STATE OF ILLINOIS

COUNTY OF KANE

ORDINANCE NO. 09 - 433

AMENDING THE KANE COUNTY STORMWATER MANAGEMENT ORDINANCE

WHEREAS, pursuant to 55 ILCS 5/5-1062, the Kane County Board adopted Resolution No. 97-07 establishing the Kane County Stormwater Management Committee, for the purpose of preparing a comprehensive countywide stormwater management plan and stormwater management ordinance (the "Ordinance"); and

WHEREAS, the Ordinance was adopted by the County Board as by the passage of Ordinance No. 00-312 on November 14, 2000; and

WHEREAS, the Kane County Stormwater Committee has recommended to the County Board several amendments to the Ordinance. Said Ordinance amendments have been distributed to the engineering community and all municipal stormwater administrators for review and comments.

NOW, THEREFORE, BE IT ORDAINED by the Chairman and the Kane County Board that the Kane County Stormwater Ordinance is hereby amended as follows:

§1 The following is added to Section 104, and subparagraphs 81 through 148 are renumbered to accommodate this amendment to Section 104:

> *(81)* ***market value*** means the value of a structure prior to substantial damage and/or substantial improvement. FEMA accepts several methods to determine market value. The method to determine market value shall be one approved by FEMA and the Administrator.

§2 Sections 104(131) and(132) are deleted in their entirety and replaced as follows:

(131) ***substantial damages*** means damage caused by one or more events to a building located in the floodplain or floodway from any cause (examples include but are not limited to fire, flood, earthquake) on or after January 1, 2010 whereby the cumulative cost of restoring the building to its original condition from the event or events occurring after January 1, 2010 is 50% or more of its market value, regardless of the actual repair work performed.

(132) ***substantial improvement*** means (a) an improvement or a series of improvements made to a structure located in the floodplain or floodway on or after January 1, 2010 the cost of which is 50% or more of the structure's market value; (b) the cumulative reconstruction or repair of a structure on or after January 1, 2010, the cost of which is 50% or more of the structure's market value before the start of construction of the reconstruction or repair caused by substantial damages; (c) an addition to a structure the cost of which is 50% or more of the structure's market value before the start of construction of the addition or any addition that increased the floor area by more than 20%; or (d) any work done to a structure that has suffered substantial damage. Substantial improvement does not include either (i) any work done to a structure to correct existing violations of State or local health, sanitary or safety codes identified and determined by the local code enforcement official to be the minimum necessary to assure safe living conditions; or (ii) any work done to a structure listed on the state or federal Historic Register provided that alteration will not preclude the structure's continued designation as a historic structure.

§3 Section 203 is amended as follows

(i) Storage facilities located within the regulatory floodplain shall (a) comply with Article 4; ~~and~~ (b) store the required amount of site runoff to meet the release rate requirements under all streamflow and backwater conditions up to the ten-year flood elevation on the adjacent receiving watercourse; the Administrator may approve designs which can be shown by detailed hydrologic and hydraulic analysis to provide a net watershed benefit not otherwise realized by strict application of the requirements set forth in (a) and (b) of this subsection; <u>and (c) comply with 203(b).</u>

(j) Storage facilities located within the regulatory floodway shall (a) meet the requirements for locating storage facilities in the regulatory floodplain; (b) be evaluated by performing hydrologic and hydraulic analysis consistent with the standards and requirements for watershed plans; ~~and~~ (c) provide a net watershed benefit; <u>and (d) comply with 203(b).</u>

(k) Site runoff storage volume provided by solely enlarging existing regulatory floodplain storage (onstream site runoff storage) shall be allowed only as a variance. ~~The applicant must demonstrate that flood damage will not be increased and the development will not increase flood flows for both the two year and 100-year floods.~~

§4 The following is added to Section 1001:

<u>(h) A minimum of 45 days prior to the Kane County Board's consideration of a revision(s) to the Kane County Stormwater Ordinance, the Director shall notify and provide a copy of said revision(s) to every certified community (the certified community's Stormwater Administrator and City / Village Engineer), and the proposed date said revision(s) will be presented to the Kane County Board's Stormwater Committee. Stormwater Administrators or their designees shall be allowed to present oral or written comments to the Kane County Board's Stormwater Committee expressing their comments relating to said Stormwater Ordinance revision(s).</u>

§5 The following is added to Section 200:

§ (e) BMP-in-lieu of site runoff storage. Sites meeting one of the following requirements (1) – (3) and requirements (4) and (5) are eligible to receive credit for BMP-in-lieu of site runoff storage in accordance with § 203(n) against the calculated site runoff storage in § 203 and the requirements of § 203 (g).

(1) The development has been approved for fee-in-lieu of site runoff storage and waiver of § 203(g) under § 200 (c);

(2) The development has been approved for fee-in-lieu of site runoff storage and waiver of § 203 (g) under § 200 (d);

(3) The volume of site runoff storage for the proposed development calculated as prescribed in § 203 is less than or equal to 1.0 acre – feet on a development which does not have an existing site runoff storage facility on the site. If the development has an existing site runoff facility, the Administrator may require said site runoff facility to be expanded to meet the requirements section 203

(4) The site plan is otherwise in compliance with § 201.

(5) The subgrade of areas of permeable pavements and in-situ soils at the bottom of rain gardens and other similar infiltration type systems shall have their infiltration capacity verified by appropriate geotechnical investigation. An opinion of the suitability of the area for the intended BMP shall be provided by a professional engineer. Verification of soil conditions prior to the start of the work may be required by the Administrator. Final approval is at the sole discretion of the Administrator.

§ 203(n) BMP in-lieu of site runoff storage. The "Kane County Technical Guidance Manual BMPs" (2007) shall be used as a reference in the design of BMPs for consideration under this section.

(1) Permeable pavements consisting of porous concrete and asphalt surfaces; or permeable interlocking concrete pavers, shall receive credit for their effectiveness in reducing site runoff by all of the following:

a. When the depth of subbase provided is at least 16 inches and the void ratio of the subbase aggregates is at least 30%, and any required underdrains are 4 inches diameter or less, then detention and retention requirements of § 203 shall be considered as provided for the area of the pavement so designed. Inclusions of up to 25% of the pavement area which consists of non-permeable surface materials which drains onto the permeable pavement shall be allowed and will not be deducted from the application provided the subbase is consistent with the above requirements.

b. The verifiable differential in permeable pavement cross-section costs compared to non-permeable pavements may be considered as an offset payment for any remaining fee-in-lieu of site runoff storage calculated in accordance with Article 13. The differential costs may include increased excavation and subbase material and the cost differential of surfaces, provided that the administrator approves the conventional pavement cross-section.

(2) Rain gardens and rain garden-infiltration trench systems shall receive credit for both their effective reduction site runoff and/or fee-in-lieu of storage by all of the following.

When the surface area of the rain garden or rain garden infiltration trench represents at least 15% or more of the impermeable surface area draining thereto, the depth of the ponding is no greater than 18 inches, and any required underdrains are 4 inches in diameter or less, then all of the site retention storage of 203(g) and one half of the site runoff storage requirements (detention) will be considered satisfied for those portions of the site comprising the surface area of the rain garden and the surface area of the site draining thereto.§ 1301 (d) Offset payments calculated in accordance with § 203 (n) shall be considered as payments received and disbursed in accordance with § 1301 (a) – (c).

Passed by the Kane County Board on November 10, 2009.

_____	_____
John Cunningham, Clerk	Karen McConnaughay, Chairman
Kane County Board	Kane County Board
Kane County	Kane County

Vote:

Yes	_____
No	_____
Voice	_____
Abstentions	_____

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STATE OF ILLINOIS

COUNTY OF KANE

RESOLUTION NO.09 - 432

AMENDING THE KANE COUNTY
STORMWATER MANAGEMENT TECHNICAL MANUAL

WHEREAS, pursuant to 55 ILCS 5/5-1062, the Kane County Board adopted Resolution No. 97-07 establishing the Kane County Stormwater Management Committee (the "Committee), for the purpose of preparing a comprehensive countywide stormwater management plan and ordinance; and

WHEREAS, the plan prepared by the Committee and its Technical Advisory Committee was adopted by the County Board by the passage of Ordinance No. 98-251 on October 13, 1998; and

WHEREAS, pursuant to and in furtherance of the implementation of the plan, the Committee and its Technical Advisory Committee have drafted a comprehensive countywide stormwater management ordinance (the "Stormwater Ordinance"). The Board adopted the Stormwater Ordinance by the passage of Ordinance No. 00-312 on November 14, 2000; and

WHEREAS, the Committee has developed a technical manual which supplements the Stormwater Ordinance by providing background detail and guidance as to the intent of technical requirement in the Stormwater Ordinance; and

WHEREAS, the Board adopted the Kane County Stormwater Management Technical Guidance Manual by the passage of Ordinance No. 01-149 on May 8, 2001; and

WHEREAS, periodic updates to the Technical Manual are necessary to maintain consistency with technologies and methodologies. A new Article, Article 16, Retention Best Management Practices, has been drafted and reviewed by the Kane County Stormwater Management Committee. Copies of this new Article have been distributed and/or made available to all of the municipalities within the County, and all stormwater permit reviewers. The Article was amended based on the comments received, and the Stormwater Committee has endorsed this Article, and recommends that the County Board adopt this Article as an amendment to the Technical Manual.

NOW, THERFORE, BE IT RESOLVED by the Kane County Board and the Chairman that Article 16 Retention Best Management Practices be adopted and here forth be incorporated into the Kane County Stormwater Technical Guidance Manual. A copy of Article 16 is on file as Exhibit 1 with the Kane County Clerk.

Passed by the Kane County Board on November 10, 2009.

John A. Cunningham Clerk, County Board Kane County, Illinois	Karen McConnaughay Chairman, County Board Kane County, Illinois

Vote:
Yes _____
No _____
Voice _____
Abstentions _____

RESOLUTION NO. 08-019

A Resolution Approving and Adopting by Reference Certain Amendments to the Kane County Stormwater Ordinance for the Village of Montgomery, Kane and Kendall Counties, Illinois

BE IT RESOLVED by the President and Board of Trustees of the Village of Montgomery, Kane and Kendall Counties, Illinois, as follows;

WHEREAS, the Village of Montgomery is not a home rule municipality within Article VII, Section 6A of the Illinois Constitution and, pursuant to the powers granted to it under 65 ILCS 5/1-1 *et seq.*; and,

WHEREAS, the Village is desirous of protecting the public health, safety, welfare and morals of its residents through the provision of efficient and effective stormwater detention and environmentally sound development practices; and,

WHEREAS, the County of Kane has previously adopted a certain Kane County Stormwater Ordinance, County Ordinance No. 00-312, on November 14, 2000, and has thereafter adopted certain updates and amendments thereto (collectively, the "KCSO"); and,

WHEREAS, the Village has sought and received status as a certified municipality with authority to implement the requirements of the KCSO and has adhered to its obligations thereunder; and,

WHEREAS, as a component of its efforts to efficiently and safely manage stormwater and floodwaters, the Village has also heretofore adopted ordinances and resolutions necessary to entitle the Village to participate in the National Flood Insurance Program ("NFIP") administered under the provisions of the National Flood Insurance Act of 1968 as amended from time to time; and,

WHEREAS, the Village is desirous of maintaining adherence with the requirements of the KCSO and in meeting the minimum requirements of the NFIP, and has learned that the Federal Emergency Management Agency, Illinois Department of Natural Resources, and County of Kane are cooperating on a process of updating and modernizing the Flood Insurance Rate Maps (FIRM) applicable across the United States, potentially including those applicable to the Village; and,

WHEREAS, the Village has determined that utilizing updated maps will not only

preserve the Village's status as an eligible community for programs administered under NFIP, but will also result in more accurate determinations as to whether given parcels within the Village are potentially subject to floodwater intrusion or related development concerns; and,

WHEREAS, the Village is required to adopt and approve certain changes to the KCSO in order to maintain eligibility as a certified municipality thereunder and in order to maintain continuing eligibility for participation in the NFIP, and has determined that this resolution and the updated maps to be utilized hereunder is protective of the public health, safety, welfare and morals;

NOW THEREFORE BE IT RESOLVED by the President and Board of Trustees of the Village of Montgomery, Kane and Kendall Counties, Illinois, as follows;

SECTION ONE: UPDATED ORDINANCE APPROVED.

The Village of Montgomery, by and through its Corporate Authorities, hereby approve of and adopt by reference the provisions of the Amended KCSO, as said amendments are reflected in the attached Exhibit A. Further, and with greater specificity, the Village resolves as follows pursuant to the provisions of §1000 and §1102 of the attached Exhibit:

§1000: Responsibility for Administration

The Village of Montgomery acknowledges its sole responsibility for its standing in the National Flood Insurance Program including the notification of the Director, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any changes or deviations which the Village makes from the KCSO, as defined above, and further resolves to adopt, pursuant to §404(a) of the KCSO, the most current version of any maps adopted and published by FEMA for regulation under the NFIP. The Village further resolves to automatically adopt any amendments, additions, revisions or substitutions thereto or therefore on an ongoing basis, until such point in time as the Corporate Authorities of the Village shall rescind this policy of automatic adoption of updates.

§1102: Filing and Contents of Petition for Certification

As indicated in §1000 above, the Village resolves and declares its intent to automatically adopt by reference all amendments to the KCSO as may be adopted by the County of Kane at any time in the future, and specifically to automatically adopt by reference the most current version of the FIRM and other maps adopted and published by FEMA for regulation under the NFIP.

All Village Staff, including but not limited to the Village Engineers, are hereby directed and authorized to utilize such updated FIRM and other maps, and such updates to the KCSO as may be available from time to time.

SECTION TWO: GENERAL PROVISIONS

REPEALER: All resolutions or portions thereof in conflict with this ordinance are hereby

repealed.

SEVERABILITY: Should any provision of this Resolution be declared invalid by a court of competent jurisdiction, the remaining provisions will remain in full force and effect the same as if the invalid provision had not been a part of this Resolution.

EFFECTIVE DATE: This Resolution shall be in full force and effect on and after its approval, passage and publication in pamphlet form as provided by law.

PASSED by the Board of Trustees of the Village of Montgomery, Kane and Kendall Counties, Illinois, this 7th day of October, 2008.

Marilyn Michelini

Marilyn Michelini, President of the Board of Trustees of the Village of Montgomery

VILLAGE OF MONTGOMERY, ILLINOIS
VILLAGE SEAL
KANE & KENDALL COUNTIES

ATTEST:

Barbara S Argo

Barbara Argo, Village Clerk

	Aye	Nay	Absent	Abstain
Trustee Jeanne Felten	✓			
Trustee Peter Heinz			✓	
Trustee William Keck	✓			
Trustee Dennis Lee	✓			
Trustee Lloyd Mattingly	✓			
Trustee Rob Watermann	✓			
Village President Marilyn Michelini	NO VOTE CAST			

COUNTY OF KANE

ENVIRONMENTAL AND BUILDING MANAGEMENT
Timothy Harbaugh, P.E., DEE, Director

County Government Center
719 Batavia Avenue
Geneva, IL 60134
www.co.kane.il.us
Environmental Management: (630) 208-5118
FAX: (630) 208-5137
Building Management: (630) 444-1068
FAX: (630) 587-1688

Date: 8/14/08

TO: Kane County Stormwater Administrators
Kane County Village / City Engineers

FROM: Tim Harbaugh, P.E., DEE, Director

RE: Requirement to Adopt Revisions to the Kane County Stormwater Ordinance

The Federal Emergency Management Agency (FEMA), together with the Illinois Department of Natural Resources, are completing the Map Modernization, "Map-Mod" initiative in Kane County, part of FEMA's nationwide update of Flood Insurance Rate Maps (FIRMs). As part of the Map-Mod process, FEMA completes a detailed review of County Stormwater Ordinances for deficiencies and other required revisions to ensure all Stormwater Ordinances meet the minimum requirements of the National Flood Insurance Program (NFIP).

FEMA, IDNR, and others deem necessary the attached revisions (also available at http://www.co.kane.il.us/kcstorm/) to the Kane County Stormwater Ordinance to comply with the NFIP and other state regulations (letter from FEMA also attached). Therefore, ***every certified municipality is being asked to adopt these revisions to remain active in the NFIP.*** Failure to adopt these revisions by the required date could result in FEMA dropping the community from the NFIP. If a community is dropped from the NFIP, every existing flood insurance policy in the community could be cancelled, no new flood insurance policies would be written, some federal or state loans could be called due, and the municipality would not be eligible for certain types of federal disaster relief.

FEMA's due date to adopt these revisions is the date when the new maps will become effective. That date has not yet been determined. **I respectfully request every certified municipality to adopt these revisions by December 1, 2008**, and send an executed copy of the adoption resolution to me for submittal to FEMA.

