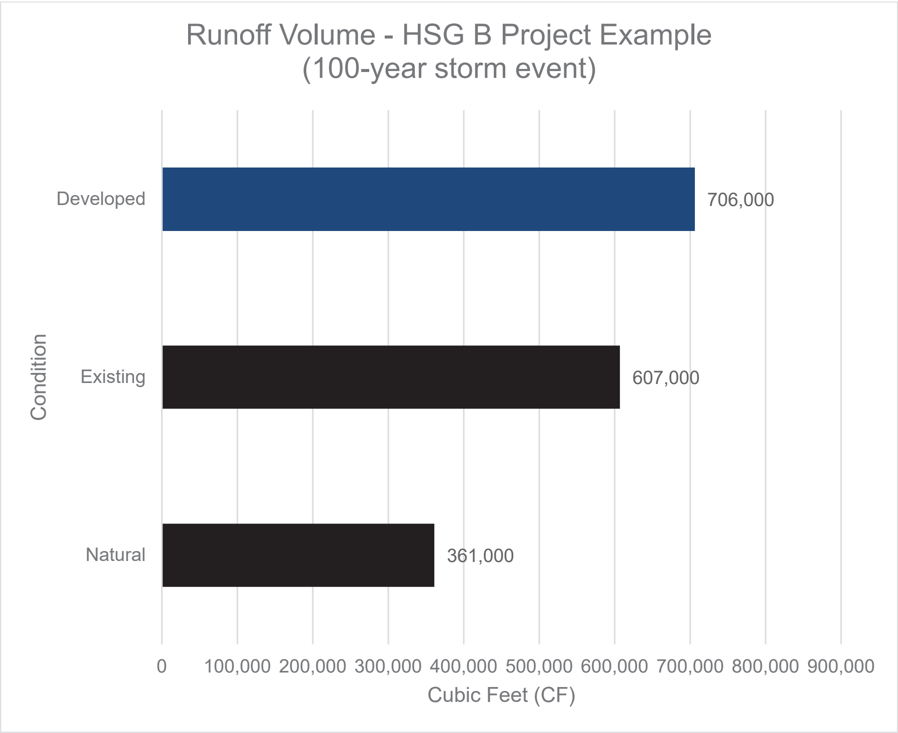
For the same site example, the runoff volume is predicted to be 16% higher than agricultural (existing) levels, during a 100-year storm event (7.12" of rain in 24 hours for Central Iowa). This volume increase of 99,000 cubic feet is equal to 741,000 gallons of additional runoff created.

