CHAPTER 153

POST-CONSTRUCTION STORMWATER MANAGEMENT

153.01 TITLE. A chapter amending City-wide standards for the quantity and quality of water that runs off land under construction within the City.

153.02 PURPOSE. The purpose of this chapter is to help protect the City's surface waters and quality of life by reducing the negative impacts of sediment, rainfall, melting snow and other water runoff. This chapter seeks to meet that purpose through the following objectives:

1. Minimize increases in stormwater runoff from development within the city limits and fringe area in order to reduce flooding, siltation, increases in stream temperature, and streambank erosion and maintain the integrity of stream channels;

2. Minimize increases in nonpoint source pollution caused by stormwater runoff from development which would otherwise degrade local water quality;

3. Minimize the total annual volume of surface water runoff which flows from any specific development project site after completion To not exceed the pre-development hydrologic regime to the maximum extent practicable; and

4. Reduce stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, through establishment of appropriate minimum stormwater management standards and BMPs and to ensure that BMPs are properly maintained and pose no threat to public safety.

153.03 FINDINGS. The U.S.EPA's National Pollutant Discharge Elimination System ("NPDES") permit program administered by the Iowa Department of Natural Resources ("IDNR") requires that cities meeting certain demographic and environmental impact criteria obtain from the IDNR an NPDES permit for the

discharge of stormwater from a Municipal Separate Storm Sewer System ("MS4"). The City of Asbury is subject to the Program and is required to obtain, and has obtained, an MS4 Permit; the City's MS4 Permit is on file at City Hall and is available for public inspection during regular office hours.

153.04 DEFINITIONS. For the purpose of this chapter all words shall carry their customary meanings, except where specifically defined herein. The use of the present tense shall include the past and future tenses, and the future the present; the word "shall" is mandatory, while the word "may" is permissive; the singular number shall include the plural and the plural the singular.

1. "Applicant" means a property owner or agent of a property owner who has filed an application for a stormwater management permit.

2. "Best management practice" (or "BMP") means structural and non-structural measures, practices, techniques or devices employed to avoid or minimize sediment or other pollutants carried in runoff.

3. "Bioretention" means a storm water infiltration device consisting of an excavated area that is backfilled with an engineered soil, covered with a mulch layer and planted with a diversity of woody or herbaceous vegetation.

4. "Building" means any structure having a roof supported by columns or walls for the housing or enclosure of persons or corporation, animals, or property. When any portion thereof is completely separated from every other portion thereof by a division wall without openings, then such portion shall be deemed to be a separate building.

5. "Channel Protection Volume" (CPv) is the volume of runoff produced from a 1-year, 24-hour design storm on a post-development site, which is detained for an extended period of time (24 hours or more).

6. "City Engineer" means the officer designated and authorized by the City Council to carry out various functions as specified in this chapter.

7. "Clearing" means the stripping, grubbing, scalping or removal of trees and stumps, and removing and disposing of all vegetation and debris within the site, and includes the conditions resulting therefrom.

8. "Construction" means the erection, alteration, repair, renovation, demolition or removal of any building or structures; and the clearing, stripping excavating, filling grading and regulation of sites in connection therewith.

9. "Design storm" means hypothetical depth of rainfall that would occur for the stated return frequency (i.e. once every 2 years or 10 years), duration (i.e. 24-hours) and timing of distribution (i.e. type II). All values are based on the historical rainfall records for the area.

10. “Detention basin” means a stormwater management facility designed to protect against flooding and, in some cases, downstream erosion by storing water for a limited period of a time. Detention basins do not retain a significant permanent pool of water between runoff events.

11. “Developer” means any individual, subdivider, firm, association, syndicate, partnership, corporation, trust, or any other legal entity commencing proceedings under this chapter to effect the development of land.

12. “Development” means construction of buildings, other structures, impervious surfaces, and/or soil disturbance to the extent that peak runoff rates and volumes are increased, in a location where no such features currently exist.

13. “Directly connected impervious area” means an impervious surface that is directly connected to a storm sewer or water of the state via an impervious flow path.

14. “Drainage Easement” means a legal right granted by a landowner to a grantee allowing the use of private land for stormwater management purposes.

15. “Erosion” means the process of detachment, transport and deposition of soil, sediment or rock fragments by action of water, wind, ice or gravity.

16. “Extreme Flood Protection (Qf)” means the controlling of post-development runoff 100-year peak flows to prevent flood damage from large storm events, maintain the boundaries of the pre- development 100-year Federal Emergency Management Agency (FEMA) and/or locally designated floodplain, and protect the physical integrity of BMP control structures.

17. “Floodplain” means a flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding.

18. “Hotspot land use” means a site that produces higher concentrations of trace metals, hydrocarbons or other priority 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, garbage transfer facilities, and commercial parking lots with high-intensity use.

19. “Hydrologic soil group (HSG)” has the meaning used in the runoff calculation methodology promulgated by the United States Natural Resources Conservation Service Engineering Field Manual for Conservation Practices

20. “Hydrology” means the study of the movement, distribution, and quality of water throughout the Earth.

21. “Impervious surface” means an area that releases all or a large portion of the precipitation that falls on it, except for frozen soil. Conventional rooftops and asphalt or concrete sidewalks, driveways, parking lots and streets are typical examples of impervious surfaces. For purposes of this manual, typical gravel driveways and other examples listed shall be considered impervious unless specifically designed to encourage infiltration or storage of runoff.