If you have any questions on these revisions to the Kane County Stormwater Ordinance, please contact me. For questions related to the Map Modernization process in Kane County, see http://www.co.kane.il.us/kcstorm/DFIRMS.asp , or contact Karen Kosky at 630-406-8477 / koskykaren@co.kane.il.us .

cc: Karen McConnaughay
Stormwater Management Committee
Phil Bus
Qualified Engineer Review Specialists (without attachments)
Qualified Wetland Review Specialists (without attachments)
Karen Kosky

STATE OF ILLINOIS

COUNTY OF KANE

ORDINANCE NO. _____

AMENDING THE KANE COUNTY STORMWATER MANAGEMENT ORDINANCE

WHEREAS, pursuant to 55 ILCS 5/5-1062, the Kane County Board adopted Res. No. 97-07 establishing the Kane County Stormwater Management Committee, for the purpose of preparing a comprehensive countywide stormwater management plan and stormwater management ordinance (the "Ordinance"); and

WHEREAS, the Ordinance was adopted by the County Board by the passage of Ordinance No. 00-312 on November 14, 2000; and

WHEREAS, additional flood insurance and floodplain related, and other amendments to the Ordinance are necessary;

NOW, THEREFORE, BE IT ORDAINED by the Chairman and the Kane County Board that the Kane County Stormwater Ordinance, as amended, is hereby further amended as follows:

1. Section 104 is amended as follows:

§ 104. Definitions

In this ordinance -

(31) ***development*** means any man-made change to the land and includes -

(G) the installation of a manufactured home on a site, the preparation of a site for a manufactured home, or the ~~installation~~placement of a recreational vehicle on a site for more than 180 days;

(39) ***existing manufactured home park*** means a development for the placement of manufactured homes for which, at a minimum, the installation of utilities, the construction of streets, and either the final site grading or the pouring of concrete pads was completed before the effective date;

(40) ***expansion of existing manufactured home park*** means the installation of utilities, or the construction of streets, or final site grading, or pouring of concrete pads in connection with the development of additional lots within an existing manufactured home park;

(41) ***farmed wetlands*** means wetlands that have been identified as farmed wetlands ~~by NRCS in a Certified Wetland Determination~~in accordance with the National Food Security

Act Manual (NFSAM) methodology and the United States Army Corps of Engineers - Chicago District methodology;

(47) ***FIRM*** or ***Flood Insurance Rate Map*** means the current version of a map published by FEMA on which FEMA has delineated both the special flood hazard areas and the risk premium zones applicable to a community, together with any amendments, additions, revisions or substitutions made thereto or therefor by FEMA at any time;

(48) ***FIS*** or ***Flood Insurance Study*** means ~~a study of flood discharges and flood profiles~~the current version of an examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations (or an examination of flood-related erosion hazards) for a community adopted and published by FEMA, together with any amendments, additions, revisions or substitutions made thereto or therefor by FEMA at any time;

(50) ***floodplain violation*** means the failure of a structure or other development to be in compliance with the floodplain management regulations of this ordinance, including the failure to have the elevation certificate, other certificates, or other evidence of compliance required in Article 4 until such time as the required documentation is provided;

(61) ***hemimarsh*** means an isolated wetland dominated on the edges by tall emergent vegetation with an interior area of shallow open water;

(62) ***highest adjacent grade*** means the highest natural elevation of the ground surface next to the proposed walls of a structure prior to construction;

~~(59) **hemimarsh** means an isolated wetland dominated on the edges by tall emergent vegetation with an interior area of shallow open water;~~

(77) ***lowest floor*** means the lowest floor of the lowest enclosed area of a structure (including basement) but does not include an unfinished or flood resistant enclosure suitable solely for parking of vehicles, building access, or storage in an area other than a basement, provided, however, that such enclosure is not built so as to render the structure in violation of the applicable requirements of § 407.

(87) ***new construction*** means development;

(88) ***new manufactured home park*** means a development for the placement of manufactured homes for which the installation of utilities and the construction of streets, and either the final site grading or the pouring of concrete pads was completed before the effective date;

(110) ***recreational vehicle*** means a vehicle that is (a) built on a single chassis, (b) 400 ft.^{2} or less when measured at the largest horizontal projection, (c) designed to be self-propelled or permanently towable by a light duty truck; and (d) designed primarily as temporary living

quarters for recreational camping, travel or seasonal use and not for use as a permanent dwelling;

(125) ***SFHA*** or ***Special Flood Hazard Area*** means ~~an area having~~the land in the floodplain within a community that is subject to a 1% or greater chance of flooding in any given year and has special flood, mudslide or mudflow, or flood related erosion hazards and is shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, M or E;

(127) ***start of construction*** (for other than new construction or substantial improvements under the Coastal Barrier Resources Act (Pub. L. 97-348)) with respect to new construction means the date the building permit was issued, provided the first placement of a permanent improvement on the site (such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation), or the placement of a manufactured home on a foundation, occurs within 180 days; but does not include land preparation (such as clearing, grading and filling), nor the erection of temporary forms, nor the construction or installation of accessory structures such as garages or sheds not occupied as a dwelling unit and not part of the main structure; with respect to substantial improvements, start of construction means the first alteration of any wall, ceiling, floor or other structural part of a structure, whether or not the alteration affects the external dimensions of the structure;

(131) ***substantial damage*** means damage to a building from any cause whereby the cost of restoring the building to its original condition is 50% or more of its market value prior to the damage:

(132) ***substantial improvement*** means (a) an improvement made to a ~~building~~structure the cost of which is ~~greater than or equal to~~ 50% or more of ~~building's~~the structure's market value before the start of construction of the improvement; (b) the reconstruction or repair of a ~~building~~structure, the cost of which is ~~greater than~~50% or ~~equal to 50%~~more of the ~~building's~~structure's market value before the start of construction of the reconstruction or repair; or (c) an addition to a ~~building~~structure the cost of which is ~~greater than~~50% or ~~equal to 50%~~more of the ~~building's~~structure's market value before the start of construction of the addition, or any addition that increases the floor area by more than 20%; or (d) any work done to a structure that has suffered substantial damage; but not (i) any work done to a structure to correct existing violations of State or local health, sanitary or safety codes identified and determined by the local code enforcement official to be the minimum necessary to assure safe living conditions; or (ii) any work done to an historic structure;

2. Section 201 is amended as follows:

§ 201. General stormwater requirements

(b) Analysis and design of all stormwater facilities required for a development shall -

(3) ensure that the site is reasonably safe from flooding.

3. Section 404 is amended as follows:

§ 404. Floodplain, regulatory floodplain, BFE and regulatory floodway locations

(a) The BFE shall be delineated on the site topography to establish the regulatory floodplain area limits for regulation under this ordinance. Regulatory floodplains shall be delineated on the site map from the current FEMA FIRM, FBFM or LOMR and include those areas of the SFHA which are not regulatory floodplains. The current version of the maps adopted and published by FEMA for regulation under the NFIP together with any amendments, additions, revisions or substitutions thereto or therefor adopted and published by FEMA at any time in the future are hereby referred to, adopted, and made part hereof as if fully set out in this ordinance. A list of the current regulatory maps for the County to be consulted is maintained by the Director. ~~All amendments or revisions to any FIRM or FBFM, any IDNR-OWR or FEMA approved revision to the BFE, and any IDNR-OWR or FEMA approved FIS made or adopted after the date of this ordinance are hereby referred to, adopted and declared to be part of this ordinance as though fully set forth, it being the specific intention of the Kane County Board by the adoption of this ordinance to adopt by reference each and every such amendment or revision concurrently with its adoption by IDNR-OWR or FEMA.~~

(b)

(7) When none of the above apply but the proposed development consists of more than 50 lots or more than 5 acres, a study acceptable to the Administrator shall be provided for determination of a site-specific BFE.

(c)

(2) General criteria for analysis of flood elevations in the regulatory floodway are as follows:

(D) If the development will result in a change in the location of the regulatory floodway or a change in the BFE, the applicant shall submit the information required for the issuance of a CLOMR to IDNR/OWR and FEMA. A public notice inviting ~~public~~ comment on the proposed change in the BFE or location of the regulatory floodway will be ~~issued~~published by IDNR/OWR or its designee before a CLOMR is issued. All communities adjacent to a watercourse alteration or revocation shall be notified of the proposed development. Filling, grading, dredging or excavating may take place upon issuance of a conditional approval from IDNR/OWR and the Administrator, provided that no encroachment increases the Base Flood ~~Level~~ Elevation more than 1/10 of 1 foot. No further development activities shall take place in the existing or proposed floodplain until a LOMR is issued by FEMA unless such activities meet all the requirements of §§ 403 through 413 of this ordinance. The Director shall be copied on all related correspondence.

4. Section 407 is amended as follows:

§ 407. Building protection standards

This section applies to all buildings located in the regulatory floodplain. However, most new and replacement buildings are not appropriate uses of the regulatory floodway.

(a) The lowest floor including basements of all new residential structures, substantially improved structures and additions shall be elevated at least to the FPE. An attached garage for a structure must be elevated at least six inches above the BFE.

(3) Fully enclosed areas in new construction and substantial improvements that are subject to flooding and are used solely for parking of vehicles, building access or storage in an area other than a basement shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing the entry and exit of flood waters. Designs shall be certified by a registered professional engineer or have a minimum of two openings having a total net area of not less than 1 in.^{2} for every square-foot of enclosed area subject to flooding with the bottom of all openings no higher than 1 foot above grade. Openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic entry and exit of flood waters.

(c) Manufactured homes ~~and recreational vehicles to be installed on a site for more than 180 days~~placed outside a manufactured home park or on a site in an existing manufactured home park in which a manufactured home has suffered substantial damage as a result of a flood shall be at or above the FPE and shall be anchored to resist flotation, collapse or lateral movement in accordance with the Illinois Manufactured Home Tie-Down Code (77 Ill. Adm. Code 870 (1999), as amended.) Manufactured homes placed or substantially improved in an existing manufactured home park shall be elevated so that the chassis is supported by reinforced piers no less than 36 inches in height above grade and securely anchored. Recreational vehicles to be installed on a site for more than 180 days, unless fully licensed and highway ready, shall be at or above the FPE and shall be anchored to resist flotation, collapse or lateral movement. In accordance with the Illinois Manufactured Home Tie-Down Code (77 Ill. Adm. Code 870 (1999), as amended).

(f) All new construction and substantial improvements shall employ anchoring to prevent flotation, collapse or lateral movement of the structure, use flood resistant materials, and be constructed by methods and practices that minimize flood damages.

(g) Where base flood elevation data are used within Zone A on the community's FHBM or FIRM, a record of the following shall be obtained and maintained by the Administrator:

(1) The elevation of the lowest floor (including basement) of all new structures and substantially improved structures; and

(2) The elevation to which the structure was floodproofed (if the structure has been floodproofed in accordance with §§ 407(a)(2), 407(b) and 407(f).)

(h) In FEMA Zones AO and AH drainage paths shall be provided around structures on slopes to guide water around and away from proposed structures.

5. Section 412 is amended as follows:

§ 412. Riverine Floodplain

These standards apply to riverine regulatory floodplains without a regulatory floodway. The applicant shall obtain approval from IDNR/OWR for all development, any portion of which is located within the regulatory floodplain (without a delineated regulatory floodway) with a tributary drainage area of 640 acres or more.

(c) If a development will alter or relocate a watercourse the applicant shall notify adjacent communities.

6. Section 413 is amended as follows:

§ 413. Bridge and culvert standards

These standards are for the construction, reconstruction~~,~~ or modification ~~or new construction~~ of bridges, culvert crossings and roadway approaches located in the regulatory floodplain.

7. Section 414 is amended as follows:

§ 414. Requirements for wetland delineation

(a) Before any development in or near Waters of the U.S., or in or near isolated wetlands or farmed wetlands, a written report identifying and evaluating the boundaries, location, limits, area and quality of all onsite wetlands shall be submitted. The presence and limits of wetland areas shall be determined by a wetland delineation conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual. Wetland delineations under this section shall be valid for three years. ~~The presence of farmed wetlands shall be determined by NRCS.~~

~~(b) Before any development on agricultural land, in addition to the onsite delineation required under the previous paragraph, a Certified Wetland Determination shall be obtained from NRCS.~~

8. Section 418 is amended as follows:

§ 418. Buffer requirements

The requirements of this section are not applicable to redevelopment projects on sites adjacent to the main channel of the Fox River. The requirements of this section are also not applicable to isolated wetlands or Waters of the U.S. that, in either case, are below the threshold size limitations for mitigation requirements under the COE § 404 permit program (currently, less than 0.~~25~~10 acres).

(a)

(3)

(B)

(ii) For all non-lineal water bodies or ~~Waters of the U.S. designated as ADID or~~ wetlands with an FQI greater than 16, a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(ii).

(iii) For ~~non-ADID~~ wetlands with an FQI of 7 to 16 a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(iii).

(iv) For ~~non-ADID~~ wetlands with an FQI of less than 7 a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(iv).

(b) Buffers shall be replanted or reseeded using appropriate predominately native deep-rooted vegetation, appropriately managed and maintained ~~following disturbance~~.

(e) If a buffer area is disturbed by permitted activities during construction, the buffer strip shall be stabilized in accordance with ~~§300~~subsection (b) of this section.

9. Tables 418(a)(3)(B)(ii), 418(a)(3)(B)(iii) and 418(a)(3)(B)(iv) are amended as follows:

BUFFER WIDTH CALCULATION TABLES

Table 418(a)(3)(B)(ii) – High Quality Wetlands – FQI > 16

BUFFER RATIO	WETLAND AREA *(Acres)*	BUFFER AREA *(Acres)*	BUFFER WIDTH *(Feet)*
0.5	0.10	0.050	15.0
0.5	0.25	0.125	15.0
0.5	0.50	0.250	20.0
0.5	0.75	0.375	25.0
0.5	1.00	0.500	30.0
0.5	1.25	0.625	30.0
0.5	1.50	0.750	35.0
0.5	1.75	0.875	35.0
0.5	2.00	1.000	40.0
0.5	2.25	1.125	40.0
0.5	2.50	1.250	45.0
0.5	2.75	1.375	45.0
0.5	3.00	1.500	50.0
0.5	3.25	1.625	50.0
0.5	3.50	1.750	50.0
0.5	3.75	1.875	50.0
0.5	4.00	2.000	50.0
0.5	4.25	2.125	50.0
0.5	4.50	2.250	50.0
0.5	4.75	2.375	50.0
0.5	5.00 or more	2.500	50.0

Buffer Ratio = % of total wetland area
Wetland Area = Total on and offsite area of the wetland = (%*Acres)
Buffer Area = Area of the buffer = (%*Acres)
Buffer Width = [Area * 43560) / 4] / [Sqrt (Acres * 43560)]

Table 418(a)(3)(B)(iii) – Medium Quality Wetlands ~~FQI >~~ 7 < FQI < 16

BUFFER RATIO	WETLAND AREA *(Acres)*	BUFFER AREA *(Acres)*	BUFFER WIDTH *(Feet)*
0.4	0.10	0.04	15.0
0.4	0.25	0.10	15.0
0.4	0.50	0.20	15.0
0.4	0.75	0.30	20.0
0.4	1.00	0.40	25.0
0.4	1.25	0.50	25.0
0.4	1.50	0.60	30.0
0.4	1.75	0.70	30.0
0.4	2.00	0.80	30.0
0.4	2.25	0.90	35.0
0.4	2.50	1.00	35.0
0.4	2.75	1.10	35.0
0.4	3.00	1.20	40.0
0.4	3.25	1.30	40.0
0.4	3.50	1.40	40.0
0.4	3.75	1.50	45.0
0.4	4.00	1.60	45.0
0.4	4.25	1.70	45.0
0.4	4.50	1.80	45.0
0.4	4.75	1.90	50.0
0.4	5.00 or more	2.00	50.0

Buffer Ratio = % of total wetland area
Wetland Area = Total on and offsite area of the wetland = (%*Acres)
Buffer Area = Area of the buffer = (%*Acres)
Buffer Width = [Area * 43560) / 4] / [Sqrt (Acres * 43560)]

Table 418(a)(3)(B)(iv) – Low Quality Wetlands – FQI < 7

BUFFER RATIO	WETLAND AREA *(Acres)*	BUFFER AREA *(Acres)*	BUFFER WIDTH *(Feet)*
0.3	0.10	0.030	15.0
0.3	0.25	0.075	15.0
0.3	0.50	0.150	15.0
0.3	0.75	0.225	15.0
0.3	1.00	0.300	20.0
0.3	1.25	0.375	20.0
0.3	1.50	0.450	20.0
0.3	1.75	0.525	25.0
0.3	2.00	0.600	25.0
0.3	2.25	0.675	25.0
0.3	2.50	0.750	25.0
0.3	2.75	0.825	30.0
0.3	3.00	0.900	30.0
0.3	3.25	0.975	30.0
0.3	3.50	1.050	30.0
0.3	3.75	1.125	35.0
0.3	4.00	1.200	35.0
0.3	4.25	1.275	35.0
0.3	4.50	1.350	35.0
0.3	4.75	1.425	35.0
0.3	5.00 or more	1.500	35.0

Buffer Ratio = % of total wetland area
Wetland Area = Total on and offsite area of the wetland = (%*Acres)
Buffer Area = Area of the buffer = (%*Acres)
Buffer Width = [Area * 43560) / 4] / [Sqrt (Acres * 43560)]

10. Section 504 is amended as follows:

§ 504. Plan set submittal

(b) General Plan View Drawing:

(10) existing Waters of the U.S. including wetlands, ~~a certified wetland determination obtained from NRCS if the development occurs on agricultural land~~farmed wetlands and aquatic resources identified in ADID, and required buffers;

11. Section 702 is amended as follows:

§ 702. Offenses

(a) Any person who violates, disobeys, omits, neglects, refuses to comply with, or resists the enforcement of any provision of this ordinance (***ordinance violation***), or any requirement or condition in any permit issued pursuant to this ordinance (***permit violation***), or any requirement or condition contained in Article 4 (***floodplain violation***), and, in the case of a permit violation or a floodplain violation, fails to correct such violation, omission or neglect, or cease such disobedience, refusal or resistance after notice and reinspection as provided below, shall be guilty of an offense under this ordinance.