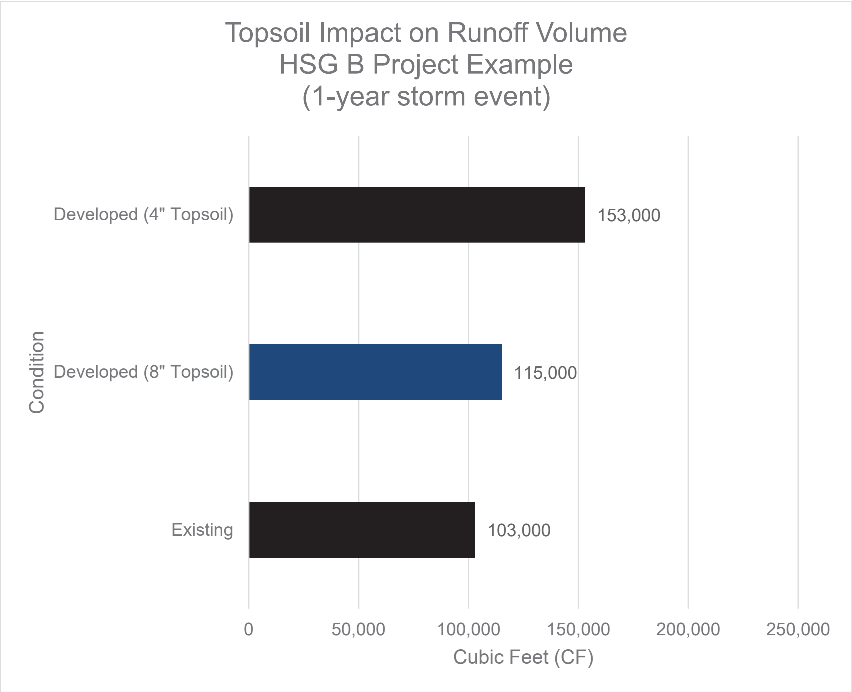


These impacts significantly change the hydrologic response of the site area. Greater volumes of stormwater runoff are created. Even if stormwater detention practices are used to control the rates of the flow leaving developed areas, these greater runoff volumes can still have negative impacts. Flow volumes are increased across land surfaces, in storm sewer networks and urban streams. These can increase the risk of flooding as runoff volumes increase along larger streams and rivers where flood events can last for days or weeks (instead of hours in smaller watersheds).

In these settings, less rainfall is absorbed by the soil and used by plants (evapotranspiration). In addition, much less rainfall is allowed to percolate into deeper soil layers of the soil to become groundwater flow. Groundwater volumes can further be reduced because of installation of subdrainage systems and footing drain collectors around buildings in urban areas. Over time, these changes can reduce water stored in shallow aquifers, which can impact water supplies drawn from shallow wells.

Runoff reduction guidelines are intended to mitigate these hydrologic changes by employing practices that reduce runoff volume. One approach toward meeting these guidelines can be as simple as providing adequate depths of healthy topsoil.

For the same 40-acre site example, increasing topsoil depth from 4 inches up to 8 inches, would reduce the expected runoff volume by 25%, during a 1-year storm event. The decrease of 38,000 cubic feet is equivalent to 284,000 gallons of reduced runoff volume. The runoff volume is still projected to remain above the agricultural (existing) level, but the overall increase would be 12%, instead of almost 50% (if only 4 inches of topsoil were applied).



- The developed condition with 40% impervious cover and 8” topsoil in a site area with Hydrologic Soil Group (HSB) B soils.
  - NRCS Curve Numbers (CN): Impervious Cover (98), Open Spaces (61), Weighted Average CN with 40% impervious cover (76)

In addition to soil quality management and restoration, other stormwater **best management practices** (BMPs) can also be employed that reduce runoff volumes through absorption, infiltration, evaporation and **evapotranspiration**. **Rainwater harvesting** techniques can also be used to collect and use rainwater for irrigation and non-potable water needs.

Runoff reduction guidelines are represented in the Recharge Volume (Rev) element of ISWMM’s Unified Sizing Criteria (USC). While it is termed the Recharge Volume standard, its goal is not simply to increase infiltration for the purpose of recharging groundwater levels. **It is a systematic effort to use a series of structural and non-structural BMPs to reduce runoff volumes to the greatest extent possible.**

Local jurisdictions may choose to enforce the Rev criteria by setting a goal focused on retaining (keeping onsite) the runoff generated by a certain small storm event (a half inch or one inch rainfall event for example). Regardless of local jurisdictional requirements, **designers should consider methods to reduce runoff levels as much as possible as the first line of defense in stormwater management.**

NOTE

See ISWMM Section 3.01 (Unified Sizing Criteria) for more information about the Recharge Volume standard.

#3 – STORMWATER POLLUTANT REDUCTIONS

Urban landscapes are potential sources for water pollution. Fertilizers, oils, metals, sediments, bacteria are among a series of pollutants that can be present at elevated levels in urban areas. **These pollutants are often picked up by the first flush of runoff after rainfall events,** which allows them to be quickly conveyed through storm sewer networks and drainage paths to nearby streams.