22. “Infiltration” means the entry of precipitation or runoff into or through the soil.

23. “Karst features” means an area or surficial geologic feature subject to bedrock dissolution so that it is likely to provide a conduit to groundwater, and may include caves, enlarged fractures, mine features, exposed bedrock surfaces, sinkholes, springs, seeps or swallets.

24. “Land disturbing activity” (or “disturbance”) means any man-made alteration of the land surface that may result in a change in the topography or existing vegetative or non-vegetative soil cover, or may expose soil and lead to an increase in soil erosion and movement of sediment. Land disturbing activity includes clearing and grubbing for future land development, excavating, filling, grading, building construction or demolition, and pit trench dewatering.

25. “Maintenance Agreement" means a legally recorded document that acts as a property deed restriction, and which provides for long-term maintenance of storm water BMPs.

26. “Overbank Flood Protection (Qp)” means the controlling of post-development runoff peak flows to prevent an increase in the frequency and magnitude of out-of-bank flooding generated by development (e.g., flow events that exceed the bank-full capacity of the channel and therefore must spill over into the floodplain).

27. “Peak flow” means the maximum rate at which a unit volume of storm water is discharged.

28. “Post-development condition” means the extent and distribution of land cover types anticipated to occur under conditions of full development that will influence rainfall, runoff and infiltration.

29. “Pre-development condition” means the extent and distribution of land cover types present before the initiation of land development activity.

30. “Pre-settlement condition” means the extent and distribution of land cover types likely present before European settlement.

31. “Rain garden” means a depression area, designed and constructed as a landscape feature, that is used to improve water quality and enhance infiltration.

32. “Recharge Volume (Rev)” means the volume of rainfall that is captured on a post-development site and directed through the soil to the groundwater table.

33. “Redevelopment” means any construction, alteration, or improvement performed on sites where the existing site is already predominantly developed.

34. “Runoff” means water from rain, snow or ice melt, or dewatering that moves over the land surface via sheet or channelized flow.

35. “Runoff curve number (RCN)” has the meaning used in the runoff calculation methodology promulgated by the United States Natural Resources Conservation Service Technical Release 55, “Urban Hydrology for Small Watersheds” (commonly known as TR-55).

36. “Sediment” means solid earth material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity or ice, and has come to rest on the earth’s surface at a different site.

37. “Site” means the entire area included in the legal description of which the land disturbing or land development activity will occur.

38. “Soil” means all earth material of whatever origin that overlies bedrock, and may include the decomposed zone of bedrock which can be readily excavated by mechanical equipment.

39. “Specifications” means the general term comprising all the directions, provisions and requirements, together with such as may be added or adopted as supplemental specifications or special provisions approved by the City Engineer.

40. “Stormwater” has the same meaning as the term “runoff”.

41. “Surface waters” means all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses, drainage systems and other surface water or groundwater, natural or artificial, public or private, within the City of Asbury.

42. “Time of concentration (Tc)” means the time needed for water to flow from the most remote point in a watershed to the watershed outlet. It is a function of topography, geology and land use within the watershed.

43. “Volumetric Runoff Coefficient (Rv)” means the fraction of rainfall during small storm events that becomes runoff, and can be determined by the methodologies described by Scheuler (1987) or Pitt (1994).

44. “Water Quality Volume (WQv)” is the storage needed to capture and treat the runoff from 90% of the average annual rainfall. In numerical terms, it is equivalent to the rainfall depth in inches multiplied by the volumetric runoff coefficient (Rv) for the site, and the site drainage area.

45. “Wetlands” means an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions.

153.05 ADMINISTRATION. The Post-Construction Stormwater Management chapter shall be administered by the City Engineer.

153.06 ULTIMATE RESPONSIBILITY. The standards set forth herein and promulgated pursuant to this chapter are minimum standards; therefore if any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, whichever provisions are more restrictive or impose higher protective standards for human health or the environment shall be considered to take precedence.

153.07 MANUAL. The City of Asbury Post-Construction Stormwater Management BMP Design Standards Manual shall be available for inspection and/or copying during regular business hours at City Hall.

153.08 APPLICABILITY. Stormwater management plans and permits are required for any of the following:

1. Required any new development and redevelopment disturbing 1 acre or more of land, and if less than 1 acre, if the amount of impervious cover exceeds 10,000 square feet. ***(Ord. 9-2019 – Jan. 20 Supp.)***

2. Development requiring a subdivision plat.

3. Commercial or industrial development that requires a certified survey map.

4. Any new development or redevelopment, regardless of size, with a Standard Industrial Classification (SIC) code that falls under the NPDES Industrial Stormwater Permit program or a hotspot land use.

153.09 PERFORMANCE STANDARDS.

1. Post-development runoff shall be infiltrated such that a rainfall depth of 1.25 inches is recharged to the ground (Recharge Volume, Rev). Infiltration shall be limited to the volume infiltrated in 24 hours.
Exclusion: If the site is unsuitable for infiltration as determined by the City Engineer, the applicant may submit engineering evidence such as clay soil or karst that may suggest that the site may require alternative infiltration practices.

2. If the above infiltration standard cannot be met due to an exclusion permitted by the City Engineer, provide water quality treatment for the runoff resulting from a rainfall depth of 1.25 inches (Water Quality Volume, WQv).