12. Section 1000 is amended as follows:

§ 1000. Responsibility for administration

(c) Each community shall remain solely responsible for its standing in the National Flood Insurance Program, including

(2) the notification of the Director, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any proposed amendment to this ordinance; and

(3) The adoption pursuant to §404(a) of the most current version of the maps adopted and published by FEMA for regulation under the NFIP and the automatic adoption of any amendments, additions, revisions or substitutions thereto or therefor.

13. Section 1002 is amended as follows:

§ 1002. Duties of Administrator

The Administrator shall -

(o) ensure that all wetland impacts have been mitigated; and

(p) maintain records of the lowest floor and floodproofing elevations for new construction and substantial improvements where BFE data are used in FEMA Zone A.

14. Section 1102 is amended as follows:

§ 1102. Filing and contents of petition for certification

A petition for certification shall be filed with the Director. The petition need not be on any particular form but, at a minimum, shall set forth and be accompanied by -

(a) the agreement of the corporate authorities of the community to adopt, if certified, this ordinance by reference, including in such ordinance of adoption language expressing the intent of the corporate authorities of the community to automatically adopt by reference all amendments to this ordinance adopted by the County at any time in the future, and specifically to automatically adopt by reference the most current version of the maps adopted and published by FEMA for regulation under the NFIP;

15. The caption of Article 13 is amended as follows:

ARTICLE 13 – FEE-IN-LIEU OF SITE RUNOFF STORAGE ~~AND~~OR WETLAND MITIGATION

16. Section 1503 is amended as follows:

§ 1503. Mitigation requirements

(i)The applicant may propose an alternative mitigation plan combining wetland creation, purchase of credits from a wetland mitigation bank, payment of a fee-in-lieu of wetland mitigation, and/or enhancing existing wetlands either onsite or offsite. The ~~Director (or~~ Administrator in a community certified to administer Article 15~~)~~, shall notify the Director of the proposal of an alternate mitigation plan and the Director shall determine if ~~a~~the proposed alternative mitigation plan meets the requirements of this section and his or her decision shall be final.

Passed by the Kane County Board on _____, 2007.

_____	_____
John H. Cunningham	Karen McConnaughay
Clerk, County Board	Chairman, County Board
Kane County, Illinois	Kane County, Illinois

Vote:
Yes _____
No _____
Voice _____
Abstentions _____

U.S. Department of Homeland Security
Region V
536 South Clark Street, Floor 6
Chicago, IL 60605

FEMA

December 17, 2007

Tim Harbaugh, P.E., DEE
Director of Environmental and
Building Management
719 Batavia Ave
Geneva, Illinois 60134

Dear Mr. Harbaugh:

We have received a copy of the proposed changes to Kane County's Stormwater Management Ordinance. If the Ordinance is adopted as proposed, it will meet the National Flood Insurance Program (NFIP) minimum requirements. Once this office receives a certified copy of the Ordinance, a cursory review will be done to verify that the proposed changes have been made. If the adopted Ordinance is as proposed, a letter will be sent to the County Board Chairman notifying him that the Ordinance has been approved and the County will continue to participate in the NFIP.

If you or any member of your staff experiences difficulties interpreting or enforcing its floodplain regulations or has questions on the NFIP in general, feel free to contact Michael Bryant at (312) 408-5334.

Sincerely,

Terry Reuss Fell

Terry Reuss Fell (Ms.), Chief
Hazard Identification and
Risk Assessment Branch

C.C. John Lentz, IDNR

VILLAGE OF MONTGOMERY

ORDINANCE NO. 1167

AN ORDINANCE ADOPTING CERTAIN PORTIONS OF THE REVISED KANE COUNTY STORMWATER ORDINANCE FOR THE VILLAGE OF MONTGOMERY, ILLINOIS

PASSED BY THE PRESIDENT AND BOARD OF TRUSTEES
OF THE VILLAGE OF MONTGOMERY, KANE AND KENDALL COUNTIES, ILLINOIS
THIS 14th DAY OF FEBRUARY, 2005.

PUBLISHED IN PAMPHLET FORM BY AUTHORITY
OF THE PRESIDENT AND BOARD OF TRUSTEES
OF THE VILLAGE OF MONTGOMERY, KANE AND KENDALL COUNTIES,
ILLINOIS, THIS 14th DAY OF FEBRUARY, 2005.

ORDINANCE NO. 1167
AN ORDINANCE ADOPTING CERTAIN PORTIONS OF THE REVISED KANE COUNTY STORMWATER ORDINANCE FOR THE VILLAGE OF MONTGOMERY, ILLINOIS

BE IT ORDAINED by the President and Board of Trustees of the Village of Montgomery, Kane and Kendall Counties, Illinois, as follows;

WHEREAS, the Village of Montgomery is not a home rule municipality within Article VII, Section 6A of the Illinois Constitution and, pursuant to the powers granted to it under 65 ILCS 5/1-1 *et seq.*; and,

WHEREAS, the Village of Montgomery has previously adopted the Kane County Stormwater Ordinance and has previously filed its Petition for Certification, which Petition was approved; and,

WHEREAS, the Kane County Board adopted certain Minor Ordinance Revisions to the Kane County Stormwater Ordinance which became effective on January 1, 2005; and,

WHEREAS, the Village of Montgomery desires to enforce the Revised Kane County Stormwater Ordinance in those portions of the Village located within Kane County, with certain modifications to be described below;

NOW, THEREFORE, BE IT ORDAINED by the President and Board of Trustees of the Village of Montgomery, Kane and Kendall Counties, Illinois, as follows:

SECTION ONE: ORDINANCE ADOPTED

The Revised Kane County Stormwater Ordinance effective January 1, 2005, a copy of which is attached hereto, be and hereby is adopted by reference as if fully set forth herein, (except as modified in Section Two hereof), to serve as the stormwater regulations for those portions of the Village of Montgomery which are located in Kane County, Illinois.

SECTION TWO: MODIFICATIONS TO KANE COUNTY ORDINANCE

The Revised Kane County Stormwater Ordinance, as adopted and enforced by the Village of Montgomery, shall be modified with the amendment of Section 1300 as follows:

§ 1300. Fee-in-lieu of site runoff storage

(a) The Director or the Administrator may require, or in the limited circumstances prescribed in Article 2 an applicant may request approval of, the payment of a fee-in-lieu of site runoff storage to fulfill all or part of the site runoff storage requirement for a development. The fee to be paid in lieu of site runoff storage shall be the lesser of—

(1) Ninety Thousand Dollars ($90,000.00) for each acre-foot, with said sum proportionally adjusted by being multiplied by the total fractional number of acre-feet to be substituted by payments in lieu (e.g. 1.5 acre-feet x $90,000.00 = $135,000.00); or,

(2) The verifiable cost of otherwise providing the required storage, including the value of the land required and all construction costs. For this purpose the land required shall be valued according to the use to which it will ultimately be put if not used to provide the required storage.

SECTION THREE: ORDINANCES REPEALED

Any and all ordinances, resolutions, motions or part thereof, in conflict with this Ordinance, are to the extent of such conflict, hereby superseded and waived, provided however that this Ordinance is to be read and construed in conjunction with the attached Kane County Stormwater Ordinance, subject to the modifications described in Section Two of this Ordinance. However, nothing contained in this Ordinance shall affect the applicability of Village of Montgomery Ordinance No. 815, Ordinance No. 948, other Village Ordinances or Resolutions, or other sections of the Village Code of Ordinances to property located within the Village of Montgomery, but outside of Kane County, Illinois.

SECTION FOUR: EFFECTIVE DATE

This ordinance shall be in full force and effect from and after its passage, approval and publication in pamphlet form as provided by law.

PASSED AND APPROVED by the President and Board of Trustees of the Village of Montgomery, Kane and Kendall Counties, Illinois this 14th day of February, 2005.

Marilyn Michelini

Marilyn Michelini
President of the Board of Trustees of the Village of Montgomery

VILLAGE OF MONTGOMERY ILLINOIS
VILLAGE SEAL
KANE & KENDALL COUNTIES

ATTEST:

Rob Watermann, Clerk of the Village of Montgomery

	Aye	Nay	Absent	Abstain
Trustee Roger Burrell	✓			
Trustee Jeanne Felten	✓			
Trustee Peter Heinz	✓			
Trustee William Keck	NO VOTE CAST			
Trustee Dennis Lee	✓			
Trustee Lloyd Mattingly	✓			
Village President Marilyn Michelini			✓	

TABLE OF CONTENTS

ARTICLE 1—AUTHORITY, PURPOSE AND DEFINITIONS 4
§ 100. Statutory authority 4
§ 101. Kane County Comprehensive Countywide Stormwater Management Plan 4
§ 102. Purposes of this ordinance 4
§ 103. Reference to watershed plans 5
§ 104. Definitions 6

ARTICLE 2—REQUIREMENTS FOR STORMWATER MANAGEMENT 16
§ 200. General information 16
§ 201. General stormwater requirements 16
§ 202. Site runoff requirements 17
§ 203. Site runoff storage requirements (detention) 19

ARTICLE 3—EROSION AND SEDIMENT CONTROL (NRCS) 22
§ 300. Erosion and sediment control 22

ARTICLE 4—PROTECTION OF SPECIAL MANAGEMENT AREAS 25
§ 400. Reserved 25
§ 401. Disclaimer 25
§ 402. Statewide and regional permits 25
§ 403. Floodplain management 25
§ 404. Floodplain, regulatory floodplain, BFE and regulatory floodway locations 25
§ 405. General performance standards 27
§ 406. Public health protection standards 28
§ 407. Building protection standards 28
§ 408. Non-conforming structures 29
§ 409. Lowest opening 29
§ 410. Compensatory storage volume standards 30
§ 411. Floodway standards 30
§ 412. Riverine Floodplain 32
§ 413. Bridge and culvert standards 33
§ 414. Requirements for wetland delineation 34
§ 415. Mitigation to be local 34
§ 416. Threatened and endangered species consultation 34
§ 417. Wetland preservation during development 34
§ 418. Buffer requirements 35

ARTICLE 5—REQUIRED SUBMITTALS FOR STORMWATER MANAGEMENT PERMITS 42
§ 500. General requirements 42
§ 501. Duration and revision of permits 43
§ 502. Required submittals 43
§ 503. Application and project overview 44
§ 504. Plan set submittal 44
§ 505. Stormwater submittal 46
§ 506. Floodplain submittal 47
§ 507. Wetland submittal 48
§ 508. Performance security 48
§ 509. Maintenance schedule and funding 48
§ 510. Record drawings 48
§ 511. Terms of permit/denial—appeal 48

ARTICLE 6—LONG TERM MAINTENANCE 50
§ 600. Long-term maintenance 50

§ 601. Transfer to permitting authority or other public entity 50
§ 602. Transfer to homeowner's or similar association 50
§ 603. Conveyance to one or more persons 51
§ 604. Incorporation of maintenance obligations in stormwater management permit 51
§ 605. Funding of long-term maintenance of stormwater facilities 51

ARTICLE 7—ENFORCEMENT AND PENALTIES 53
§ 700. Inspection and maintenance authority 53
§ 701. Required inspections 53
§ 702. Offenses 53
§ 703. Offenses - penalties; remedies 53

ARTICLE 8—GENERAL PROVISIONS 55
§ 800. Scope of Regulation 55
§ 801. Exemptions 55
§ 802. Committees's determination of exemption 55
§ 803. Community's list of proposed exempt developments 56
§ 804. Interpretation 56
§ 805. Warning and disclaimer of liability 57
§ 806. Choice of planning jurisdiction 57
§ 807. Severability 57
§ 808. Repealer 57
§ 809. Amendments 57
§ 810. Effective date 57

ARTICLE 9—VARIANCES 58
§ 900. Purpose 58
§ 901. Application for variance 58
§ 902. Application fee 58
§ 903. Public hearing 58
§ 904. Granting of variances 58
§ 905. Recommendations 59
§ 906. Decision 60
§ 907. Conditions 60

ARTICLE 10—ADMINISTRATION 61
§ 1000. Responsibility for administration 61
§ 1001. Duties of Director 61
§ 1002. Duties of Administrator 61
§ 1003. Representative capacity 62
§ 1004. Oversight committee 62
§ 1005. Decision-making authority 63
§ 1006. Service 63
§ 1007. Publication 63

ARTICLE 11—CERTIFIED COMMUNITY ENFORCEMENT 64
§ 1100. Enforcement authority 64
§ 1101. Petition for certification and waiver of enforcement 64
§ 1102. Filing and contents of petition for certification 64
§ 1103. Committee consideration of petition for certification 65
§ 1104. Standards for certification 65
§ 1105. Certified community records 65
§ 1106. Committee review of enforcement by certified community 65
§ 1107. Investigations; compliance 65
§ 1108. Hearing on complaint 66
§ 1109. Committee decision 66

ARTICLE 12— PERFORMANCE SECURITY 67
§ 1200. General security requirements 67
§ 1201. Development security 67
§ 1202. Erosion and sediment control security 67
§ 1203. Wetland mitigation and performance security 68
§ 1204. Letters of credit 68

ARTICLE 13—FEE-IN–LIEU OF SITE RUNOFF STORAGE AND WETLAND MITIGATION 70
§ 1300. Fee-in-lieu of site runoff storage 70
§ 1301. Procedures; use of funds 70
§ 1302. Fee-in-lieu of wetland mitigation 70
§ 1303. Procedures; use of funds 70

ARTICLE 14— QUALIFIED REVIEW SPECIALISTS 72
§ 1400. General 72
§ 1401. Requirements for qualified engineer review specialists 72
§ 1402. Requirements for qualified wetland review specialists 72
§ 1403. Review of qualifications 73
§ 1404. Review Specialist Qualification Committee 73
§ 1405. Investigation; compliance 73
§ 1406. Hearing on complaint 73
§ 1407. Decision of the RSQC 74
§ 1408. Appeals 74

ARTICLE 15— WETLAND IMPACTS AND MITIGATION 75
§ 1500. General 75
§ 1501. Unmitigable wetlands—exceptions 75
§ 1502. Mitigation required 75
§ 1503. Mitigation requirements 75
§ 1504. Wetland mitigation plan 76
§ 1505. Buffer requirements for wetland mitigation facilities 77
§ 1506. Wetland mitigation performance standards 77
§ 1507. Mitigation monitoring 77
§ 1508. Mitigation required for non-performing wetland 77
§ 1509. Denial of permit—appeal 78

APPENDIX A—WATERSHED BOUNDARIES 79

APPENDIX B—QUALIFIED ENGINEER REVIEW SPECIALIST STATEMENT 81

APPENDIX C—QUALIFIED WETLAND REVIEW SPECIALIST STATEMENT 82

APPENDIX D—SAMPLE SPECIAL SERVICE AREA ORDINANCES 83

ARTICLE 1—AUTHORITY, PURPOSE AND DEFINITIONS

§ 100. Statutory authority

(a) This ordinance shall be known, and may be cited, as the Kane County Stormwater Management Ordinance.

(b) The Kane County Board adopts this ordinance pursuant to its authority to regulate stormwater management and govern the location, width, course, and release rate of all stormwater runoff channels, streams, and basins in the County, in accordance with the Kane County Comprehensive Countywide Stormwater Management Plan. The statutory authority for this ordinance is contained in 55 ILCS 5/5-1041, 5-1042, 5-1049, 5-1062, 5-1063, 5-1104, 5-12003 and 5-15001 *et seq.*, and 415 ILCS 5/43, and other applicable authority, all as amended from time to time.

(c) As applicable, the municipalities within the County adopt and enforce this ordinance pursuant to 55 ILCS 5/5-1062, 65 ILCS 5/1-2-1, 11-12-12, 11-30-2, 11-30-8, and 11-31-2; and 615 ILCS 5/5, *et seq.*, including 5/18g.

§ 101. Kane County Comprehensive Countywide Stormwater Management Plan

The Kane County Comprehensive Countywide Stormwater Management Plan was recommended by the Kane County Stormwater Management Committee and adopted by the County Board, after review by the appropriate agencies and a public hearing, by Ordinance No. 98-251 on October 13, 1998. The Plan is available for public inspection in the office of the Kane County Clerk.