Water quality standards are intended to manage post-construction stormwater runoff from the development site to protect downstream water quality. Construction projects regulated under the NPDES program are required to identify practices that achieve at least 80% reduction of the average annual loading of total suspended solids (TSS) from the project site. Other local

NOTE

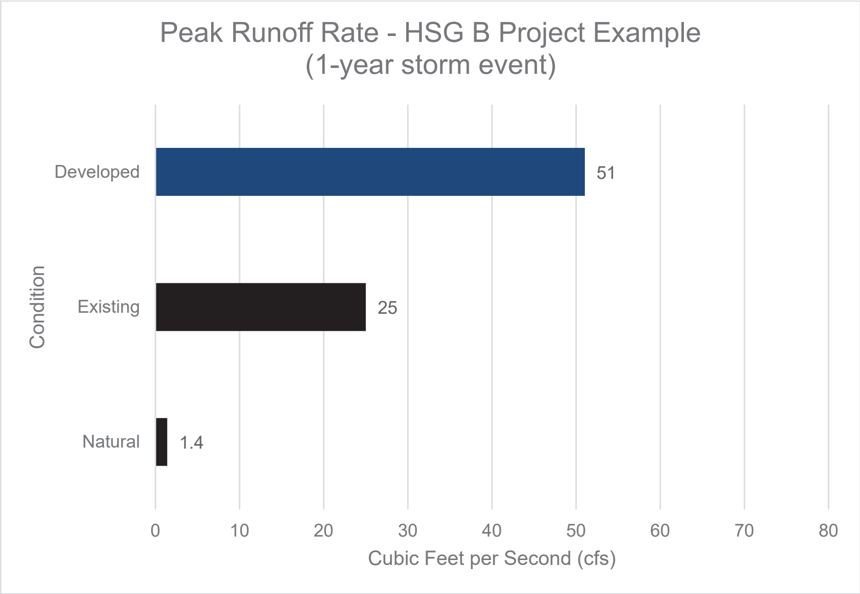
See ISWMM Section 3.01 (Unified Sizing Criteria) for more information about the Water Quality Volume standard.

watershed impairments may make it important to focus on other water quality conditions, such as reductions in bacteria, nitrogen or phosphorus loadings. These can be achieved through the use of site design practices and structural stormwater controls that are known to be most effective at removing the pollutants of concern.

These requirements are expressed through the Water Quality volume (WQv) standard that is part of the Unified Sizing Criteria. The water quality volume is equal to the runoff generated on a site from the water quality design rainfall event. Approximately 90% of all runoff producing rainfall events across Iowa are less than 1.25 inches. To meet this standard, structural and non-structural BMPs are used. These practices reduce pollutants for the smaller events and the first flush of any larger rainfall events. As noted in the "Stormwater Better Site Design" part of this Section, multiple practices can be employed to create a treatment train that are used to collectively meet WQv requirements.

#4 – STREAM CHANNEL PROTECTION

Increases in stormwater runoff rates caused by development activities are even higher than the increases in runoff volume that were described earlier in this section. This is especially true during the smallest, most frequently occurring storm events. For the same 40-acre single-family project example previously described, the peak rate of flow leaving the project area would be expected to be double what would be expected from the same site under agricultural (existing) conditions. The peak rate of flow from the developed site would be 36 times higher than the same area in its natural (prairie, savanna) condition.



- Values based on the previously noted NRCS TR-55 model simulation.
- The developed condition is proposed to be single-family land uses, with 40% impervious cover and 4" topsoil in a site area with Hydrologic Soil Group (HSB) B soils. **Time of concentration** (Tc) = 17.0 minutes.
  - NRCS Curve Numbers (CN): Impervious Cover (98), Open Spaces (69), Weighted Average CN with 40% impervious cover (81)
- The existing condition (immediately prior to development) is row-crop agriculture (CN=74), Tc = 25.6 minutes.
- The natural condition was prairie or savanna, (represented by meadow, CN=58), Tc = 73.8 minutes.