3. If the above infiltration standard cannot be met due to an exclusion permitted by the City Engineer, provide no increase in runoff temperature originating from sites in cold-water community watersheds using a thermal impact model approved by the City Engineer. Affected sites are those located within the watershed of the following rivers and streams:

    A. Upper Portions of Catfish Creek.

B. Little Maquoketa River, Middle (aka Bankston Creek) and South Forks.

C. Cloie Branch.

4. If during construction the plans require a spring to be crossed or encroached upon, a stormwater conveyance system may be installed; however, the natural course of the spring must not be redirected or altered.

5. Post-development peak runoff rates for 24-hour storm events must not exceed the following peak runoff rates for the same event:
Exclusion: Sites where 1-year post-development peak discharge is less than 2.0 cfs.

A. Channel Protection Volume (CPv). Provide 24 hours of extended detention of the runoff from the 1 and 2-year, 24-hour design storm event to reduce bank-full flows and protect downstream channels from erosive velocities and unstable conditions. To avoid excessively small outlet restrictions, the minimum peak outflow need not be less than 0.25 cfs.

B. Overbank Flood Protection (Qp). Post-development peak runoff rates for the 2-, 10-, and 25-year, 24-hour storm event must not exceed the pre-settlement peak runoff rate for the same event. Post-development peak rates may be further restricted by available capacity of downstream drainage systems.

C. Extreme Flood Protection (Qf). Post-development peak runoff rates for the 100-year, 24-hour storm event must not exceed the pre-development peak runoff rate for the same event. Post-development peak rates may be further restricted by available capacity of downstream drainage systems.

Table 1: Summary of the City of Asbury unified stormwater sizing criteria for management of stormwater quality and quantity:

Sizing Criteria	Recommended Method
Recharge Volume Rev	The runoff resulting from a rainfall depth of 1.25 inches or less. Equal to WQv. Goal is to recharge groundwater and maintain stream baseflow and temperature. Goal may be reduced or eliminated if site conditions warrant. Rev = (Rv)(A)(P)/12 Rv = site runoff volume coefficient A = site drainage area (acres) P = design rainfall depth = 1.25 inches
Water Quality Volume WQv	The runoff resulting from a rainfall depth of 1.25 inches or less. Equal to Rev. Goal is to reduce average annual post-development total suspended solids loadings by 80%. Goal is met if Rev is completely infiltrated. WQv = (Rv)(A)(P)/12 Rv = site runoff volume coefficient A = site drainage area (acres) P = design rainfall depth = 1.25 inches
Channel Protection Storage Volume Cpv	Provide 24 hours of extended detention of the runoff from the 1-year and 2-year 24-hr duration storm event to reduce bank-full flows and protect downstream channels from erosive velocities and unstable conditions.
Overbank Flood Protection Qp	Provide peak discharge control of the 2-, 10-, and 25-year storm events through detention controls and/or additional infiltration measures. Downstream conveyance capacity may require additional peak discharge control.
Extreme Flood Protection Qf	Evaluate the effects of the 100-year storm on the stormwater management system, adjacent property, and downstream facilities and property. Manage the impacts of the extreme storm event through detention controls and/or floodplain management.

D. Intakes. Storm sewer intake points (inlet grates, endwalls, etc.) should have a minimum capacity to convey the post-development condition 10-year peak flow rate.

E. Storm sewers. Storm sewers should have a minimum capacity to convey the post-development condition 10-year peak flow rate. Provisions should be made for the 25- and 100-year peak flow rate when overland flow is not allowed or available. A minimum cleaning velocity of 3 fps should be used for the design storm. Storm sewer and surface water conveyance easements should be dedicated to the public. For those storm sewers that will handle footing drains, the following additional discharge (Q) values should be used:

(1) For less than 50 houses, Q = 5.0 gpm (0.011 cfs) per house.

(2) For greater than 50 houses, Q = 250 gpm (0.556 cfs) plus 2.5 gpm (0.0056 cfs) per house for each additional house over 50.

F. Culverts. Culverts should have capacity to convey the following:

(1) Post-development condition 25-year peak flow rate without the headwater depth exceeding the diameter of the culvert.

(2) Post-development condition 50-year peak flow rate without the headwater depth exceeding one foot over the top of the culvert.

(3) Post-development condition 100-year peak flow rate without the headwater depth exceeding one foot below the low point of the roadway/embankment, unless there are other, more restrictive elevations.

(4) Private Culverts: Private culverts should be designed with an overflow so that no damage is caused upstream of the proposed culvert.

G. Ditches. Ditches should have capacity to convey the post-development condition 50-year peak flow rate within the ditch banks. Provisions should be made for the post-development condition 100-year peak flow rate to flow overland. Surface water flowage easements should be provided to the general public for all designed drainage ways and overland flow paths.

H. Outlet Stabilization. Stable outlets must have the capacity to handle the designed outflow from the pond outlet or pipe conveyance structures they serve. If the outlet is to be vegetated, it should be constructed and established before installation of other stormwater or erosion control structures. Outlet stabilization shall be designed based on the expected outlet discharge from the 10-year, 24-hour storm event.