§ 102. Purposes of this ordinance

(a) The principal purpose of this ordinance is to promote effective, equitable, acceptable and legal stormwater management measures by establishing reasonable rules and regulations for development. Other purpose of this ordinance include—

(1) managing and mitigating the effects of urbanization on stormwater drainage throughout Kane County through planning, appropriate engineering practices and proper maintenance;

(2) protecting the public health and safety and reducing the potential for loss of human life and property from flood damage;

(3) protecting the public from the degradation of water quality on a watershed basis;

(4) preserving and enhancing the natural hydrologic and hydraulic functions and natural characteristics of watercourses and floodplains to protect water quality, aquatic habitats, reduce flood damage, reduce soil erosion, provide recreational and aesthetic benefits and enhance community and economic development;

(5) controlling sediment and erosion in and from stormwater facilities, developments, agricultural fields, and construction sites and reducing and repairing streambank erosion;

(6) requiring planning for development to provide for water resource management, taking into account natural features such as vegetation, wildlife, waterways, wetlands and topography in order to reduce the probability that new development will create unstable conditions susceptible to erosion or degrade the quality of ground and surface waters;

(7) protecting environmentally sensitive areas from deterioration or destruction by private or public actions;

(8) protecting and enhancing the quantity and quality of potable groundwater and potable surface water supplies;

(9) requiring appropriate and adequate provision for site runoff control, especially when the land is developed with a large amount of impervious surface;

(10) requiring the design and evaluation of each site stormwater management plan to be consistent with watershed capacities;

(11) encouraging the use of stormwater storage and infiltration of stormwater in preference to stormwater conveyance;

(12) lessening the taxpayers' burden for flood-related disasters, repairs to flood-damaged public facilities and utilities, and flood rescue and relief operations;

(13) meeting the IDNR-OWR floodway permitting requirements delineated in 615 ILCS 5/18g, (*An Act in Relation to the Regulation of the Rivers, Lakes, and Streams of the State of Illinois* (1992)), as amended from time to time;

(14) complying with the rules and regulations of the National Flood Insurance Program thereby making federally subsidized flood insurance available to persons throughout the County;

(15) minimizing conflicts and incompatibilities between agricultural and urban drainage systems and maintaining agriculture as a viable and productive land use;

(16) encouraging cooperation and consistency in stormwater management activities within and between units of government having floodplain and stormwater management jurisdiction;

(17) restricting development in the floodplain to facilities that will not adversely affect the potential for flood damage;

(18) protecting and improving surface water quality and promoting beneficial uses of ponds, lakes, wetlands, rivers and streams by reducing point source and non-point source discharges of pollutants;

(19) requiring regular, planned maintenance of stormwater management facilities;

(20) requiring control of stormwater quantity and quality at the most site-specific or local level and preventing unauthorized or unmitigated discharge of flow offsite;

(21) protecting the quantity and quality of wetlands;

(22) allowing the use of simple technologies whenever appropriate and realistic, but requiring the use of more sophisticated techniques when necessary to insure the adequacy of stormwater controls;

(23) providing a procedure by which communities throughout the County may petition the Committee for authority to implement and enforce the provisions of this ordinance; and

(24) requiring strict compliance with and enforcement of this ordinance.

(b) The purposes of this ordinance are consistent with and supersede the Plan.

§ 103. Reference to watershed plans

(a) This ordinance recognizes the integrated nature of the watershed system and the need to study certain flood control alternatives and other stormwater management functions on a watershed-wide basis.

(b) Individual watershed plans or interim watershed plans which recognize the unique attributes of each watershed may be prepared and periodically updated for the major watersheds to identify management projects and establish criteria for development.

(c) Watershed plans or interim watershed plans may be adopted which contain more or less stringent requirements than those of this ordinance. Watershed-specific requirements established in such watershed plans or interim watershed plans will be set forth in §§ 105 through 117 of this ordinance.

§ 104. Definitions

In this ordinance—

(1) ***ADID*** means advanced identification of wetlands and aquatic resources under a study authorized and funded by the United States Environmental Protection Agency and adopted by the County;

(2) ***Administrator*** means the person designated by the permitting authority to administer and enforce this ordinance;

(3) ***agricultural land*** means land predominantly used for agricultural purposes;

(4) ***agricultural subsurface drainage*** is a water management technique driven by economic and safety concerns, where the rate at which surplus groundwater should be removed is determined primarily by the moisture/air requirements of the vegetation;

(5) ***applicable engineering practice*** means procedures, methods or materials recommended in standard engineering textbooks or references as suitable for the intended purpose;

(6) ***applicant*** means any person who submits an application for a permit under this ordinance;

(7) ***appropriate use*** means a use of the regulatory floodway permitted under Article 4;

(8) ***base flood*** means the flood having a one percent probability of being equaled or exceeded in a given year;

(9) ***BFE*** or ***base flood elevation*** means the highest water surface elevation that can be expected during the base flood;

(10) ***BMP*** or ***best management practices*** means a measure used to control the adverse stormwater-related effects of development, and includes structural devices (for example, swales, filter strips, infiltration trenches, and site runoff storage basins), designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats, and nonstructural approaches, such as public education efforts to prevent the dumping of household chemicals into storm drains;

(11) ***building*** means a structure that is principally aboveground and is enclosed by walls and a roof; a building includes a gas or liquid storage tank, a manufactured home or prefabricated building;

(12) ***buffer*** means an area of predominantly deeply rooted native vegetated land adjacent to channels, wetlands, lakes or ponds for the purpose of stabilizing banks, reducing contaminants, including sediments, in stormwater that flows to such areas;

(13) ***Bulletin 70*** means *Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois*, by Floyd Huff and James Angel of the Illinois State Water Survey (1989);

(14) ***certified community*** means a community certified under Article 11;

(15) ***channel*** means any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway which has a definite bed and bank or shoreline, in or into which surface, groundwater, effluent, or industrial discharges flow either perennially or intermittently;

(16) ***channel modification*** means alteration of a channel by changing the physical dimensions or materials of its bed or banks, and includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation, but does not include the clearing of debris or removal of trash or dredging to previously documented thalweg elevations and sideslopes;

(17) ***commercial*** means having the qualities associated with the transaction of business with the public at large where the traffic generated warrants construction of site improvements;

(18) ***Committee*** means the Kane County Stormwater Management Committee;

(19) ***community*** means the County or any municipality within the County;

(20) ***compensatory storage*** means an excavated, hydrologically and hydraulically equivalent volume of storage created to offset the loss of existing flood storage;

(21) ***CLOMA*** or ***Conditional Letter of Map Amendment*** means a FEMA comment letter on a development proposed to be located in, and affecting only that portion of, the area of floodplain outside the regulatory floodway and having no impact on the existing regulatory floodway or base flood elevations;

(22) ***CLOMR*** or ***Conditional Letter of Map Revision*** means a letter that indicates that FEMA will revise base flood elevations, flood insurance rate zones, flood boundaries or floodways as shown on an effective FIRM or FBFM, after the record drawings are submitted and approved;

(23) ***COE*** means the United States Army Corps of Engineers;

(24) ***control structure*** means a structure designed to control the rate of flow that passes through the structure given a specific upstream and downstream water surface elevation;

(25) ***County*** means Kane County, Illinois;

(26) ***critical duration*** means the duration of a storm event that results in the greatest peak runoff;

(27) ***dam*** means any obstruction, wall embankment, or barrier, together with any abutments and appurtenant works, constructed to store or divert water or to create a pool (not including underground water storage tanks);

(28) ***Department*** means the Kane County Department of Environmental Management;

(29) ***depressional storage*** means the volume contained below a closed contour on a one foot contour interval topographical map, the upper elevation of which is determined by the invert of a surface gravity outlet;

(30) ***developer*** means a person who creates or causes a development;

(31) ***development*** means any manmade change to the land and includes—

(A) the construction, reconstruction, or replacement of a building or an addition to a building;

(B) the installation of utilities, construction of roads, bridges or similar projects;

(C) drilling and mining;

(D) the construction or erection of levees, walls, fences, dams, or culverts;

(E) channel modifications, filling, dredging, grading, excavating, paving, or other nonagricultural alterations of the ground surface;

(F) the storage of materials and the deposit of solid or liquid waste;

(G) the installation of a manufactured home on a site, the preparation of a site for a manufactured home, or the installation of a recreational vehicle on a site for more than 180 days;

(H) any wetland impact; and

(I) any other activity of man that might change the direction, height, or velocity of flood or surface water, including the extensive removal of vegetation;

development, however, does not include—

(J) maintenance and repair of existing buildings or facilities;

(K) repair or replacement of an existing parking lot outside the floodplain provided that no new impervious surfaces are added, there is no increase in peak flows, and there is no change in the location of the stormwater discharge;

(L) resurfacing of streets and highways outside the floodplain;

(M) resurfacing of publicly owned streets and highways within the floodplain provided the difference between the elevation of the road surface after resurfacing and the elevation of the road surface on the effective date is not more than two inches;

(N) for agricultural uses, maintenance of existing drainage systems for the limited purpose of maintaining cultivated areas and crop production; or

(O) for agricultural uses, improvements undertaken pursuant to a written NRCS conservation plan;

(32) ***Director*** means the Director of the Department;

(33) ***drainable water*** means water that readily drains from soil under the influence of gravity;

(34) ***drainage area*** means the land area above a given point that may contribute runoff flow at that point from rainfall;

(35) ***effective date*** means January 1, 2002;

(36) ***elevation certificate*** means a form published by FEMA used to certify the base flood elevation and the lowest elevation of usable space to which a building has been constructed;

(37) ***ephemeral stream*** means a stream whose bed elevation does not intersect the groundwater table and carries flow only during and immediately after a runoff producing rainfall event;

(38) ***erosion*** means the process whereby soil is detached by the action of water or wind;

(39) ***farmed wetlands*** means wetlands that have been identified as farmed wetlands by NRCS in a Certified Wetland Determination;

(40) ***FEMA*** means the Federal Emergency Management Agency and its regulations at 44 CFR 59-79, effective September 29, 1989, as amended;

(41) ***flood*** means a general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal ways or the unusual and rapid accumulation of runoff of surface waters from any source;

(42) ***FBFM*** or ***Flood Boundary and Floodway Map*** means a floodplain management map published by FEMA that depicts, based on detailed analysis, the boundaries of the base flood, the 0.2% probability flood and the floodway;

(43) ***flood frequency*** means a frequency normally expressed as a period of years, based upon a percent chance of occurrence in any given year from statistical analysis, during which a flood of a stated magnitude may be expected to be equaled or exceeded, as in the two-year flood frequency has a 50% chance of occurrence in any given year and the 100-year flood frequency has a 1% chance of occurrence in any given year;

(44) ***flood fringe*** means that portion of the floodplain outside of the designated floodway;

(45) ***FIRM*** or ***Flood Insurance Rate Map*** means a map published by FEMA on which FEMA has delineated both the special flood hazard areas and the risk premium zones applicable to a community;

(46) ***FIS*** or ***Flood Insurance Study*** means a study of flood discharges and flood profiles for a community adopted and published by FEMA;

(47) ***floodplain*** means that land typically adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation and includes detached special flood hazard areas, ponding areas and the like;

(48) ***FPE*** or ***Flood Protection Elevation*** means the BFE plus two feet of freeboard for structures within the plan limits of the BFE; outside the plan limits, the water table or 100-year design water surface elevation of any adjacent stormwater facility, whichever is higher, plus two feet of freeboard; along the Fox River and within its backwater zone the BFE plus three feet of freeboard;

(49) ***floodproof*** means any combination of structural and nonstructural additions, changes or adjustments to structures or property which reduce or eliminate flood damage to real estate, water and sanitary facilities, structures and their contents;

(50) ***Floodproofing Certificate*** means a form published by FEMA that is used to certify that a building has been designed and constructed to be structurally dry floodproofed to the FPE;

(51) ***floodway*** or ***designated floodway*** means the channel, onstream lakes and that portion of the floodplain adjacent to a stream or channel which is needed to store and convey the critical duration 100-year frequency flood discharge with no more than a 0.1 foot increase in flood stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities;

(52) ***floodway conveyance*** means the measure of the flow carrying capacity of the floodway section and is defined using Manning's equation, $K=1.49\ AR^{2/3}/n$, where "n" is Manning's roughness factor, "A" is the effective area of the cross-section, and " R" is the ratio of the wetted area to the wetted perimeter;

(53) ***FQI*** or ***Floristic Quality Index*** means the parameter related to the number of native plant species present, as defined by Floyd Swink and Gerald Wilhelm in *Plants of the Chicago Region*, 4th Ed. (1994) or by Gerald Wilhelm and Linda Masters in *Floristic Quality Assessment and Application Computer Programs for the 22-County Chicago Region*, Conservation Design Forum (2000);

(54) ***freeboard*** means an increment of height added to the BFE, groundwater table or 100-year design water surface elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave action and unpredictable effects such as those caused by ice or debris jams;

(55) ***functional*** means that a facility performs its primary purpose but may not be completed;

(56) ***groundwater*** means water that is located within soil or rock below the surface of the earth;

(57) ***groundwater control system*** means a designed system which may consist of tiles, underdrains, French drains or other appropriate stormwater facilities whose purpose is to lower the groundwater table to a predictable elevation throughout the year;

(58) ***historic structure*** means a structure or site that is (a) listed individually in the National Register of Historic Places, or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing in the National Register; (b) certified or preliminarily determined by the Secretary of the Interior as contributing to an historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (c) individually listed on the State Inventory of Historic Places by the Illinois Historic Preservation Agency; or (d) individually listed on a local inventory of historic places that has been certified by the Illinois Historic Preservation Agency;

(59) ***hemimarsh*** means an isolated wetland dominated on the edges by tall emergent vegetation with an interior area of shallow open water;

(60) ***hydraulics*** means the science and study of the mechanical behavior of water in physical systems and processes;

(61) ***hydraulically connected impervious area*** means those areas of concrete, asphalt and gravel that, along with building roof surfaces, convey flows directly to an improved drainage system consisting of storm sewers or paved channels and includes roadways drained by curb and gutter and storm sewers and driveways hydraulically connected to those roadways, but does not include roof surfaces which discharge to unpaved surfaces which absorb and filter stormwater runoff nor roadways whose primary conveyance is through open ditches and swales;

(62) ***hydraulically equivalent compensatory storage*** means compensatory storage either adjacent to the floodplain fill or not located adjacent to the development but which can be shown by hydrologic and hydraulic analysis to be equivalent to compensatory storage located adjacent to the development;

(63) ***hydrologically disturbed*** means an area where the land surface has been cleared, grubbed, compacted or otherwise modified that changes runoff, volumes, rates or direction;

(64) ***hydrology*** means the science of the behavior of water, including its dynamics, composition and distribution in the atmosphere, on the surface of the earth and underground;

(65) ***IDNR-OWR*** means the Illinois Department of Natural Resources, Office of Water Resources, or its duly authorized designee;

(66) ***interim watershed plan*** means a regional study of a watershed which does not address the entire range of purposes, goals and objectives outlined in the Plan;

(67) ***intermittent stream*** means a stream whose bed intersects the groundwater table for only a portion of the year on average or any stream that flows continuously for at least one month out of the year, but not the entire year;

(68) ***isolated wetland*** means a wetland that does not have an identifiable surface water connection to other Waters of the U.S.;

(69) ***LOMA*** or ***Letter of Map Amendment*** means the official determination by FEMA that a specific structure is not in a regulatory floodplain and amends the effective Flood Hazard Boundary Map, FBFM, or FIRM;

(70) ***LOMR*** or ***Letter of Map Revision*** means a letter from FEMA that revises BFE, flood insurance rate zones, flood boundaries or floodway as shown on an effective Flood Hazard Boundary Map, FBFM, or FIRM;

(71) ***lake*** means a body of water two or more acres in size which retains water throughout the year;

(72) ***lineal Waters of the U.S.*** means wetlands along creeks, streams, rivers, ponds, lakes, or impoundments that are hydraulically connected to surface water;

(73) ***major stormwater system*** means that portion of a stormwater facility needed to store and convey flows beyond the capacity of the minor stormwater system;

(74) ***manufactured home*** means a structure transportable in one or more sections which is built on a permanent chassis and is designated for use with or without a permanent foundation when attached to the required utilities and includes park trailers, travel trailers and other similar vehicles onsite for more than 180 consecutive days but does not include a recreational vehicle;

(75) ***manufactured home park or subdivision*** means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale;

(76) ***mass grading*** means development in which the primary activity is a change in topography affected by the movement of earth materials;

(77) ***minor stormwater system*** means all infrastructure including curb, gutter, culverts, roadside ditches and swales, storm sewers and subsurface drainage systems intended to convey stormwater runoff at less than a 100-year flood frequency;

(78) ***mitigation*** means measures taken to offset negative impacts from development in waters of the U.S. including wetlands or the floodplain;

(79) ***NFIP*** or ***National Flood Insurance Program*** means the federal program codified in Title 44 of the Code of Federal Regulations;

(80) ***net benefit in water quality*** means the institution of best management practices as part of a development that when compared to the pre-development condition can be judged to reduce downstream sediment or pollutant loadings;

(81) ***net watershed benefit*** means a finding that, when compared to the existing condition, the development will substantially reduce (more than 10%) downstream peak discharges, will reduce downstream flood stages (more than 0.1 feet), or will reduce downstream damage to structures occurring in the pre-development condition and must be demonstrated by detailed hydrologic and hydraulic analysis of watersheds on a regional scale as approved by the Administrator;

(82) ***non-riverine*** means areas not riverine in character such as isolated depressional storage areas, ponds and lakes;

(83) ***NRCS*** means the United States Department of Agriculture, Natural Resources Conservation Service;

(84) ***nuisance flow*** means primarily a dry weather flow resulting from groundwater pumped by individual sump pumps and other human activities not directly related to rainfall events and surface runoff;

(85) ***observation structures*** are structures built on a field tile where the pipe inflow and outflow is visible upon removal of a lid;