The dramatic increases in rates and volumes of runoff during these frequently occurring events, leads to the **flashy flow patterns in urban streams after rainfall events.** This can lead to rapidly rising and falling water levels and higher flows being sustained for longer periods of time. The majority of bank and channel erosion along smaller urban stream corridors can be attributed to these effects. Stream and channel design now often focuses around the channel forming storm event, which usually defines the width, depth and cross-sectional area for a stable stream. The channel forming storm event is often considered to be a 1- to 1.5-year storm event.

Goose Creek - Davenport

Watershed: approximately 5 square miles

The surrounding area developed into residential land uses in the 1950's. Further upstream, additional commercial and industrial growth occurred in the late 1990's.

This photo, taken in the early 2020's, shows how the stream has lowered (incised), widened and moved horizontally over the decades. A manhole that was almost completely buried at the time of installation is exposed more than 10 feet in height at this location.

Little Walnut Creek - Urbandale

Watershed: approximately 9 square miles

The immediate surrounding area developed into residential land uses into the 1980's and 1990's. Further upstream, additional residential, commercial and industrial growth continues at the current date of publication.

This photo, taken in 2018, shows the extreme amount of erosion that has occurred. A storm sewer outlet is expopsted at the base. The eroded bank is about 15 feet tall and the stream has widened significantly in only 30 or 40 years after development started in this area.

Unnamed tributary to Walnut Creek - Clive

Watershed: approximately 120 acres

The surrounding area developed into residential and commercial land uses in the 1970's and 1980's.

One city employee said this stream was about a foot deep and two feet wide when the surrounding area was developed.

This photo, taken in 2009, shows an eroded ravine about 15 feet deep and 40 feet wide at this location. Erosion was working down through shale and rear yard TV and electric cables were exposed.

The city has completed multiple stabilization projects since this photo to repair and restore this stream corridor.

Unnamed tributary to Fourmile Creek - Des Moines

Watershed: approximately 500 acres

This neighborhood was constructed along this small stream in the late 1990's and early 2000's. Stormwater detention basins were designed using the standards in place at the time, which did not focus on controlling smaller storm events.

Within 10 years of development, this extreme level of erosion was already apparent, eroding severely near newly constructed homes.

Multiple stream stabilization projects have moved forward in this neighborhood, and local homeowners' association dues were raised to pay for repairs and pond dredging.

Unnamed tributary to Beaver Creek - Johnston

Watershed: approximately 370 acres

The upstream area began development in the early 1990's and continues at the time of publication of this section.

This photo, taken in 2008, shows how the stream had eroded down to uncover a trunk 24" sanitary sewer main. In 2011, large rain events caused severe erosion upstream, causing a different section of sanitary sewer and manholes to be washed out, leading to sewage directly discharging into Beaver Creek.

A significant emergency repair project was needed to repair the sewer and bank erosion and required temporary pumping of the sewer for several months.

The stream channel protection standards are based on three complementary criteria:

1. **Extended detention of the 1-year, 24-hour storm for a period of 24 hours** using structural stormwater controls. It is known that the increase in runoff due to development can dramatically increase stream channel erosion.

    a. This standard is intended to reduce the frequency, magnitude, and duration of post-development bankfull flow conditions. The volume to be detained as needed **to maintain the allowable extended detention release rate** is known as the channel protection volume (CPv).

    b. The **channel protection volume is one of ISWMM's Unified Stormwater Sizing Criteria** which are used in conjunction to size and design stormwater management facilities to address stormwater impacts.

    c. Local jurisdictions may choose to not enforce this requirement for sites that discharge immediately into a lake (such as Easter Lake in Des Moines) where the peak rate reduction for smaller storm events will not have an impact on streambank or channel integrity.

2. **Implement velocity control, energy dissipation, streambank stabilization, and erosion prevention practices and structures** as necessary in the stormwater management system to prevent downstream erosion and streambank damage.