I. Open Channel Stabilization. To prevent channels from eroding, the channel lining must be adequate to carry the design velocity and volume. Where velocities are higher than 5 ft/sec or where the channel must carry prolonged flow, the channel should be lined with riprap or other armoring material. Channel linings shall be designed based on the expected channel velocity from the 10-year, 24-hour storm event.

153.10 MANAGEMENT PRACTICES. A comprehensive guide to managing stormwater on post-development sites has been developed by the Iowa Department of Natural Resources. The "Iowa Stormwater Management Manual" can be found on the Internet at: http://www.ctre.iastate.edu/pubs/stormwater/index.cfm. Rate control measures listed in this guide include dry detention basins, wet detention basins, low-impact development (LID) and DCIA minimization strategies, infiltration systems,

and constructed wetlands. Conveyance design measures listed in this guide include street flow, intake capacity, storm sewer sizing, culvert hydraulics and sizing, open channel flow design, groundwater barriers, and stormwater swale systems. Stormwater infiltration measures listed in this guide include infiltration basins, bioretention systems, infiltration trenches, soil quality restoration, and native landscaping. Stormwater quality measures listed in this guide include wet detention basins, stormwater swale systems, bioretention systems, constructed wetlands, and native landscaping. Contractors and developers are required to stockpile and redistribute a minimum of four inches of topsoil as part of the final grading for the project or development. The guide contains figures and tables summarizing the appropriate use of each of the measures listed, as well as providing specifications and installation guidelines for each. The use of this guide is strongly encouraged when choosing management practices for post-development stormwater. Other guides may be used to design outlet stabilization measures. Acceptable guidelines include the Denver Urban Drainage and Flood Control District publication "Design of Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets", the FHWA publication HEC-14, and other practices found in Iowa, Wisconsin, Nebraska, and Minnesota Department of Transportation design standards.

(Ord. 10-2016 – Nov. 16 Supp.)

153.11 POST-CONSTRUCTION STORMWATER MANAGEMENT SUBMITTAL. **PLEASE NOTE** A DNR issued General Permit No. 2 will continue to be necessary prior to the beginning of any construction activity that disturbs more than one or more acres or which is part of a larger project that disturbs one or more acres in total. The submittal of site development project will require a descriptive narrative of the site, a site plan, and other supporting documents. They are provided as a minimum guide and are not to be construed as the specific information to be supplied on every project drainage report, and other information may be required. Pre-settlement, pre-development, and post-development conditions for any given site will require analysis unique to that area.

1. Project Report Narrative including the following items:

   A. A cover sheet with project name and location, name of firm or agency preparing the report, Professional Engineer's signed and sealed certification, and table of contents. Number each page of the report.

   B. The nature of the construction activity (e.g. roadway construction, utility construction, single family residential construction, etc.), an estimate of the total area of the project site, and the total anticipated impervious area.

   C. Watershed size for each drainage area (both onsite and offsite) to determine how much of the area to be developed is affected by other drainage flowing through the site and to design appropriately sized storm sewer, culverts, and drainage channels.

   D. Describe pre-settlement/pre-development land use, topography, drainage patterns (including overland conveyance of the 100-year storm event), and natural and manmade features. Describe pre-

development ground coverage, soil type, and physical properties, such as hydrologic soil group and infiltration. Pre-settlement ground coverage should be assumed as open prairie in any non-wooded area.

E. Describe post-developed land use and proposed grading, change in percent of impervious area, and change in drainage patterns. If an existing drainage way is filled, the runoff otherwise stored by the drainage way will be mitigated with stormwater detention, in addition to the post-development runoff.

F. Describe contributing off-site drainage patterns, land use, and stormwater conveyance. Identify undeveloped contributing areas with development potential and list assumptions about future development runoff contributed to the site.

G. Discussion of soils located on site and their suitability for infiltration. If infiltration meets the exclusion criteria, state why.

H. Describe the features that will be installed to control rate of runoff, pollutants in stormwater, and infiltration in the post-development condition.

I. Describe the Maintenance and Repair Plan for all stormwater BMPs including detailed maintenance and repair procedures to ensure their continued efficient function. These plans will identify the parts or components of a stormwater BMP that need to be maintained and the equipment and skills or training necessary.

J. Indicate what permits have been applied for and received, including but not limited to IDNR Notice of Intent, flood permit for sites affecting FEMA FIRM Zone A, ACOE Section 401 and/or 404 permits for work in waterways or wetlands.

2. Pre-settlement and pre-development runoff analysis, including:

A. Describe overall watershed area and relationship between other watersheds or sub-areas. Include a pre-settlement/pre-development watershed map in the report appendix.

B. The typical method used to predict runoff and peak discharge is the NRCS TR-55 method. Other methods may be used only with the preapproval of the City Engineer. If other methods are used, describe the method and provide documentation of correspondence with City Engineer regarding the method.

C. Describe method used to calculate the time of concentration. Describe runoff paths and travel times through sub-areas. Show and label the runoff paths on the pre-settlement/pre-development watershed map. Pre-settlement runoff paths should be assumed to match pre-development with respect to location and slope.