(86) ***open channel*** means a conveyance system with a definable bed and banks carrying the discharge from field tiles and surface drainage, but does not include grassed swales within farm fields under agricultural production which are ephemeral in nature;

(87) ***open water*** means surface water in lakes, ponds, impoundments and wetlands devoid of vegetative cover;

(88) ***OHWM*** or ***ordinary high water mark*** means the point on the bank or shore up to which the presence and action of surface water is so continuous as to leave a distinctive mark, such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristic;

(89) ***overland flow path*** means a design feature of the major stormwater system which carries flows in excess of the minor stormwater system design capacity in an open channel or swale, or as sheet flow or weir flow over a feature designed to withstand the particular erosive forces involved;

(90) ***parcel*** means a separate tract of land identified by its own legal description;

(91) ***perennial stream*** means a riverine watercourse whose thalweg intersects the groundwater table continuously and flows throughout the year;

(92) ***permitting authority*** means the community having jurisdiction under this ordinance to issue permits;

(93) ***person*** means an individual, partnership, corporation, limited liability company, unincorporated association, trust, municipal corporation, unit of local government or other government agency or authority, or any combination of any of the foregoing;

(94) ***Plan*** means the Kane County Comprehensive Countywide Stormwater Management Plan adopted by the County Board on October 13, 1998, as amended from time to time;

(95) ***plant communities*** means groups of plants with similar habitat requirements and planting regimes;

(96) ***pond*** means a body of water less than two acres in size which retains a normal water level year-round;

(97) ***primary gravity outlet*** means the outlet structure designed to meet the release rate requirements of this ordinance, the invert (lowest elevation) of which shall be considered the high water elevation for required stormwater retention;

(98) ***professional land surveyor*** means a land surveyor registered in the State of Illinois under the Illinois Land Surveyors Act (225 ILCS 330/1, *et seq.*, as amended);

(99) ***professional engineer*** means an engineer registered in the State of Illinois under the Illinois Professional Engineering Practice Act (225 ILCS 325/1, *et. seq.*, as amended);

(100) ***public flood control project*** means a flood control project which will be operated and maintained by a public agency or entity to reduce flood damage to existing buildings and structures which includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed;

(101) ***public flood easement*** means an easement acceptable to the appropriate jurisdictional body that meets the regulations of IDNR-OWR, the Department and the community and provides legal assurances that all areas subject to flooding in the created backwater of the development will remain open to allow flooding;

(102) ***record drawings*** means drawings prepared, signed and sealed by a professional engineer or professional land surveyor representing the final record of the actual in-place elevations, locations of structures and topography;

(103) ***redevelopment*** means development on a developed site devoted to an existing urban land use the stormwater from which discharges into an existing stormwater facility either owned or maintained by a unit of local government, or discharges directly onto a regulatory floodplain; redevelopment includes the widening of an existing street or highway owned by a unit of local government;

(104) ***registered structural engineer*** means a person licensed under the laws of the State of Illinois as a structural engineer;

(105) ***regulatory floodplain*** means the floodplain depicted on maps recognized by IDNR-OWR for regulatory purposes;

(106) ***regulatory floodway*** means those portions of the floodplain depicted as floodway on maps recognized by IDNR-OWR for regulatory purposes;

(107) ***restrictive bridge or culvert*** means a bridge or culvert that crosses a floodplain and cannot convey the base flood without causing increases in the upstream flood profile;

(108) ***retention facility*** means a facility which stores stormwater runoff without a gravity release;

(109) ***riverine*** means related to, formed by or resembling a channel and includes creeks and rivers;

(110) ***runoff*** means the waters derived from melting snow or rain falling within a tributary drainage basin that exceeds the infiltration capacity of the soils of that basin;

(111) ***seasonal high groundwater table*** means the upper limits of the soil temporarily saturated with water, being usually associated with spring wetness conditions which may be indicated by soil mottles with a Munsell color of two chroma or less;

(112) ***sedimentation*** means the process that deposits hydraulically moved soils, debris and other materials on other ground surfaces or in bodies of water or stormwater drainage systems;

(113) ***sedimentation trap*** means a structure or area that allows for the temporary deposit and removal or disposal of sediment materials from stormwater runoff;

(114) ***seepage*** means the movement of drainable water through soil and rock;

(115) ***site*** means all of the land contemplated to be part of a coordinated development of one or more parcels;

(116) ***site runoff storage facility*** means a manmade structure for the temporary storage of stormwater runoff with a controlled release rate;

(117) ***SFHA*** or ***Special Flood Hazard Area*** means an area having special flood, mudslide or mudflow, or flood related erosion hazards and which is shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, M or E;

(118) ***special management area*** means a floodplain, regulatory floodplain, wetland, wetlands mitigation area, stream, river, or other water body;

(119) ***stormwater facility*** means all ditches, channels, conduits, bridges, culverts, levees, ponds, natural and manmade impoundments, wetlands, riparian environment, tile, swales, sewers or other natural

or artificial structures or measures which serve as a means of draining surface water and groundwater from land;

(120) ***stormwater management permit*** means the permit issued under Article 5;

(121) ***structure*** means a manmade change to the land constructed on or below the ground, including the construction, reconstruction or placement of a building or any addition to a building;

(122) ***substantial improvement*** means (a) an improvement made to a building the cost of which is greater than or equal to 50% of building's market value before the improvement; (b) reconstruction or repair of a building, the cost of which is greater than or equal to 50% of the building's market value before reconstruction or repair; or (c) an addition to a building the cost of which is greater than or equal to 50% of the building's market value before the addition or that increases the floor area by more than 20%;

(123) ***subsurface drainage*** means the removal of excess soil water to control water table levels at predetermined elevations for structural, environmental or other reasons in areas already developed or being developed for agricultural, residential, industrial, commercial or recreational uses;

(124) ***Technical Manual*** means the manual adopted by the County which refers to this ordinance and provides additional explanations and examples;

(125) ***thalweg*** means a line along the lowest point in a channel;

(126) ***topsoil*** means the uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils;

(127) ***transition section*** means the reaches of the stream or floodway where water flows from a narrow cross-section to a wide cross-section, or vice versa;

(128) ***usable space*** means space used for dwelling, storage, utilities or other beneficial purposes and includes basements;

(129) ***water table*** means the upper limit of a free water surface in a saturated soil or underlying material;

(130) ***Waters of the U.S.*** is defined by COE in 33 CFR 328.3 and, for purposes of this ordinance, includes wetlands, lakes, rivers, streams, creeks, bogs, fens, ponds and isolated wetlands but does not include maintained stormwater facilities;

(131) ***watershed*** means all land drained by, or contributing water to the same stream, lake, stormwater facility, or draining to a point;

(132) ***watershed characteristics*** means the land use, physiology, habitat, climate, drainage system and community profile of a watershed;

(133) ***watershed plan*** means a study and evaluation of an individual drainage basin's stormwater management, floodplain management, water quality and flood control needs capabilities adopted by the County;

(134) ***wetland*** is defined by COE in the *1987 Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1*, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi (the "1987 Manual"), or other federally recognized methodology;

(135) ***wetland impact*** means—

(A) the dredging or filling of any wetland having an FQI greater than 25; or

(B) the dredging or filling of any other wetland if—

(i) the effect would be that cumulatively, since the effective date, 0.10 acres (4,356 sq. ft.) or more of the wetlands on the site have been dredged or filled; and

(ii) such wetland is not then regulated by COE; or

(iii) such dredging or filling is not an approved impact under a conservation plan administered by any federal agency under the Food Security Act, as amended (16 U.S.C. § 3801, *et seq.*);

(136) ***wetland mitigation*** means the creation and long-term maintenance of wetlands to offset wetland impacts from development;

(137) ***wetland mitigation facility*** means a parcel in the County specifically dedicated for the creation and long-term maintenance of wetlands and other aquatic resources and includes any area designated as a compensatory storage facility when such area is used for wetland mitigation; and

(138) ***wetland mitigation bank*** means one or more parcels in the County approved by COE or the Director where wetlands and/or other aquatic resources are restored, created, enhanced or, in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.

(Sections 105 through 117 reserved)

ARTICLE 2—REQUIREMENTS FOR STORMWATER MANAGEMENT

§ 200. General information

(a) All developments shall meet the requirements of § 201, § 202 and Articles 3 and 6.

(b) Developments shall comply with § 203 if—

(1) two or more one or two family residences are to be constructed on a site three or more acres in size;

(2) a single-family attached dwelling, apartment or condominium, attached townhome or other multifamily residential building comprised of more than two units is to be constructed on a site one acre or more in size;

(3) any non-residential land use is to be developed on a site one acre or more in size, unless such development consists solely of the installation, repair or replacement of the underground or overhead lines of a public utility within a public right-of-way.

(4) redevelopment after the effective date on a site one acre or more in size exceeds in the aggregate 25,000 square feet;

(5) road development after the effective date of this ordinance in rights-of-way under the ownership or control of a unit of local government exceeds in the aggregate one acre; or

(6) the repair or replacement of an existing parking lot or privately owned road within the floodplain results in any additional impervious surface, an increase in peak flows, a change in the location of the stormwater discharge, or an increase in the elevation of the parking or driving surface

(c) The developer of a redevelopment may ask that a fee-in-lieu of site runoff storage be approved under Article 13 and that the requirements of § 203(g) be waived if—

(1) the drainage plan will not increase peak discharges from the site, nor change the existing conveyance of offsite flow; and

(2) the drainage plan provides a net benefit in water quality compared to the existing development.

(d) The developer of a development consisting only of mass grading may ask that a fee-in-lieu of site runoff storage be approved under Article 13 if—

(1) there is no net increase in impervious surfaces;

(2) no structure is constructed, reconstructed or improved; and

(3) the quality of site runoff is improved.

§ 201. General stormwater requirements

(a) No development shall—

(1) result in any new or additional expense to any person other than the developer for flood protection; or

(2) increase flood elevations or decrease flood conveyance capacity upstream or downstream of the site.

(b) Analysis and design of all stormwater facilities required for a development shall—

(1) comply with the standards and criteria established in any applicable watershed plan or interim watershed plan; and

(2) be consistent with the Technical Manual.

(c) (1) Stormwater facilities shall be functional before any building permit is issued for any other construction on a site to be comprised when finished of more than one parcel.

(2) Building permits may be issued but stormwater facilities shall be functional where practicable before any other construction begins on a site to be comprised when finished of only one parcel.

(d) All developments shall have an overland flowpath at the downstream limit of the site that will pass the base flood flow without increasing flood damage. If the upstream drainage area is less than 20 acres, a storm sewer pipe and inlet sized for the base flood may be constructed in lieu of providing an overland flowpath. Overland flowpaths internal to the site shall be considered part of the major stormwater system and shall be designed for conveyance of a minimum of one cfs per tributary acre without damage to structures.

(e) All usable space in new buildings or added to existing buildings hydraulically connected to a major stormwater system, site runoff storage facility or overland flowpath shall be elevated, floodproofed or otherwise protected to at least two feet above the 100-year design elevation or current FIS elevation, whichever is greater. The design elevation is the elevation associated with the design release rate as determined in § 202(c).

(f) The design of any development shall incorporate the following specific planning principles:

(1) Impervious surfaces are the minimum necessary to satisfy the intended design function. Where requirements of zoning ordinances conflict with this principle, consideration has been given to asking for a zoning variance.

(2) Where feasible, allow sufficient right-of-way and easement widths so that stormwater runoff may be conveyed in vegetated swales. Storm sewers may be used for conveyance of nuisance flows and where conveyance in vegetated swales is impractical.

(3) Existing open channels have been preserved and incorporated into the design.

(4) Best management practices have been used in the site drainage plan.

(5) Existing high-quality wetlands have been avoided, preserved or enhanced.

(6) Retention and infiltration of stormwater onsite have been enhanced to the extent practicable to reduce the volume of stormwater runoff and the quantity of runoff pollutants.

(g) The function of existing onsite depressional storage shall be preserved as an additional volume to required site runoff storage. When the depressional storage is removed it must be compensated for in the site runoff storage facility at a 1:1 ratio. Offsite areas tributary to the existing depressional storage shall be routed through the site runoff storage facility unless the existing depressional storage is reserved independently. This requirement is in addition to the site runoff storage requirements of § 203.

§ 202. Site runoff requirements

(a) Stormwater facilities shall be required and designed so that runoff exits the site at the point where it exited prior to development (unless a change is required and approved in writing by the Administrator) and in a manner so as not to increase flood damage downstream. Concentrated discharges from new developments must enter conveyance systems capable of carrying the design flow rate without increasing flood damage, erosion or maintenance costs downstream.

(b) Minor stormwater systems shall be sized to convey runoff from the tributary watershed under fully developed conditions consistent with the design requirements of the permitting authority.

(c) Major stormwater systems shall be sized to carry the base flood without causing additional flood damage.

(d) Stormwater systems shall properly incorporate and be compatible with existing subsurface and surface drainage systems including agricultural systems. Designs shall not cause damage to existing drainage systems or to existing adjacent or tributary agricultural land uses. The following principles and requirements shall be observed in the design:

(1) Offsite outfall: Agricultural subsurface and surface drainage systems shall be evaluated with regard to their capacity and capability to properly convey low flow groundwater and site runoff storage facility release without damage to downstream structures and land uses. If the outfall drain tile and surface drainage systems prove to be inadequate it will be necessary to modify the existing systems or construct new systems which will not conflict with the existing systems and will not impact existing land uses.

(2) Onsite: Agricultural drainage systems shall be evaluated in accordance with Article 5. All existing onsite agricultural drain tile not serving a beneficial use shall be abandoned by trench removal prior to other development and recorded on record drawings. If any existing drain tiles continue to upland watersheds the developer must maintain drainage service during construction until new storm sewers can be installed for a permanent connection.

(3) Offsite tributary: Existing drainage systems shall be evaluated with regard to existing capabilities and reasonable future expansion capacities. All existing tributary drain tiles shall be incorporated into the new stormwater system including observation structures located at the limits of the site and shall provide a free flow discharge. Agricultural tributary surface conveyance shall be accepted by the new development with consideration given to water quality and sediment filtering control.

(4) New roadway construction shall preserve existing subsurface systems within the right-of-way. Inspection wells shall be placed at the right-of-way and tiles found not to be flowing between inspection wells at the end of construction shall be replaced.

(e) Design runoff rates shall be calculated using event hydrograph methods. Acceptable event hydrograph methods are HEC-HMS, HEC-1 (SCS runoff method), TR-20 or TR-55 tabular method. Event methods must incorporate the assumptions contained in § 203(b). Design runoff rates for minor conveyance systems may be calculated using the Rational Method if the design watershed is less than 20 acres.

(f) Any design runoff rate calculation method shall use Bulletin 70 northeast sectional rainfall statistics and shall calculate flow from all tributary areas upstream of the point of design. Peak discharges for conveyance design purposes shall be based on the critical duration considering the appropriate rainfall distribution.

(g) Major and minor stormwater systems shall be located within easements or rights-of-way explicitly providing for public access or maintenance of such facilities. New facilities constructed offsite pursuant to § 202(d) need not comply with this requirement.

(h) Maximum flow depths for new transverse stream crossings shall not exceed one foot at the crown of the road during the base flood condition. The maximum flow depth on a roadway shall not exceed six inches at the crown for flow parallel to the roadway. For flow over a roadway or parallel to a roadway the product of the flow depth (in feet) and velocity (in feet per second) shall not exceed four for the base flood condition.

(i) Transfers of waters between watersheds (diversions) shall be prohibited except when such transfers will not violate the provisions of § 201(a) and are otherwise lawful. Watersheds for the purposes of this section shall be the major watershed divides shown in Appendix A of this ordinance.

(j) Developments shall incorporate all best management practices required under the Clean Water Act (33 U.S.C. § 1251, *et seq.*, as amended).

§ 203. Site runoff storage requirements (detention)

(a) The area of hydrological disturbance on the site shall be used to calculate the required site runoff storage volume. The tributary area of the site at the point of discharge shall be used to calculate the allowable release rate of the primary restrictor for the site runoff storage facility.

(b) Absent any applicable watershed plan or interim watershed plan, sufficient storage shall be provided such that the probability of the post-development release rate exceeding 0.1 cfs/acre of development shall be less than 1% per year. Design runoff volumes shall be calculated using event hydrograph methods.

(c) Event hydrograph routing methods such as HEC-1, HEC-HMS, TR-20 or TR-55 tabular method using SCS curve number methodology shall be used to calculate design runoff volumes for facilities with more than five acres of tributary area or when areas tributary to the facility extend offsite. For facilities with less than five acres of tributary area all onsite, the nomograph relating *%-Impervious to Unit Area Detention* developed by NIPC may be used to calculate the volume of site runoff storage required. Event methods shall incorporate the following assumptions:

(1) antecedent moisture condition equals two;

(2) appropriate Huff rainfall distribution except that SCS Type II distribution is acceptable with TR-55 tabular method only; and

(3) 24-hour duration storm with a 1% probability (100-year) of occurrence in any one year as specified by Bulletin 70 northeast sectional rainfall statistics.

(d) For sites where the undeveloped release rate is less than the maximum release rate in § 203(b), the developed release rate and corresponding site runoff storage volume shall be based on the existing undeveloped release rate for the development site.

(e) Hydraulic computations for the release structure must assume appropriate backwater conditions considering the likelihood of concurrent flood events on the site and receiving stream.