3. **Establishment of riparian stream buffers on the development site.** Stream buffers not only provide channel protection but also water quality benefits and protection of streamside properties from flooding. Stream buffer widths should be selected to meet the following objectives:

    a. **Safe conveyance of the 100-year storm events** without damages to public or private property, buildings or infrastructure. This would include any regulatory FEMA floodplain or floodway zones.

    b. **Consideration of stream migration patterns,** accounting for past movement and potential future movement or meandering of the stream path.

    c. **Projection of a 3 (horizontal) to 1 (vertical) slope** from the **toe elevation** of the stream bank to the surface of the adjacent lands beyond the bank of the stream. Again, this setback projection may need to account for anticipated future stream movement.

    d. **Provisions for an access path for maintenance equipment** on at least one side of the stream or drainageway. Access for erosion repairs, tree removals and other maintenance activities are needed along drainage pathways.

        i. In existing developed areas, there is often limited space that has been provided for access, forcing equipment to have to navigate around private residences, fences, accessory structures, etc.

        ii. Such a path should be at least 15 feet wide with a cross slope no greater than 8% (no more than 5% is recommended) and a longitudinal slope of no greater than 12%. The path may need to be wider if larger maintenance equipment may be needed.

        iii. In some areas (especially along larger streams), access routes along both sides of a drainageway may be advisable.

        iv. The maintenance path should be mowed at least annually to keep it clear of volunteer trees and brush.

    e. The riparian stream buffer area should be planted with deep-rooted, site appropriate, erosion resistant native vegetation.

Refer to the Iowa River Restoration Toolbox for more information about stream restoration and riparian buffer protection.

https://www.iowadnr.gov/Environmental-Protection/Water-Quality/River-Restoration/River-Restoration-Toolbox

NOTE

See ISWMM Section 3.01 (Unified Sizing Criteria) for more information about the Channel Protection Volume standard. See ISWMM Section 11 for more information about establishing and maintaining Native Landscaping.

#5 – OVERBANK FLOOD PROTECTION

Overbank flood protection for downstream channels, and/or flooding from surcharging of downstream piped conveyances, is provided by controlling the post-development peak discharge rate leaving a development. This is accomplished by using stormwater controls to control release rates to the allowable levels. **This Overbank Flood Protection (Qp) standard is one of ISWMM's Unified Stormwater Criteria** and is applied to the 2- to 10-year storm events.

#6 – EXTREME FLOOD PROTECTION

Extreme flood protection is intended to reduce the potential for flood damages to private or public property and infrastructure by controlling and safely conveying storm events up to the 100-year, 24-hour storm event (denoted Qf). Like the overbank flood protection standard, this is provided by controlling the post-development peak discharge to not exceed an allowable discharge rate. **The Extreme Flood Protection standard is one of ISWMM's Unified Sizing Criteria** and is applied to the 25- to 100-year storm events.

Some communities have chosen to set standards for even larger events (such as the 500-year storm event). Often standards for events larger than the 100-year storm have been focused on ensuring that there is a safe path of conveyance of runoff that avoids damage to occupied building structures, or that structures are elevated above the high-water elevation of these events by a specified elevation difference. Developments must also comply with the requirements for the National Flood Insurance Program, as administered through the Federal Emergency Management Agency (FEMA) and the Iowa Department of Natural Resources (DNR).

For both the Overbank and Extreme Flood Protection criteria, refer to ISWMM Section 3.01 (Unified Sizing Criteria) **for more information on how allowable release rates are to be calculated.** These criteria may be adjusted by a local jurisdiction for areas where all downstream conveyances and receiving waters have the natural capacity to handle the peak runoff rate from the proposed development without causing flood damage (such as where the development is located immediately upstream of a large pond or lake). In such cases, a downstream analysis may be required to justify such an exemption.