D. List runoff coefficients or curve numbers applied to the drainage areas. The RCNs listed in Table 2a shall be used in all

hydrologic calculations for pre-settlement conditions required for determining Qp limits (2-, 10-, and 25-year events). These RCNs have been selected with the intent to mimic hydrologic conditions that existed in Iowa prior to settlement and farming. The RCNs listed in Table 2b shall be used in all hydrologic calculations for pre-development conditions required for determining Qf limits (100-year event). These RCNs have been selected with the intent to reflect hydrologic conditions that exist after settlement and farming. If a geotechnical study of the site was used to determine HSG, provide boring logs and locations in the appendix of the report. If a soil survey was used to determine HSG, cite it in the references.

Table 2a: RCNs for Projects in the City of Asbury
(Pre-settlement Conditions, 2- thru 25-year events)

Cover Type	Curve Numbers for Hydrologic Soil Group			
	A	B	C	D
Non-wooded Areas[1]	30	58	71	78
Wooded Areas[2]	30	55	70	77

[1] RCNs are equivalent to the TR-55 listed values for meadow in good condition with the intent to mimic pre-settlement conditions. Apply to any pre-development condition area which is not wooded.
[2] RCNs are equivalent to the TR-55 listed values for woods in good condition.

Table 2b: RCNs for Projects in the City of Asbury
(Pre-development 100-year events and all Post-development storm events)

Cover Type	Curve Numbers for Hydrologic Soil Group			
	A	B	C	D
Continuous Cropped Agricultural Use[1]	55	69	78	82
Continuous Mature Wooded Area[2]	30	55	70	77
Continuous Meadow Area[3]	30	58	71	78
Lawn and Pasture Areas[4]	39	61	74	80
Impervious Area[5]	98	98	98	98

[1] RCNs are equivalent to mid-range TR-55 listed values for row crops and legume crops (excluding crops mown for hay) were conservation practices are used.
[2] RCNs are equivalent to the TR-55 listed values for woods in good condition.
[3] RCNs are equivalent to the TR-55 listed values for meadow (ungrazed and unmowed) in good condition.
[4] Areas include residential lawns, golf courses, cemeteries, grazed or mowed farm pasture, and other areas with short grass.
[5] Areas include roofs, sidewalks, paved streets and roads (excluding right-of-way), curbs, paved parking lots and driveways.

E. The typical precipitation model and rainfall duration used for the design storm is the NRCS Type II 24-hour distribution. Total 24-hour rainfall amounts for given frequency shall reflect data from Bulletin 71, "Rainfall Frequency Atlas of the Midwest" as displayed in Table 3 below. Other methods (such as a user-defined model based on collected precipitation data) or durations (such as a critical duration analysis) may be used only with the preapproval of the City Engineer. If other methods are used, describe the method and provide documentation of correspondence with City Engineer regarding the method.

Table 3: City of Asbury, Dubuque County
24-hour Rainfall Depth for Various Storm Events

Return Period	Rainfall Depth (in)
1-yr	2.32
2-yr	2.91
5-yr	3.67
10-yr	4.31
25-yr	5.11
50-yr	5.73
100-yr	6.36

F. Provide summary table(s) of model results including drainage area, time of concentration, frequency, peak discharge, and accumulative routed flows at critical points within the development (if any) and at development boundaries. At a minimum, flow rates for pre-settlement 2-, 10-, and 25-year storms and pre-development 100-year storm must be provided.

3. Post-Development runoff analysis, including:

A. Describe overall watershed area and sub-areas. Discuss if the post development drainage area differs from the pre-development drainage area. Include a post development watershed map in the report appendix.

B. The method used to predict runoff and peak discharge will be the same as used in the pre-development analysis, except for variables changed to account for the developed conditions.

C. The time of concentration method used will be the same as used in the pre-development analysis. Describe change in times of concentration due to development (i.e. change in drainage patterns). Show and label the runoff paths on the post-development watershed map.

D. List runoff coefficients or curve numbers applied to the drainage areas. The RCNs listed in Table 2b (above) shall be used in all hydrologic calculations for post-development conditions. Include an analysis of the proposed increase in impervious area and describe the change in runoff volume due to development. Directly connected impervious area (roads, front of houses, etc) shall be separated out from pervious area and unconnected impervious areas (backs of houses, etc) in the determination of a weighted RCN. Provide a summary of the total directly connected impervious area and the total unconnected impervious area for each sub-watershed/catchment.

E. The precipitation model storm event, total rainfall, and total storm duration will be the same as used for the pre-development model.

F. Provide summary table(s) of model results including drainage area, time of concentration, frequency, peak discharge, and accumulative routed flows at critical points within the development (if any) and at development boundaries. At a minimum, flow rates for 1-, 2-, 10-, 25-, and 100-year storms must be provided.

G. Summary of post-development runoff:

(1) Description of BMP including water quality practices (methodology).

(2) Provide table(s) including drainage area, time of concentration, frequency, duration, and peak discharge. Summarize in narrative form the change in hydrologic conditions due to the development.

(3) Post-developed discharge should take into account any upstream offsite detention basins and undeveloped offsite areas assumed to be developed in the future with stormwater detention.

4. Rate control structure and conveyance system analysis, including:

   A. Describe any detention basin locations by discussing existing topography and relationship to basin grading. Determine if rock deposits will affect construction and if a high water table precludes basin storage. Floodplain locations should be avoided.

   B. The detention basin size in final design should be based upon actual hydrograph routing for the design storms controlled by the basin. Note the TR-55 approximate method of sizing detention basins (TR-55 Chapter 6) may result in storage errors of 25%, and should not be used in final design.