(f) Reserved.

(g) (1) The runoff from a 0.75 inch rainfall event over the hydraulically connected impervious area of the new development shall be stored below the elevation of the primary gravity outlet (retention) of the site runoff storage facility. The facility may be designed to allow for evapotransporation or infiltration of this volume into a subsurface drainage system and shall not be conveyed through a direct positive connection to downstream areas. Wherever the retention depth is less than 3 ft. the retention facility shall be constructed by over-excavating the required retention volume by 1 ft. and replacing such volume with 1 ft. of topsoil suitable for growing wetland plants. Topsoil used shall be generally free from non-native and noxious seed bank. Native wetland plantings shall be introduced and shall not be dominated by or contain cumulatively more than 25% cover of the following species: Buckthorn (*Rhamunus cathartica* or *frangula*), Reed Canary Grass (*Phalaris arundinacea*), Purple Loosestrife (*Lythrum salicaria*), or Giant Reed (*Phragmites australis*). Within six months of the completion of the development a qualified wetland review specialist retained by the developer shall verify compliance with this section in a report submitted to the Administrator.

(2) The hydraulically connected impervious area used in the calculation of required retention volume may be reduced by the Administrator if the soils are undisturbed *in-situ* or prepared to maximize infiltration and deep-rooted grasses or other plants which help promote infiltration and transpiration are planted in areas appropriately dedicated. The reduction in hydraulically connected impervious area used in the calculation shall be equal to the area of the development meeting the above soils/planting requirement.

(3) Residential, industrial, commercial, institutional or multi-family developments where the downstream outlet is not directly connected to a new or municipal storm sewer outletting to an open channel will also be required to meet the retention requirement of this section, except that the area of new roadway impervious area shall be used as a minimum to calculate the required volume.

(4) Subsurface drainage systems may be designed as a component of the retention portion of the site runoff storage basin to assist in infiltration in accordance with the following criteria:

(A) The retention volume shall be discharged at a rate no greater than that required to empty the calculated retention volume within five days of the storm event.

(B) No such subsurface drainage pipe shall be located within ten feet of drainage pipes directly connected to the site runoff storage basin.

(C) For purposes of meeting the maximum subsurface drainage requirements, flow control orifices and weirs may be used.

(D) The design shall be consistent with the methodologies and intent of the Technical Manual.

(h) Storage facilities shall be designed and constructed with the following characteristics:

(1) Water surface depths two feet above the base flood elevation will not damage the storage facility.

(2) The storage facilities shall be accessible and easily maintained.

(3) All design site runoff storage volume shall be provided above the seasonal high groundwater table or the invert elevation of the groundwater control system.

(4) Storage facilities shall facilitate sedimentation and catchment of floating material. Unless specifically approved by the Administrator, concrete lined low flow ditches shall not be used in site runoff storage basins.

(5) Storage facilities shall minimize impacts of stormwater runoff on water quality by incorporating best management practices.

(6) Storage facilities shall maximize the distance between site runoff storage inlets and outlets to the extent possible.

(7) Storage facilities shall be designed such that the existing conditions pre-development peak runoff rate of the 100-year, critical duration rainfall will not be exceeded assuming the primary restrictor is blocked.

(8) Storage facilities with single pipe outlets shall have a minimum inside diameter of twelve inches. If design release rates necessitate a smaller outlet, structures such as perforated risers or flow control orifices shall be used.

(9) A mechanically opened outlet to draw down the permanent pool or retention area for maintenance purposes to the lowest available invert at the site boundary shall be provided.

(i) Storage facilities located within the regulatory floodplain shall (a) comply with Article 4; and (b) store the required amount of site runoff to meet the release rate requirement under all streamflow and backwater conditions up to the ten-year flood elevation on the adjacent receiving watercourse. The Administrator may approve designs which can be shown by detailed hydrologic and hydraulic analysis to provide a net watershed benefit not otherwise realized by strict application of the requirements set forth in (a) and (b) of this subsection.

(j) Storage facilities located within the regulatory floodway shall (a) meet the requirements for locating storage facilities in the regulatory floodplain; (b) be evaluated by performing hydrologic and hydraulic analysis consistent with the standards and requirements for watershed plans; and (c) provide a net watershed benefit.

(k) Site runoff storage facilities may be located offsite if (a) the offsite storage facility meets all of the requirements of this Article; (b) adequate storage capacity in the offsite facility is dedicated to the development; and (c) the development includes means to convey stormwater to the offsite storage facility.

(l) Site runoff storage volume provided by enlarging existing regulatory floodplain storage (onstream site runoff storage) will be allowed only as a variance. The applicant must demonstrate that flood damage will not be increased and the development will not increase flood flows for both the two-year and 100-year floods.

(m) Structures built across the channel to impound water to meet site runoff storage requirements shall be prohibited on any perennial stream unless part of a public flood control project with a net watershed benefit. Those streams appearing as blue on a USGS Quadrangle Map shall be assumed to be perennial unless better data is provided by the developer. In all cases it must be demonstrated that all such structures will not cause short-term or long-term stream instability. Where such facilities are approved the applicant must also comply with § 203(g).

ARTICLE 3—EROSION AND SEDIMENT CONTROL (NRCS)

§ 300. Erosion and sediment control

(a) Erosion and sediment control planning shall be part of the initial site planning process. In planning the development of the site, the applicant shall consider the sensitivity of existing soils to erosion and topographical features such as steep slopes, stream corridors and special management areas which must be protected to reduce the amount of erosion and sediment which occurs. Where appropriate, existing vegetation shall be protected from disturbance during construction by fencing or other means. In the planning process the applicant shall also address the following:

(1) For projects that involve phased construction, existing land cover for those areas not under current development shall be addressed. If existing land cover does not consist of an appropriate dense vegetation then these phases shall be planted temporarily to reduce erosion from idle land.

(2) In planning the erosion and sediment control strategy, preference shall be given to reducing erosion rather than controlling sediment. In order to accomplish this the plan must carefully consider the construction sequence of the phases so that the amount of land area exposed to erosive forces is the minimum consistent with completing construction.

(b) Standards and specifications for erosion and sediment control measures shall be in accordance with the *Illinois Urban Manual*, (1995, or current edition). Erosion and sediment control planning shall be in accordance with *Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois*, (revised, July, 1988) by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts (the *Green Book*), Chapters 1-5. Where the *Illinois Urban Manual* conflicts with the *Green Book*, the *Illinois Urban Manual* shall prevail. (NRCS)

(c) The runoff from disturbed areas shall not leave the site without first passing through sediment control measures or devices. This requirement shall apply to all phases of construction and shall include an ongoing process of implementation of measures and maintenance of those measures during both the construction season and any construction shutdown periods.

(d) The condition of the construction site for winter shutdown shall be addressed early in the fall growing season so that slopes and other bare earth areas may be stabilized with temporary and/or permanent vegetative cover for proper erosion and sediment control. All open areas that are to remain idle throughout the winter shall receive temporary erosion control measures including temporary seeding, mulching and/or erosion control blanket prior to the end of the fall growing season. The areas to be worked beyond the end of the growing season must incorporate soil stabilization measures that do not rely on vegetative cover such as erosion control blanket and heavy mulching.

(e) In the hydraulic and hydrologic design of major erosion control measures (those whose tributary drainage area is greater than three acres) such as sediment basins and traps, diversions and the like, the design frequency shall be commensurate with the risk of the design event being exceeded. The following design frequencies shall be regarded as minimum design frequencies for the construction period:

(1) If development is estimated to be completed in less than six months, the storm event having a 50% chance (two-year event) of being exceeded in any year shall be used for design purposes.

(2) If development is estimated to be completed in more than six months but less than one year, the design frequency for major sediment basins shall be a rainfall event with a 20% (five-year event) chance of been exceeded in any one year.

(3) If development is estimated to take more than one year to complete, major sediment basins shall be designed for a rainfall event with a 10% (ten-year event) chance of been exceeded in any one year.

(4) All sediment basins shall be designed for a minimum residence time of ten hours for detained runoff and shall include a volume for sediment storage reflective of the clean out schedule for the basin. (SDI)

(f) The erosion and sediment control plan shall designate a series of practices which shall be implemented either at the direction of the applicant or the applicant's representative onsite or at the direction of the Administrator should an inspection of the site indicate a deficiency in soil and sediment erosion control measures. At a minimum, these measures shall include (a) sedimentation basins; (b) sediment traps; (c) diversion swales; (d) silt fences; (e) temporary seeding; (f) mulching; and (g) erosion control blankets.

(g) The area of disturbance onsite at any one time shall be limited to 20 acres. An additional 20 acres (a maximum of 40 acres of disturbance at any one time) may be stripped in order to balance cut and fill onsite. No additional area may be open without the permission of the Administrator until the previously disturbed areas have been temporarily or permanently stabilized. All disturbed areas shall be stabilized within 14 days of final grading or when left idle for more than seven days. Maintained haul roads and the area of sediment basins, site runoff storage facilities and any permanently stabilized areas are excluded from this limitation. (CBBEL)

(h) Erosion and sediment control plans shall be in accordance with Article 5 and shall include the following:

(1) Detailed construction phasing plan identifying erosion and sediment control measures to be in place for each phase shall be submitted.

(2) Erosion and sediment control measures to be installed initially prior to stripping existing vegetation or mass grading shall be indicated on the plans.

(3) Permanent stabilization measures shall be indicated on a separate plan.

(4) The expected two-year and ten-year runoff rates from all offsite areas draining into the site shall be identified on the plan.

(5) Methods for conveying flows through the site during construction shall be indicated. These methods must include the temporary and permanent stabilization measures to be used to reduce velocity and erosion from flow through the construction zone.

(6) A maintenance schedule of each measure used shall be indicated on the plan. As a minimum, all erosion and sediment control measures onsite shall be inspected weekly or after a one-half inch or greater rainfall event and any required repairs shall be made to keep these measures functional as designed.

(7) Special management areas and any required buffers shall be indicated on the erosion and sediment control plan.

(i) To the extent practicable, proposed ditches and waterways which are to convey offsite flows through the site shall be stabilized upon construction. Where new waterways are constructed they shall be stabilized to the extent practicable prior to their use to convey flood flows.

(j) Stockpiles of soil and other building materials (sand, limestone, etc.) shall not be located in special management areas or required buffers. If a stockpile is to remain in place for more than three days, erosion and sediment control shall be provided. (COE)

(k) Storm sewer inlets shall be protected with sediment trapping and/or filter control devices during construction.

(l) Water pumped or which is otherwise discharged from the site during construction dewatering shall be filtered and a means provided to reduce erosion.

(m) Graveled roads, access drives, parking areas of sufficient width and length and vehicle wash-down facilities if necessary, shall be provided to prevent soil from being tracked onto public or private roadways. Any soil tracked onto a public or private roadway shall be removed before the end of each workday or sooner as directed by the authority maintaining the roadway.

(n) Temporary stream crossings of intermittent and perennial streams used only for and during construction shall be designed to convey a two-year flood (minimum), without overtopping unless a more frequent design event is allowed by the Administrator and will not obstruct the portion of the channel carrying the base flow. The entire crossing shall be designed to withstand hydrodynamic and erosive forces up to the base flood event without washing out. Ephemeral streams may be crossed at temporary at-grade crossings provided that the crossing point is stabilized with materials resistant to the erosive forces produced by runoff from the upstream drainage area and the design is approved by the Administrator. All temporary stream crossings shall be completely removed and the stream restored to its preconstruction condition upon completion of construction. Restoration shall incorporate appropriate native vegetation. (USFWS)

ARTICLE 4—PROTECTION OF SPECIAL MANAGEMENT AREAS

§ 400. Reserved

§ 401. Disclaimer

Nothing in this ordinance purports to alter or affect the regulatory program administered by IDNR-OWR. Anything in this ordinance to the contrary notwithstanding, if under the rules and regulations administered by IDNR-OWR a submittal need not be made to IDNR-OWR, or a review, approval or permit from IDNR-OWR need not be obtained, then nothing in this ordinance shall be construed to impose a requirement that such a submittal be made or that such a review, approval or permit be obtained from IDNR-OWR. Similarly, if IDNR-OWR has delegated its regulatory authority to another entity, then anything in this ordinance to the contrary notwithstanding, if required by such entity, such submittal shall be made or such review, approval or permit shall be obtained from such entity.

§ 402. Statewide and regional permits

Development that qualifies for any of the self-issuing statewide or regional permits administered by IDNR-OWR (Statewide Permits Nos. 1 through 14 and Regional Permit No. 3), are similarly permitted under this Article. The developer need only submit to the Administrator such information as shall show the Administrator that the development qualifies for the particular statewide or regional permit in question under the regulations established by IDNR-OWR for such permit and no further submittal need be made under this Article. All other provisions of this ordinance applicable to such development, however, continue to apply.

§ 403. Floodplain management

All development shall meet the requirements set forth in Table 403.

Table 403 - Summary of requirements for development in floodplains

	§ 404	§ 405	§ 406	§ 407	§ 408	§ 409	§ 410	§ 411	§ 412	§ 413
Floodplains	All	405(e) 405(f)	All	--	--	All	--	--	--	--
Regulatory Floodplains	All	All	All	All	All	--	All (Note 1)	--	--	--
Regulatory floodways	All	All	All	All (Note 2)	All	--	All	All	--	--
Riverine Regulatory Floodplains	All	All	All	All	All	--	--	--	All	--
Bridge and Culvert Crossings	All	All	--	--	--	--	All (Note 3)	--	--	All

Note 1. Riverine, floodplains only
Note 2. For buildings meeting appropriate use criteria
Note 3. See exclusion in § 413(c)

§ 404. Floodplain, regulatory floodplain, BFE and regulatory floodway locations

(a) The BFE shall be delineated on the site topography to establish the regulatory floodplain area limits for regulation under this ordinance. Regulatory floodplains shall be delineated on the site map from the current FEMA FIRM, FBFM or LOMR and include those areas of the SFHA which are not regulatory floodplains. A list of the current regulatory maps for the County to be consulted is maintained by the Director.

(b)

(1) The BFE shall be the elevation of the 100-year profile shown for the site on the current flood insurance study.

(2) In the case of FEMA delineated AH Zones the elevation noted on the current applicable regulatory map(s) shall be the BFE.

(3) In the case of FEMA delineated AO Zones the BFE shall be the depth number shown on the current applicable regulatory map(s) added to the highest adjacent grade, or at least two feet above the highest adjacent grade if no depth number is provided.

(4) (A) When no BFE information exists and the upstream tributary drainage area is 640 acres or more, the BFE shall be determined using a site specific floodplain study by a professional engineer using appropriate hydrologic and hydraulic models as follows:

(i) hydrologic models: TR-20, HEC-1, HEC-HMS;

(ii) hydraulic models: HEC-2, HEC-RAS, WSP-2; or

(iii) a technique approved by the Administrator and IDNR/OWR.

(B) Where a channel has a tributary drainage area of 640 acres or more, the above analyses shall be submitted to IDNR/OWR for approval.

(C) For a non-riverine regulatory floodplain, the historic flood of record plus three feet may be used for the BFE instead of performing a detailed hydrologic and hydraulic study.

(5) For floodplains that are not regulatory, are not draining more than 640 acres and for which no BFE has been determined, the Administrator may require a site-specific floodplain study for the purpose of establishing an FPE for the development.

(6) The Administrator may require the use of a floodplain study not yet approved by IDNR-OWR and FEMA if its use would establish a higher BFE than the approved study. This provision may necessitate that different analyses be prepared for other agencies having permitting jurisdiction over the floodplain/floodway.

(c) (1) The location of the regulatory floodway shall be as delineated on the current applicable regulatory map(s). The location of the regulatory floodway boundary shall be scaled on the site plan using references common to both the map and the plan (typically the centerlines of adjacent roadways). Where an interpretation is needed to determine the exact location of the regulatory floodway boundary, IDNR/OWR should be contacted. If an area of the site is located in the regulatory floodway that is higher than the BFE, that area is subject to the floodway standards of § 411, including the appropriate use criteria, until such time as a LOMA/LOMR receives concurrence from IDNR/OWR and is issued by FEMA.

(2) General criteria for analysis of flood elevations in the regulatory floodway are as follows:

(A) The flood profiles, flows and data from the current applicable regulatory map must be used for analysis of the base conditions. If the study data appears to be in error or conditions have changed, FEMA and IDNR/OWR shall be contacted for approval and concurrence on the appropriate base conditions data to use. The same Manning's "n" value shall be used for both existing and proposed conditions unless a recorded maintenance agreement obligates a public entity to maintain the proposed conditions or the land cover is changing from vegetative to non-vegetative. The Director shall be copied on all related correspondence.

(B) If the BFE at the site is affected by backwater from a downstream receiving stream with a larger drainage area, the proposed development shall be shown to meet the requirements of this section with the receiving stream at both the normal water elevation and BFE.

(C) If the applicant is informed by IDNR/OWR, a local government or a private owner that a downstream or upstream restrictive bridge or culvert is scheduled to be removed, reconstructed or modi-

fied, or a regional flood control project is scheduled to be built, removed, constructed or modified within the next five years, the proposed development shall be analyzed and shown to meet the requirements of this section for both the existing conditions and the expected flood profile conditions when the bridge, culvert or flood control project is built, removed or modified.