NOTE

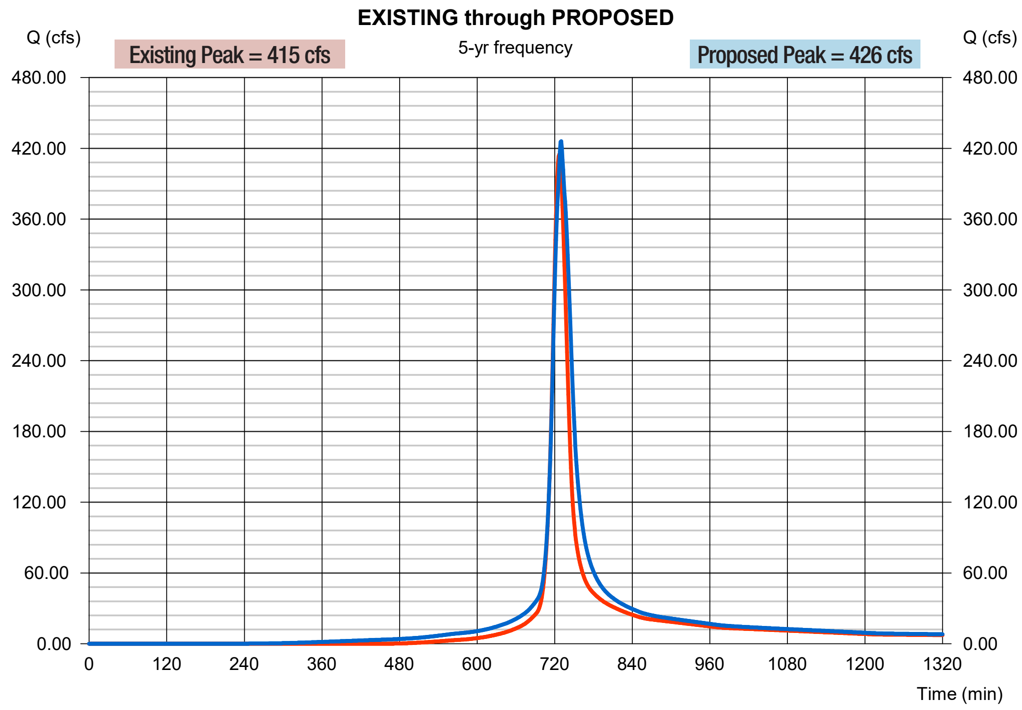
See the Sections within ISWMM Chapter 9 for more information about the sizing and design of Stormwater Detention BMPs which are typically used to control peak release rates from development sites.

#7 – DOWNSTREAM ANALYSIS

A downstream hydrologic analysis is performed to determine if there are any additional impacts in terms of peak flow increases or downstream flooding. Even when stormwater detention BMPs are used, the delays caused by flow restrictions can cause "peak matching", where peak flows from different drainage areas align more closely than they did before development. In such cases, even though the peak rates of flow from any individual development aren't increasing, the overall peak rate of flow in the downstream corridor can increase.

A downstream peak flow analysis would be performed to the point in the watershed downstream of the site or the stormwater management system where the area of the site comprises 10% of the total drainage area. For example, for a 40-acre development, the downstream analysis would need to extend to a point where the total drainage area is at least 400-acres.

Local jurisdictions may choose to waive the downstream requirement if the peak release rates from the site are expected to be sufficiently below existing levels to negate the concerns of increased peak flows caused by peak matching. For example, a site development could propose to control the peak rate of flow for all storm events up to the 100-year event, such that the peak release rates are set below the natural condition for the same storm event. In such a case, the peak rate of flow from the site for all events studied may be sufficient below the existing rates that it would be unlikely that the effects of peak matching would result in an increase in peak rate at any point in the immediate area downstream.



In this example, a detention basin is used so that the release rate from a newly developed site is slightly less than the existing level from that site (224 cfs vs. 226 cfs). However, it shifts the peak discharge from that site about 6 minutes later, allowing it to overlap with the peak flow from an upstream area. This means that even though the peak flow from the proposed site doesn't increase, the total flow immediately downstream is increasing (the total flow increases from 415 cfs to 426 cfs in this example).