   C. The top of any dike used in forming a detention basin should be a minimum of one foot above the 100-year storage elevation. Large detention basin design may require IDNR approval (See Iowa Administrative Code Title V, Chapter 70).

   D. Discuss the basin outlet design in terms of performance during low and high flows and downstream impact. Note that a single-stage outlet (i.e. one culvert pipe) may not be appropriate because of its inability to detain post-developed runoff from storms less than the 10-year interval. A more desirable outlet has two or more stages (such as a riser structure with an orifice) which will serve to detain runoff for low-flow events of a 2-year storm, and pass greater storm events via the riser outlet.

   E. Design the spillway for high flows using weir and/or spillway design methods. The steady-state open channel flow equation is not intended for use in spillway design.

   F. Describe methods to protect the basin during overtopping flow.

   G. Describe channel protection/lining and velocity dissipation at outlets.

   H. Provide a summary table of the respective volumes and discharge rates for the project area after routing though rate control structures, and a comparison to the calculated allowable release rate from the site for the 2-, 10-, 25-, and 100-yr storm events.

5. Infiltration basin analysis, including:

   A. Describe any basin locations by discussing existing topography and relationship to basin grading. Floodplain, high groundwater, and high bedrock locations should be avoided.

   B. The available infiltration rate and resulting footprint size and depth of basin required to capture the Water Quality Volume.

   C. Wet detention (retention) basin analysis, if the site conditions do not allow for infiltration of the WQv.

D. Extended detention basin analysis. Discuss the basin outlet design in terms of extended detention during 1- and 2-year post-development condition rainfall events. Note that a single-stage outlet (i.e. one culvert pipe) may not be appropriate because of its inability to detain post-developed runoff from storms less than the 10-year interval. A more desirable outlet has two or more stages (such as a riser structure with an orifice) which will serve to provide extended detention via the orifice and pass greater storm events via the riser outlet.

E. Thermal impact analysis, if the site is in a thermally-sensitive watershed. If the WQv is infiltrated, it is assumed that thermal impacts are zero.

6. A site map (or maps) including the following items:

A. A preliminary plat (with pre-and post-development topography) may be used to show the proposed development. Minimum scale of 1 inch = 500 feet or larger to ensure legibility should be used for all drainage areas. (Drawings no larger than 24 inches by 36 inches should be inserted in 8-1/2 inch by 11-inch sleeves in the back of the bound report). The plat is to show street layout and/or building location on a contour interval not to exceed 2 feet. The map must show on- and off-site conditions. Label flow patterns used to determine times of concentration. Drainage plans (preliminary plat or topography map) must extend a minimum of 250 feet from the edge of the proposed preliminary plat boundary, or a distance specified by Jurisdiction. The limits of swale and ditch easements should be established based upon the required design frequency. This includes 100-year overflow easements from stormwater controlled structures.

B. Identify areas of the site located within the floodway or floodplain boundaries as delineated on flood insurance rate maps, or as determined by other engineering analysis. Identify wetland areas on the site, as delineated by the National Wetlands Inventory, or as determined by a specific wetland study.

C. Soil map or geotechnical information.

D. Location and elevations of Jurisdictional benchmarks. All elevations should be on Jurisdictional datum.

E. Proposed property lines (if known).

F. Existing drainage facilities and structures, including existing roadside ditches, drainage ways, gutter flow directions, culverts, etc. All pertinent information such as size, shape, slope location, 100-year flood elevation, and floodway fringe line (where applicable), should also be included to facilitate review and approval of drainage plans.

G. Proposed drainage facilities and structures, including storm sewers and open drainage ways, right-of-way and easement width requirements, 100-year overland flow easement, proposed inlets,

manholes, culverts, erosion and sediment control, water quality (pollution) control, infiltration basins, energy dissipation devices, and other appurtenances.

H. Cross sections and profiles of road ditches, designed to carry storm flows and to ensure non-erosive velocities.

I. Proposed outfall point(s) for runoff from the study area.

J. The 100-year flood elevation and major storm floodway fringe (where applicable) are to be shown on the plans, report drawings, and plats (preliminary and final). In addition, the report should demonstrate that the stormwater system has adequate capacity to handle a 100-year storm event, or provisions are made for overland flow.

K. Show the critical minimum lowest opening elevation of buildings for protection from major and minor storm runoff.

7. Supporting computations. Computations may be done by hand or with computer software (P8, WinSLAMM or other DNR approved models). If software was used, attach computer-generated reports and output and underline and label results, such as the peak discharge. Provided computations must include:

A. Runoff coefficients and curve numbers for each sub-watershed

B. Total impervious area (ft^2 and % of total drainage area)

C. Times of concentration for each sub-watershed

D. Storm sewer design summaries

E. Peak runoff calculations – Show results in tabular format and pre- and post-developed hydrographs

F. Detention basin design – Show tabular stage-storage-discharge results and inflow/outflow hydrographs. Include both extended-detention and rate control results.

G. Water Quality Volume calculations

H. Infiltration basin design calculations

I. Open channel flow calculations. For ditches that drain areas over two square miles in urban areas and over ten square miles in rural areas, design may require the Iowa Department of Natural Resources (IDNR) approval (See Iowa Administrative Code Chapter 567.71).