(D) If the appropriate use will result in a change in the location of the regulatory floodway or a change in the BFE, the applicant shall submit the information required for the issuance of a CLOMR to IDNR/OWR and FEMA. A public notice inviting public comment on the proposed change in the BFE or location of the regulatory floodway will be issued by IDNR/OWR or its designee before a CLOMR is issued. Filling, grading, dredging or excavating may take place upon issuance of a conditional approval from IDNR/OWR and the Administrator. No further development activities shall take place in the existing or proposed floodplain until a LOMR is issued by FEMA unless such activities meet all the requirements of §§ 403 through 413 of this ordinance. The Director shall be copied on all related correspondence.

(E)In the circumstances listed below and located in a regulatory floodway, at a minimum, the information set forth below shall be submitted to IDNR/OWR for its review and approval:

(i) analysis of the flood profile due to a proposed bridge, culvert crossing or roadway approach;

(ii) an engineer's determination that an existing bridge, culvert crossing or approach road is not a source of flood damage and the analysis indicating the proposed flood profile;

(iii) alternative transition sections and hydraulically equivalent compensatory storage; and

(iv)stormwater management permits issued to local units of government for regulatory floodway and floodplain development.

(v) IDNR/OWR will issue permits for any IDNR/OWR, state, federal or community projects.

§ 405. General performance standards

The following general performance standards are applicable to all development in a regulatory floodplain. The standards of this section apply except when superseded by more stringent requirements in subsequent sections.

(a) No development shall be allowed in the regulatory floodplain that singularly or cumulatively creates any increase in flood stage or velocity offsite, or a damaging or potentially damaging increase in flood heights or velocity onsite or a threat to the public health, safety and welfare.

(b) For all projects involving a channel modification, fill, stream maintenance or a levee, the flood conveyance and storage capacity of the regulatory floodplain shall not be reduced.

(c) If the proposed development would result in a change in the regulatory floodplain or BFE the applicant shall obtain a LOMR from FEMA. No buildings may be built in the existing or proposed regulatory floodplain until the LOMR is obtained from FEMA unless the building meets all the building protection standards of § 407. Proposed changes to the regulatory floodway delineation and the BFE must be submitted to IDNR/OWR for approval.

(d) If the development is located in the Fox River a permit must also be received from IDNR/OWR.

(e) Prior to the commencement of any construction, modification or removal of a dam the developer shall obtain an IDNR/OWR Dam Safety Permit or letter indicating a permit is not required.

(f) For public flood control projects, §§ 403 through 413 will be deemed met if the applicant demonstrates to IDNR/OWR and the Committee—

(1) by hydraulic and hydrologic modeling that the proposed project will not singularly or cumulatively result in increased flood heights outside the project site or that any increases will be contained in easements for all flood events up to and including the base flood event;

(2) that the project will be operated and maintained by a public entity;

(3) that the project will reduce flood damage to an existing building or structure.

(g) Fences within the floodplain shall not impede the base flood.

Nothing in this section precludes the design, engineering, construction or financing, in whole or in part, of a public flood control project by persons who are not public entities.

§ 406. Public health protection standards

(a) New and replacement water supply systems, wells and sanitary sewer lines may be permitted if all manholes or other above-ground openings located below the FPE are watertight.

(b) New onsite waste disposal systems, such as septic systems, shall not be constructed within the regulatory floodplain.

(c) New, substantially improved or replacement wastewater treatment plants shall have watertight openings for those openings located below the FPE. Such facilities should be located to avoid impairment to the facility or contamination of flood waters during the base flood.

§ 407. Building protection standards

This section applies to all buildings located in the regulatory floodplain. However, most new and replacement buildings are not appropriate uses of the regulatory floodway.

(a) The lowest floor including basements of all new residential structures, substantially improved structures and additions shall be elevated at least to the FPE. An attached garage for a structure must be elevated at least six inches above the BFE.

(1) If placed on fill, the top of the fill for a residential structure shall be above the FPE. The top of fill for an attached garage shall be at least six inches above the BFE. The fill shall be placed at that elevation for a distance of ten feet out from the building unless the building design is certified by a registered structural engineer to be protected from damage due to hydrostatic pressures. Additionally, the fill shall not settle below the FPE for a residential structure and not below six inches above the base flood for an attached garage, and shall be adequately protected against erosion, scour and differential settlement. A LOMR shall be obtained from FEMA removing the residential site from the floodplain.

(2) If elevated by means of walls, pilings, or other foundation, the building's supporting structure must be permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood. The permanent openings shall be no more than one foot above existing grade and consist of a minimum of two openings. The openings must have a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding below the BFE. The lowest inside grade must match the lowest existing outside grade adjacent to the structure. The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining structures so as to minimize exposure to known hydrodynamic forces such as current, waves, ice and floating debris. All areas below the FPE shall be constructed of materials resistant to flood damage. The lowest floor (including basement) for a residential structure and all electrical, heating, ventilating, plumbing and air conditioning equipment and utility meters shall be located at or above the FPE. An attached garage must be elevated at least six inches above the BFE. Water and sewer pipes, electrical and telephone lines, submersible pumps and other waterproofed service facilities may be located below the FPE. No area less than two feet above the BFE shall be used for storage.

(b) The lowest floor including the basement of all new or substantially improved non-residential buildings shall be elevated at least to the FPE as described above or be structurally dry floodproofed to at least the FPE. A non-residential building may be structurally dry floodproofed (in lieu of elevation) provided that a professional engineer or registered structural engineer shall certify that the building has been structurally dry floodproofed below the FPE and the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood. The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy and impacts from debris or ice. Floodproofing measures shall be operable without human intervention and without an outside source of electricity. Levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection.

(c) Manufactured homes and recreational vehicles to be installed on a site for more than 180 days shall be at or above the FPE and shall be anchored to resist flotation, collapse or lateral movement in accordance with the Illinois Manufactured Home Tie-Down Code (77 Ill. Adm. Code 870 (1999), as amended).

(d) Accessory structures such as tool sheds and detached garages which are not substantial improvements on an existing single family lot, may be constructed with the lowest floor below the FPE in accordance with the following criteria:

(1) The building shall not be used for human habitation.

(2) All areas below the FPE shall be constructed with waterproof material. Structures located in a regulatory floodway shall meet the floodway standards of § 411.

(3) The structure shall be anchored to prevent flotation and movement.

(4) Service facilities such as electrical and heating equipment shall be elevated or floodproofed to the FPE.

(5) The building shall be no greater than 576 square feet in floor size and cost not more than $12,000 to construct.

(6) The building shall meet the requirements of § 407(a)(2).

(7) The building shall be used only for the storage of vehicles or tools and may not contain other rooms, workshops, greenhouses or similar uses.

Accessory structures that do not meet all of the above criteria may be constructed if they are dry floodproofed or elevated at least six inches above the BFE.

(e) The lowest floor of an addition to an existing industrial use may be constructed at the BFE plus one foot provided this elevation is required by the industrial process as demonstrated by the applicant and the Administrator approves the elevation in writing.

§ 408. Non-conforming structures

A non-conforming structure damaged by flood, fire, wind or other disaster may be restored unless the damage is equal to or greater than 50% of its fair market value before it was damaged, in which case it shall conform to § 407.

§ 409. Lowest opening

For proposed structures located outside the regulatory floodplain, the lowest opening shall be above the FPE.

§ 410. Compensatory storage volume standards

The following standards apply within the regulatory floodplain:

(a) Hydraulically equivalent compensatory storage volume will be required for development in a riverine regulatory floodplain and shall be at least equal to the regulatory floodplain flood storage volume displaced multiplied by 1.5. The storage volume displaced below the existing ten-year frequency flood elevation must be replaced below the proposed ten-year frequency flood elevation. The storage volume displaced above the ten-year existing frequency flood elevation must be replaced above the proposed ten-year frequency flood elevation. The additional compensatory flood storage required beyond a 1:1 ratio may be placed above or below the ten-year flood elevation.

(b) Compensatory storage volume for development in a non-riverine regulatory floodplain area that is also adjacent to a lake shall be equal to the storage volume displaced.

(c) Compensatory storage volume requirements for development in a non-riverine regulatory floodplain that is not adjacent to a lake shall be replaced in accordance with the requirements for the loss of depressional storage in § 201(g).

(d) Compensatory storage areas shall be designed to drain freely and openly to the channel and shall be located adjacent to the development. This standard does not apply to non-riverine regulatory floodplain or the replacement of depressional storage.

(e) A recorded covenant running with the land is required to maintain the compensatory storage volume in areas modified to provide compensatory storage volume.

§ 411. Floodway standards

The only development in a regulatory floodway which will be allowed are appropriate uses which will not cause an increase in flood heights or velocities for all flood events up to and including the base flood. Only those appropriate uses listed below will be allowed in the regulatory floodway. Appropriate uses do not include the construction or placement of any new structures, fill, building additions, buildings on stilts, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined below as an appropriate use. If the development is proposed for the regulatory floodway portion of the regulatory floodplain, the following standards apply in addition to the standards for the regulatory floodplain:

(a) Only the construction, modification, repair or replacement of the following appropriate uses will be allowed in the regulatory floodway:

(1) public flood control structures and private improvements relating to the control of drainage and flooding of existing buildings, erosion, water quality or habitat for fish and wildlife;

(2) structures or facilities relating to functionally water dependent uses such as additions, modifications and improvements to existing wastewater treatment plants and facilities (not including new wastewater treatment plants or habitable structures at existing wastewater treatment plants) and improvements relating to recreational boating;

(3) storm and sanitary sewer outfalls;

(4) underground and overhead utilities if sufficiently floodproofed;

(5) recreational facilities such as playing fields, open pavilions, gazebos and trail systems including any related fencing (at least 50% open when viewed from any one direction) built parallel to the direction of flood flows;

(6) detached garages, storage sheds, boat houses or other non-habitable structures without sanitary facilities that are accessory to existing buildings and will not block flood flows nor reduce regulatory floodway storage;

(7) bridges, culverts and associated roadways, sidewalks and railways, required for crossing the regulatory floodway or for access to other appropriate uses in the regulatory floodway and any modification thereto;

(8) parking lots built at or below existing grade provided that either—

(A) the BFE is less than one foot above the proposed parking lot; or

(B) the parking lot is accessory to short-term outdoor recreational facilities and the owner agrees to restrict access during periods of inundation and agrees to accept liability for all damage caused by vehicular access during flooding events;

(9) regulatory floodway grading, without fill, to create a positive non-erosive slope toward a channel;

(10) floodproofing activities to protect previously existing lawful structures including the construction of watertight window wells, elevating structures or the construction of flood walls or berms around residential, commercial or industrial principal structures where the outside toe of the floodwall or berm is no more than ten feet away from the exterior wall of the existing structure and where such activities are not considered to be a substantial improvement to the structure;

(11) the repair, replacement or reconstruction of a damaged building, provided that none of the outside dimensions of the building are increased and such repair, replacement or reconstruction does not constitute a substantial improvement;

(12) modifications to an existing building such as fireplaces, bay windows, decks, patios and second story addition which do not constitute a substantial improvement, do not increase the enclosed floor area of the building below the BFE and do not block flood flows; no enclosed floor areas may be built on stilts.

(b) No change shall be made to the list of appropriate uses without the prior approval of IDNR-OWR and the Committee.

(c) All development in the regulatory floodway shall require a stormwater management permit and must be in accordance with all provisions of this ordinance.

(d) An appropriate use may be permitted if the proposed project meets the following engineering and mitigation criteria and is so stated in writing with supporting plans, calculations and data prepared and signed by a professional engineer.

(1) All effective regulatory floodway conveyance lost due to the development of appropriate uses, other than bridge or culvert crossings or onstream structures or dams, shall be replaced for all flood events up to and including the base flood.

(2) The following expansion and contraction ratios shall be used to determine transition sections in calculations of effective regulatory floodway conveyance:

(A) Flowing water will expand no faster than a rate of one foot horizontally for every four feet of the flooded stream's length.

(B) Flowing water will contract no faster than at a rate of one foot horizontally for every one foot of the flooded stream's length.

(C) Flowing water will not expand or contract faster than one foot vertically for every ten feet of flooded stream's length.

(D) All cross-sections used in the calculations shall be perpendicular to flood flows.

(E) Transition sections must be used to determine the effective conveyance areas on adjacent properties.

(3) Development of an appropriate use will not result in an increase in the average channel or regulatory floodway velocities or stage. However, in the case of bridges or culverts or onstream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be increased at the structure site if scour, erosion and sedimentation will be avoided by the use of rip-rap or other design measures.

(4) In the case of onstream structures built for the purpose of backing up water during normal or flood flows, the increase in flood stage when compared to existing conditions for all storm events up to and including the base flood event shall be contained within recorded easements or the channel banks. A Dam Safety Permit or letter indicating a Dam Safety Permit is not required must be obtained from IDNR/OWR for such structures. If floodproofing construction is required beyond the outside dimensions of an existing habitable residential or commercial building, the outside perimeter of the floodproofing construction shall be no further than ten feet from the building. Compensation for lost storage and conveyance will not be required for floodproofing within the ten-foot perimeter provided flood damage to other buildings is not increased.

(5) If floodproofing construction is required beyond the outside dimensions of an existing habitable residential or commercial building, the outside perimeter of the floodproofing construction shall be no further than ten feet from the building. Compensation for lost storage and conveyance will not be required for floodproofing within the ten-foot perimeter provided the probability of flood damage to other buildings is not increased.

(6) IDNR/OWR will issue permits for all IDNR/OWR, state, federal or community projects.

§ 412. Riverine Floodplain

These standards apply to riverine regulatory floodplains without a regulatory floodway. The applicant shall obtain approval from IDNR/OWR for all development, any portion of which is located within the regulatory floodplain (without a delineated regulatory floodway) with a tributary drainage area of 640 acres or more.

(a) The development shall not singularly or cumulatively result in an obstruction of flood flows or potential flood damages outside the site due to an increase in flood heights, velocities or loss of floodplain area storage.

(b) A professional engineer shall submit a study that—

(1) determines a floodway which meets the definition of a regulatory floodway and demonstrates that the proposed development meets the floodway standards in § 411; or

(2) determines a BFE and demonstrates that the proposed development will maintain the existing conditions conveyance, will not increase flood velocities, will not increase flood profiles and will compensate for any lost floodplain storage in accordance with § 410; or

(3) shows that the proposed development will meet the requirements for regulatory floodplains in §§ 406 and 407.

§ 413. Bridge and culvert standards

These standards are for the reconstruction, modification or new construction of bridges, culvert crossings and roadway approaches located in the regulatory floodplain.

(a) A proposed new structure shall not result in an increase of upstream flood stages greater than 0.1 foot when compared to the existing conditions for all flood events up to and including the base flood event unless contained within the channel banks or recorded easements. The evaluation must be submitted to IDNR-OWR for review and issuance of a permit.

(b) If the proposed new structure will increase upstream flood stages greater than 0.1 foot, the applicant must contact IDNR/OWR for a Dam Safety Permit or waiver. The Director shall be copied on all related correspondence.

(c) A restrictive bridge or culvert may be altered to increase the conveyance of the base flood if an impact analysis is completed and approved in writing by the Administrator and the Director and all other required regulatory approvals are obtained.

(d) Velocity increases must be mitigated by use of appropriate measures to avoid scour, erosion and sedimentation at the structure.

(e) For modification or replacement of existing structures in a regulatory floodway, the existing structure must first be evaluated in accordance with IDNR/OWR Rules (17 Ill. Adm. Code Part 3708) to determine if the existing structure is a source of flood damage. If the structure is a source of flood damage, the applicant's engineer shall justify allowing the damage to continue and evaluate the feasibility of relieving the structure's impact. Modifications to or replacement of structures, other than a restrictive bridge or culvert under § 413(c), shall not increase flood stages (0.0 feet) compared to the existing condition for all flood events up to and including the base flood event. The evaluation must be submitted to IDNR/OWR for review and approval before a permit is issued. The Director shall be copied on all related correspondence.

(f) If any work is proposed in, near or over the Fox River, a permit or letter indicating a permit is not required must be obtained from IDNR/OWR.

(g) The hydraulic analysis for the backwater caused by the bridge showing the existing condition and proposed regulatory profile must be submitted to IDNR/OWR for concurrence that a CLOMR is not required.

(h) Construction vehicles shall cross streams by the means of existing bridges or culverts. Where an existing crossing is not available, a temporary crossing, for which a permit or waiver has been issued by IDNR-OWR, shall be constructed in which—

(1) the approach roads will be six inches or less above existing grade;

(2) the crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall;

(3) the top of the roadway fill in the channel will be at least two feet below the top of the lowest bank;

(4) any fill in the channel shall be non-erosive material, such as rip-rap or gravel; and

(5) the access road and temporary crossings will be removed within one year after installation, unless an extension of time is granted by the Administrator

§ 414. Requirements for wetland delineation

(a) Before any development in or near Waters of the U.S., or in or near isolated wetlands or farmed wetlands, a written report identifying and evaluating the boundaries, location, limits, area and quality of all onsite wetlands shall be submitted. The presence and limits of wetland areas shall be determined by a wetland delineation conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual. Wetland delineations under this section shall be valid for three years. The presence of farmed wetlands shall be determined by NRCS.