NOTE

In this example, one site (approximately 80 acres) is proposed to be developed, which discharges into a small drainageway which carries runoff from another undeveloped upstream area (also approximately 80 acres).

As part of site development, a new stormwater detention basin is proposed for the downstream site. The flow from the upstream area passes by the new detention area on the downstream side.

#8 – CONSTRUCTION SITE POLLUTION PREVENTION

Currently, state agency oversight of urban stormwater runoff is primarily focused on pollution prevention during active construction, as required through the National Pollutant Discharge Elimination System (NPDES). These requirements are based on the Clean Water Act, administered through the United States Environmental Protection Agency. Through the NPDES program, construction sites that have land disturbing activities of one (1) acre or more or are part of a common plan of development that does, must apply for coverage under the State's NPDES General Permit No. 2.

Iowa Code Section 161A.64, subsection 2 and/or the applicable State of Iowa NPDES General Permit No. 2 for Construction Activities covers the permit requirements for construction projects that require permit coverage. This involves the preparation and implementation of an approved Stormwater Pollution Prevention Plan (SWPPP), including appropriate best management practices, during the construction phase of development. Further guidance on practices for construction site erosion and sediment control can be found in Chapter 7 of the Iowa Statewide Urban Design Standards and Specifications (SUDAS) Design Manual, and DNR's Iowa Construction Site Erosion Control Manual, which can be found at:

https://www.iowasudas.org/manuals/design-manual/#chapter-7-erosion-and-sediment-control

https://www.iowadnr.gov/portals/idnr/uploads/water/stormwater/constructionmanual.pdf

The consideration of pollution prevention measures should happen early in the design process, including the preparation of the stormwater pollution prevention plan. As mentioned previously in this section, applying stormwater better site design practices and techniques that can reduce the total amount of area that needs to be cleared and graded should be implemented wherever possible. It is essential that erosion and sediment control be considered and implemented in stormwater concept plans and throughout the construction phase to prevent damage to natural stormwater drainage systems and previously constructed structural stormwater controls and conveyance facilities.

#9 – STORMWATER MANAGEMENT PLAN

For each development or redevelopment project a stormwater management plan document should be prepared. This includes a narrative, technical information and analysis indicating how the proposed development meets minimum design guidelines that were selected by the designer or required by a local jurisdiction. ISWMM Section 1.05 (Stormwater Management Plan) includes recommendations on the format and content for such a report.

The ISWMM website also includes a Word formatted template document that designers or jurisdictions may choose to use as a template format for the Stormwater Management Plan.

https://www.iowadnr.gov/Portals/idnr/uploads/water/stormwater/manual/1stormwater-report-template.docx

#10 – DESIGN CRITERIA FOR STORMWATER CONVEYANCE FACILITIES

The primary purpose of ISWMM is related to post-construction water quality and quantity stormwater management. For information on the design of stormwater conveyance systems, refer to the Iowa SUDAS Design Manual Chapters 2C to 2F. Designers should be aware that local jurisdictions may choose to modify SUDAS or create their own standards for stormwater conveyance design. Conveyance facilities that are intended to convey stormwater to BMPs need to be sized to convey the design storm event. For example, if a storm sewer is the only means for runoff to enter an underground detention system used to detain the 100-year storm event, then the storm sewer would need to be sized to allow runoff from that event to enter the detention system.

https://www.iowasudas.org/manuals/design-manual/#chapter-2-stormwater

C. CRITERIA CHECKLIST

The previous section presented a set of recommended minimum criteria for stormwater management for development activities in the State of Iowa. These can be to develop and enforce local policies and ordinances and provide an integrated approach to address both the water quality and quantity issues associated with stormwater runoff due to urban development. A quick summary of these criteria are listed below.