J. Culvert design calculations or nomographs. For culverts that drain areas over two square miles in urban areas and over ten square miles in rural areas, design may require the Iowa Department of Natural Resources (IDNR) approval (See Iowa Administrative Code Chapter 567.71).

K. Erosion protection design.

8. Performance Guarantee. Before the recording of final plat and issuance of a permit, or as condition of approval of final plat and issuance of a permit, the Commission and City shall require the following guarantees to insure that the stormwater BMPs are installed by the permit holder as required by the approved stormwater management final plan.

A. The amount of the performance guarantee shall be the total estimated construction cost of the stormwater BMPs approved under the permit, plus 10%. The performance guarantee shall be posted by the subdivider or subdivider's contractor under Section 166.15(10) with the City Council guaranteeing the improvements will be constructed and shall remain in full force and effect until final acceptance of the improvements by the City. Final acceptance of the plat will not constitute final acceptance by the City of any improvements to be constructed. Improvements will be accepted only after their construction has been completed, and no public funds will be expended in the subdivision until such improvements have been completed and accepted by the City Council Resolution.

B. The performance guarantee shall contain forfeiture provisions for failure to complete work specified in the stormwater management final plan.

C. The performance guarantee shall be released in full only upon submission of "as built plans" of all stormwater BMPs specified in the stormwater management final plan and written certification by a professional engineer that the stormwater BMPs have been installed in accordance with the approved stormwater management final plan and other applicable provisions of this ordinance. City will make a final inspection of stormwater BMPs to ensure compliance with the approved stormwater management final plan and the provisions of this ordinance. Provisions for a partial pro-rata release of the performance guarantee based on the completion of various development stages can be made at the discretion of City.

9. Maintenance Performance Guarantee. City shall also require the submittal of a maintenance performance guarantee prior to issuance of a permit in order to insure that the stormwater BMPs are maintained in an effective state for a minimum of two years.

153.12 INDEMNIFY CITY. The application form signed by the applicant for a City Stormwater Management permit shall include the following statement:

The undersigned Applicant hereby agrees to defend, indemnify and hold the City, its officers, and employees harmless from any and all claims, damages or suits of any kind arising directly or indirectly out of any act of commission or omission by the Applicant, or any employee, agent, assign, contractor or subcontractor of the Applicant, in connection with the Applicant's State NPDES General Permit No. 2 and/or City Stormwater Management Permit.

153.13 PERMIT ISSUANCE OR DENIAL. Upon receipt of an application for a City Stormwater Management permit, if the City finds that the application complies with this chapter, the City shall issue a City Stormwater Management permit in accordance with this chapter. If the City finds that the application fails to comply with this chapter, the City shall provide the applicant a schedule identifying wherein the application does not comply with this chapter.

153.14 NOTICE OF CONSTRUCTION COMMENCEMENT. The applicant must notify City in advance before the commencement of construction. Regular inspections of construction of the stormwater BMPs shall be conducted by City or City's designated representative. All inspections shall be documented and written reports prepared that contain the following information:

1. The date and location of the inspection; and

2. Whether construction is in compliance with the approved stormwater management concept plan; and

3. Variations, if any, from the approved stormwater management concept plan.

153.15 CONSTRUCTION VIOLATIONS. If any violations are found, the applicant shall be notified in writing of the nature of the violation and the required corrective actions. No added work shall proceed until any violations are corrected and all work previously completed has received approval by City.

153.16 AS-BUILT DRAWINGS. After construction is completed, applicants are required to submit actual "as built" drawings satisfactory to City for any stormwater BMPs located on-site. The drawings must show the final design specifications for all stormwater BMPs and must be certified by a professional engineer. A final inspection by City is required before the release of any performance securities can occur.

153.17 STABILIZATION REQUIREMENTS. Stabilization shall be accomplished to prevent violation of City stormwater requirements or impairment of BMPs.

153.18 OWNER RESPONSIBILITY. The applicant or owner of every site shall be responsible for maintaining as-built stormwater BMPs in an effective state as determined in the sole judgment of City for two years after acceptance of improvements.

153.19 MAINTENANCE AND REPAIR EASEMENT. Prior to the issuance of any permit for development involving any stormwater BMP, the applicant or owner of the site must execute a maintenance and repair easement agreement that shall be binding on all subsequent owners of land served by the stormwater BMP. The agreement shall provide for access to the BMP and the land it serves at reasonable times for periodic inspection by City or City's designee and for regular or special assessments of property owners to ensure that the BMP is maintained in proper

working condition to meet City stormwater requirements. The easement agreement shall be recorded by City at the expense of the permit holder or property owners.

153.20 MAINTENANCE COVENANTS.

1. Maintenance of all stormwater BMPs shall be ensured through the creation of a formal maintenance covenant that must be approved by City and recorded prior to the stormwater management final plan approval. As part of the covenant, a schedule shall be developed for when and how often maintenance will occur to ensure proper function of the stormwater BMPs. The covenant shall also include plans for periodic inspections to ensure proper performance of the BMPs between scheduled cleanouts.

2. City, in lieu of a maintenance covenant, may but is not required to accept dedication of any existing or future stormwater BMP to include City responsibility for maintenance and repair, provided that the maintenance and repair of such element will not impose an undue burden on other City taxpayers who enjoy little if any benefit from the BMP, the BMP meets all the requirements of this chapter, and the dedication includes adequate and perpetual access and sufficient area, by easement or otherwise, for inspection and regular maintenance.