#1 – STORMWATER BETTER SITE DESIGN

Designers should implement stormwater Better Site Design and/or “low impact development” (LID) design techniques. These approaches can reduce the amount of stormwater runoff and pollutants that are generated, provide for natural on-site control and treatment of runoff, and optimize the location of stormwater management facilities. For best results, designers should consider these approaches from the very start of the design process.

#2 – RUNOFF REDUCTION

Implement practices and approaches to mitigate increases in runoff volume increases potentially caused by urban development.

#3 – STORMWATER POLLUTANT REDUCTIONS

Implement stormwater quality BMPs to capture, treat and filter urban stormwater runoff and reduce the potential for downstream water pollution.

#4 – STREAM CHANNEL PROTECTION

Provide release rate control of the smaller, most commonly occurring storm events (up to the Channel Protection event, 1-year storm), to reduce the potential for downstream channel erosion.

#5 – OVERBANK FLOOD PROTECTION

Control peak rates of flow for moderate sized storm events (up to around the 10-year storm event) to reduce the potential for localized flash flooding downstream.

#6 – EXTREME FLOOD PROTECTION

Provide outflow control to reduce the potential for flood damages to private or public property and infrastructure by controlling and safely conveying storm events up to the 100-year, 24-hour storm event.

#7 – DOWNSTREAM ANALYSIS

As applicable, perform downstream hydrologic analyses to determine if there are any additional impacts in terms of peak flow increases or downstream flooding.

#8 – CONSTRUCTION SITE POLLUTION PREVENTION

Develop and implement a Stormwater Pollution Prevention Plan meeting the requirements of the State’s NPDES General Permit No. 2.

#9 – STORMWATER MANAGEMENT PLAN

Prepare a document that demonstrates how the proposed project addresses the criteria described within this section.

#10 – DESIGN CRITERIA FOR STORMWATER CONVEYANCE FACILITIES

Follow design guidance within Iowa SUDAS Design Manual Chapters or other local requirements to properly size stormwater conveyance facilities.

1.04-2 GLOSSARY

Best Management Practice (BMP)	A feature designed to meet stormwater water quality or quantity management goals.
Evapotranspiration	Processes where water is evaporated into the atmosphere or absorbed for use by plants.
Hydrologic Soil Group (HSG)	Categories shown on County Soils Maps that describe the runoff potential of common soil groups. HSG categories range from A to D, with HSG A soils generating the least amount of runoff from rainfall events and HSG D soils generating the most.
Impervious cover	Surfaces on the landscape that do not allow water to pass through, such as roofs and paved surfaces.
NRCS TR-55	A stormwater modeling calculation method created by the Natural Resource Conservation Service. See applicable section of ISWMM for more information.
Time of concentration	The length of time it takes stormwater runoff to pass from the farthest upstream point in a drainage area to the outlet after runoff from rainfall has started.
Toe elevation	The lowest elevation of a slope along the edge of a stream, usually at the water's edge or within the water profile within the stream.
Soil Quality Restoration (SQR)	Creating a healthy soil profile through methods of respreading topsoil materials, or using blends of compost and sand to improve soil properties. (See the Soil Quality Management and Restoration Section of ISWMM.)
Rainwater harvesting	Process of capturing stormwater runoff for reuse for purposes such as irrigation and other non-potable uses.
Unified Sizing Criteria (USC)	The set of stormwater management quality and quantity goals recommended by ISWMM.
Water quality impairments	When the essential functions of rivers, streams or lakes are not supported because of pollutant levels which are measured to be above an accepted allowable standard.
Water Quality Volume (WQv)	One of ISWMM's USC, defined as the runoff generated by a 1.25 inch rainfall event. Over 90% of all rainfall events in Iowa are at or less than this amount of rain.
Water quantity	The rate or volume of stormwater runoff.
Weighted Curve Number (CNw)	When multiple land surface covers exist in a drainage area, this value represents the average value of all curve numbers which are weighted by the percentage that each surface cover exists in that specific area.