153.21 REQUIREMENTS FOR MAINTENANCE COVENANTS. All stormwater BMPs must undergo, at the minimum, an annual inspection to document maintenance and repair needs and ensure compliance with the requirements of this chapter and accomplishment of its purposes. These needs may include but are not limited to removal of silt, litter and other debris from all catch basins, inlets and drainage pipes, grass cutting and vegetation removal, and necessary replacement of landscape vegetation. Any maintenance or repair needs detected must be corrected by the developer or entity responsible under a written maintenance agreement in a timely manner, as determined by City, and the inspection and maintenance requirement may be increased as deemed necessary to ensure proper functioning of the stormwater BMPs.

153.22 INSPECTION OF STORMWATER BMPs. Inspection programs may be established on any reasonable basis, including but not limited to: routine inspections; random inspections; inspections based upon complaints or other notice of possible violations; inspection of drainage basins or areas identified as higher than typical sources of sediment or other contaminants or pollutants; inspections of businesses or industries of a type associated with higher than usual discharges of contaminants or pollutants or with discharges of a type which are more likely than the typical discharge to cause violations of state or federal water or sediment quality standards or the NPDES stormwater permit; and joint inspections with other agencies inspecting under environmental or safety laws. Inspections may include, but are not limited to: reviewing maintenance and repair records; sampling discharges, surface water, groundwater, and material or water in stormwater BMPs, and evaluating the condition of stormwater BMPs.

153.23 RIGHT-OF-ENTRY FOR INSPECTION. When any new stormwater BMP is installed on private property, or when any new connection is made between private property and a public stormwater management facility, sanitary sewer or combined sewer, the property owner shall grant to City the right to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. This includes the right to enter a property when City has a reasonable basis to believe that a violation of this ordinance is occurring or has occurred, and to enter when necessary for abatement of a public nuisance or correction of a violation of this chapter.

153.24 RECORDS OF INSTALLATION AND MAINTENANCE AND REPAIR ACTIVITIES. Parties responsible for the operation and maintenance of stormwater BMPs shall make records of the installation permanent. Maintenance and repair records shall be retained for ten years. These records shall be made available to City during inspection of the facility and at other reasonable times upon request.

153.25 MUNICIPAL INFRACTION. A violation by any person of any provision of this chapter, including the commencing, constructing, causing, or permitting the commencement of any land disturbing activity without a City Stormwater Management permit as required by this chapter, constitutes a municipal infraction.

153.26 ABATEMENT REQUIRED. The City may order compliance with this chapter by written notice of violation to a person violating this chapter setting forth the time within which remediation or restoration must be completed and that if the person fails to complete such remediation or restoration within such time, the City shall cause such remediation or restoration work to be done and the person shall be liable for such costs.

153.27 STOP WORK ORDER. The City may issue an order to stop all construction activities on any property where land disturbing activity is being conducted until conditions of noncompliance with this chapter are corrected. Construction activity, other than that which is required to correct a condition of noncompliance, prior to the correction of the conditions of noncompliance, shall constitute a violation of this chapter.

153.28 ENFORCEMENT AND PENALTIES. The City will work with applicants for consistent enforcement of the City minimum standards. If a responsible party fails or refuses to meet the requirements of the maintenance covenant or any provision of this chapter, City, after reasonable notice, may correct a violation by performing all necessary work to place the BMP in proper working condition. In the event that the stormwater BMP becomes a danger to public safety or public health, City shall notify the party responsible for maintenance of the stormwater BMP in writing. Upon receipt of that notice, the responsible person shall have thirty (30) days to effect maintenance and repair of the stormwater BMP in an approved manner. After proper notice, City may assess, jointly and severally, the owner(s) of the stormwater BMP or the property owners or the parties responsible for maintenance under any applicable written agreement for the cost of repair work and any penalties; and the cost of the

work shall be a lien on the property, or prorated against the beneficial users of the property, and may be placed on the tax bill and collected as ordinary taxes.

153.29 APPEAL. The determination by the City of a violation of this chapter may be appealed by an aggrieved party to the City Council, provided written notice of appeal is received by the City within fifteen (15) days from the date of the notice of violation. Upon hearing, the City Council may rescind, modify or affirm the notice of violation.

153.30 ENFORCEMENT. The City Engineer and/or City Inspector may enter upon any property where land disturbing activity is being conducted and take any and all action necessary to abate any violation of this chapter and/or remediate or restore the property to its condition prior to the land disturbing activity. It shall be a violation of this chapter for any person to refuse to allow the City Engineer and/or City Inspector to enter upon property for such purposes.

153.31 COST OF ABATEMENT OF VIOLATION. Within thirty (30) days after abatement of a violation of this chapter, the owner of the property shall be notified in writing by the City of the cost of abatement, including administrative costs. The property owner may file a written protest with the City objecting to the amount of the cost of abatement within fifteen (15) days thereafter. If the cost of abatement is not paid to the City within sixty (60) days after the date of the notice, the cost of abatement shall be certified by the City in the manner of a special assessment against the property and shall constitute a lien on the property.

153.32 INJUNCTIVE RELIEF. The City may seek equitable relief restraining any person from any activity in violation of this chapter including compelling the performance of abatement or remediation of such violation.

(Ch. 153 – Ord. 15-2011 – Dec. 11 Supp.)