(b) Before any development on agricultural land, in addition to the onsite delineation required under the previous paragraph, a Certified Wetland Determination shall be obtained from NRCS.

(c) The quality of the wetlands shall be evaluated based upon the FQI.

(d) Delineations for permitting purposes shall be performed only during the period beginning on the last Monday of March and ending on the third Friday of November.

(e) The approximate location, extent and relative quality of wetlands within 50 feet of the site shall be identified and included in the written report. The location and extent of such offsite wetlands shall be determined by using the first of the following documents or procedures pertaining at the time of development:

(1) site specific delineation according to the 1987 Manual. If such delineation is not available, then—

(2) wetlands identified in watershed plans or ADID studies. If such plans are not available, then—

(3) wetlands identified in interim watershed plans. If such plans are not available, then—

(4) wetlands identified on NRCS wetlands inventory maps.

(f) FQI assessments made before June 1 or after October 15 shall be considered to be preliminary. Buffer requirements based upon such assessments shall not be considered to be final unless maximum buffer widths are assumed.

§ 415. Mitigation to be local

All wetland mitigation required under a COE § 404 permit for wetland disturbances in the County shall be provided in the County. All wetland mitigation required under this ordinance for wetland impacts in the County shall be provided in the County. All wetland mitigation required under this ordinance for wetland impacts in any other county may be provided in such county or in the County.

§ 416. Threatened and endangered species consultation

Prior to the issuance of a stormwater management permit the applicant shall consult with IDNR and the United States Fish and Wildlife Service with respect to the presence of threatened or endangered species and shall obtain a “positive outcome” letter or other instrument of approval.

§ 417. Wetland preservation during development

Preserved wetlands shall be protected during development such that an FQI calculated two years after the commencement of development will not be more than 2 points less than the FQI originally calculated. The developer shall mitigate for any wetland not so preserved at the ratio required for the FQI originally calculated.

§ 418. Buffer requirements

The requirements of this section are not applicable to redevelopment projects on sites adjacent to the main channel of the Fox River. The requirements of this section are also not applicable to isolated wetlands or Waters of the U.S. that, in either case, are below the threshold size limitations for mitigation requirements under the COE § 404 permit program (currently, less than 0.25 acres).

(a) (1) Buffers shall be identified on development plans for all areas defined as Waters of the U.S. Buffer areas are divided into two types, linear buffers and water body buffers. Buffer areas including the protected Waters of the U.S. shall be shown to be within appropriate easements on all new plats. Additionally, the maintenance requirements for the buffer shall be noted on the plat or included as a covenant running with the land in any deed which conveys any portion of a buffer area.

(2) Buffer widths required as a part of a COE permit supersede the widths required in this section, unless the width required herein is greater. If a COE permit is obtained to permanently fill a portion of a wetland and no buffer is required, the buffer width required by this ordinance immediately adjacent to the area of impact does not apply. Immediately adjacent refers to the area within 15 feet of the area of impact. In no case shall additional wetland area be filled to provide buffer required by this ordinance.

(3) A jurisdictional Waters of the U.S., or wetland may not constitute buffer. Buffer widths are to be 50 feet wide unless otherwise determined using the criteria specified in §§ 418(a)(3)(A) and/or 418(a)(3)(B). Buffer width averaging is acceptable at the discretion of the Administrator. When using buffer width averaging, the width may not be more than 20% less, at the narrowest point, than the specified width. The buffer width may never be less than 15 feet, except in the case of Waters of the U.S. or wetlands with a calculated FQI of less than 7 where the buffer at its narrowest point may not be less than 12 feet in width.

(A) Linear buffers shall be designated along Waters of the U.S. and wetlands associated with water courses, i.e. swales, creeks, streams, rivers, etc. Refer to § 418(a)(3)(B) in cases where wetlands are adjacent to and not part of the main channel, i.e. floodplain wetland, backwater slough, oxbow, bordering wetland complex.

(i) When the lineal Waters of the U.S. have a drainage area greater than 640 acres, measured at the downstream property line, or is designated as ADID because of high habitat value or an adjacent wetland has a calculated FQI greater than 16, the buffer shall be 50 feet.

(ii) When the lineal Waters of the U.S. have a drainage area less than 640 acres, measured at the downstream property line, the buffer width shall be determined utilizing the formula, $X = (A * 0.0547) + 15$, where X equals the buffer width in feet and A equals the drainage area in acres. The width calculated by this formula shall be rounded up to the nearest multiple of five. Figure 1 may be used to determine buffer widths provided the resultant width is increased to the nearest multiple of five.

(iii) If protective measures are installed along the perimeter of a buffer, the width may be reduced by up to 10% immediately adjacent to the protective measure. The reduction in width that may be applied due to installation of protective measures may not be applied where buffer width averaging has been used and the buffer would be more than 20% less than originally specified. Protective measures may consist of fencing, sediment basins, biological filter strips or other methods approved by the Administrator.

(iv) If lineal Waters of the U.S. are completely or partially relocated, the newly created portion must be constructed in a manner which will allow naturalizing to occur, for example, meandering, pools, riffles, and the like. Additionally, all disturbed areas must be replanted for stability with native vegetation where appropriate, appropriately managed and maintained and protected by an appropriately sized buffer.

(B) Water body buffers shall encompass non-linear bodies of water meeting the definition of Waters of the U.S., including wetlands.

(i) If protective measures are installed along the perimeter of a buffer, the width may be reduced by up to 10% immediately adjacent to the protective measure. The reduction in width that may be applied due to installation of protective measures may not be applied where buffer width averaging has been used and the buffer would be more than 20% less than originally specified. Protective measures may consist of fencing, sediment basins, biological filter strips or other methods approved by the Administrator.

(ii) For all non-lineal water bodies or Waters of the U.S. designated as ADID or wetlands with an FQI greater than 16, a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(ii).

(iii) For non-ADID wetlands with an FQI of 7 to 16 a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(iii).

(iv) For non-ADID wetlands with an FQI of less than 7 a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(iv).

(b) Buffers shall be replanted or reseeded using appropriate predominately native deep-rooted vegetation, appropriately managed and maintained following disturbance.

(c) The buffer area for all lineal and non-lineal Waters of the U.S. except wetlands shall extend from the jurisdictional limits of the Waters of the U.S. ordinary high water mark. The buffer area for wetlands shall extend from the edge of the approved delineated wetland boundary. A site may contain buffer that originates from a Waters of the U.S. or wetland located on another property.

(d) Constructed stormwater management features shall not require a buffer and may constitute buffer. The total width of the buffer required may not be reduced by the installation of a stormwater management facility unless the facility can be considered a protective measure. If the facility can be considered to be a protective measure then the width of the buffer maybe reduced as specified in § 418(a)(3)(A)(iii).

(e) If a buffer area is disturbed by permitted activities during construction, the buffer strip shall be stabilized in accordance with § ?.

(f) Access through buffer areas shall be allowed when necessary for maintenance purposes. Unless otherwise dedicated for a public purpose, buffer areas shall remain private property and are not generally accessible to the public.

(g) The following are exempt from buffer requirements provided they do not meet the definition of Waters of the U.S.:

(1) roadside drainage ditches;

(2) channels;

(3) conveyance systems between site runoff storage facilities;

(4) excavated site runoff storage facilities, compensatory storage and sediment basins;

(5) roadway crossings and their associated installations;

(6) downspout and sump pump discharge; and

(7) constructed stormwater management facilities.

(h) Undetained stormwater which has not passed through a site runoff storage facility shall discharge through an area or structure meeting the definition of best management practices or buffer before entering a jurisdictional Waters of the U.S. or wetland.

(i) All buffer areas once established shall be maintained free from development, except as follows:

(1) A buffer area may be used for passive recreation (e.g. birdwatching, walking, jogging, bicycling, horseback riding and picnicking) and it may contain pedestrian, bicycle or equestrian trails, provided that the created path is no wider than ten feet. If the path leads to a wetland, it must be a winding path to help prevent erosion.

(2) Non-habitable structures (i.e., tool shed) and impervious surfaces may occupy a maximum of 15% of the portion of the required buffer that extends onto or is part of an individual property.

(3) Utility maintenance, and maintenance of drainage facilities and drainage easements shall be allowed provided the maintenance activity meets all other federal, state and local regulations.

(4) Anchoring and placement of boat docks and piers shall be allowed provided the structure meets all other federal, state and local regulations.

BUFFER WIDTH CALCULATION TABLES

Table 418(a)(3)(B)(ii) - High Quality Wetlands - FQI > 16

BUFFER RATIO	WETLAND AREA *(Acres)*	BUFFER AREA *(Acres)*	BUFFER WIDTH *(Feet)*
0.5	0.25	0.125	15.0
0.5	0.5	0.25	20.0
0.5	0.75	0.375	25.0
0.5	1	0.5	30.0
0.5	1.25	0.625	30.0
0.5	1.5	0.75	35.0
0.5	1.75	0.875	35.0
0.5	2	1	40.0
0.5	2.25	1.125	40.0
0.5	2.5	1.25	45.0
0.5	2.75	1.375	45.0
0.5	3	1.5	50.0
0.5	3.25	1.625	50.0
0.5	3.5	1.75	50.0
0.5	3.75	1.875	50.0
0.5	4	2	50.0
0.5	4.25	2.125	50.0
0.5	4.5	2.25	50.0
0.5	4.75	2.375	50.0
0.5	5 or more	2.5	50.0

Buffer Ratio = % of total wetland area
Wetland Area = Total on and offsite area of the wetland = (%*Acres)
Buffer Area = Area of the buffer = (%*Acres)
Buffer Width = [Area * 43560) / 4] / [Sqrt (Acres * 43560)]

Table 418(a)(3)(B)(iii) - Medium Quality Wetlands - FQI > 7 <16

BUFFER RATIO	WETLAND AREA *(Acres)*	BUFFER AREA *(Acres)*	BUFFER WIDTH *(Feet)*
0.4	0.25	0.1	15.0
0.4	0.5	0.2	15.0
0.4	0.75	0.3	20.0
0.4	1	0.4	25.0
0.4	1.25	0.5	25.0
0.4	1.5	0.6	30.0
0.4	1.75	0.7	30.0
0.4	2	0.8	30.0
0.4	2.25	0.9	35.0
0.4	2.5	1	35.0
0.4	2.75	1.1	35.0
0.4	3	1.2	40.0
0.4	3.25	1.3	40.0
0.4	3.5	1.4	40.0
0.4	3.75	1.5	45.0
0.4	4	1.6	45.0
0.4	4.25	1.7	45.0
0.4	4.5	1.8	45.0
0.4	4.75	1.9	50.0
0.4	5 or more	2	50.0

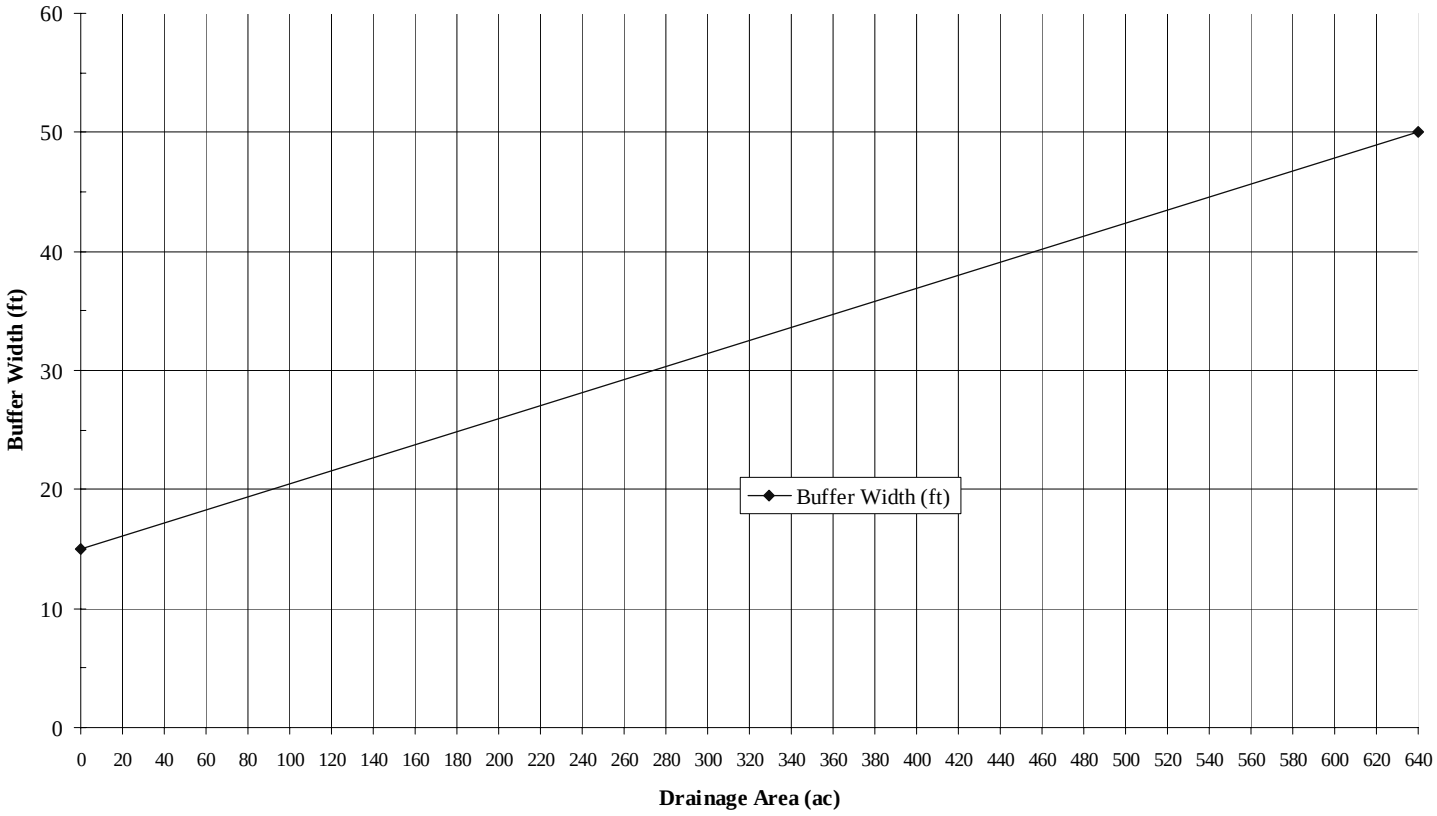
Buffer Ratio = % of total wetland area
Wetland Area = Total on and offsite area of the wetland = (%*Acres)
Buffer Area = Area of the buffer = (%*Acres)
Buffer Width = [Area * 43560) / 4] / [Sqrt (Acres * 43560)]

Table 418(a)(3)(B)(iv) - Low Quality Wetlands - FQI < 7

BUFFER RATIO	WETLAND AREA *(Acres)*	BUFFER AREA *(Acres)*	BUFFER WIDTH *(Feet)*
0.3	0.25	0.075	15.0
0.3	0.5	0.15	15.0
0.3	0.75	0.225	15.0
0.3	1	0.3	20.0
0.3	1.25	0.375	20.0
0.3	1.5	0.45	20.0
0.3	1.75	0.525	25.0
0.3	2	0.6	25.0
0.3	2.25	0.675	25.0
0.3	2.5	0.75	25.0
0.3	2.75	0.825	30.0
0.3	3	0.9	30.0
0.3	3.25	0.975	30.0
0.3	3.5	1.05	30.0
0.3	3.75	1.125	35.0
0.3	4	1.2	35.0
0.3	4.25	1.275	35.0
0.3	4.5	1.35	35.0
0.3	4.75	1.425	35.0
0.3	5 or more	1.5	35.0

Buffer Ratio = % of total wetland area
Wetland Area = Total on and offsite area of the wetland = (%*Acres)
Buffer Area = Area of the buffer = (%*Acres)
Buffer Width = [Area * 43560) / 4] / [Sqrt (Acres * 43560)]

Figure 1. Buffer Width Calculation Based on Drainage Area



ARTICLE 5—REQUIRED SUBMITTALS FOR STORMWATER MANAGEMENT PERMITS

§ 500. General requirements

(a) A stormwater management permit is required if—

(1) the development is located in the regulatory floodplain;

(2) a substantial improvement is to be located in the regulatory floodplain;

(3) there is any regulatory floodplain within the site; or

(4) the development disturbs more than 5,000 square feet of ground or 250 cubic yards of soil, unless the development consists solely of—

(A) the installation, renovation or replacement of a septic system, potable water service line or other utility serving an existing structure;

(B) the maintenance, repair or at grade replacement of existing lawn areas not otherwise requiring a stormwater permit under this ordinance;

(C) the maintenance of an existing stormwater facility, not requiring other state or federal permits or approvals.

(b) All appropriate stormwater management related approvals and permits, including, without limitation, an IDNR-OWR Floodway/Floodplain Construction Permit, a COE 404 Permit and an IDNR-OWR Dam Safety Permit, if required, shall be obtained from all federal, state and regional authorities prior to the issuance of a stormwater management permit.

(c) All permit fees shall be paid at the time of application. Permit fees shall be established by separate ordinance. Fees may be established based upon all costs incurred by the permitting authority in the administration of the permit, including, without limitation, the costs of review and inspections both during and after construction within the period for the establishment of permanent cover.

(d) (1) The design of stormwater facilities, calculations for the determination of the regulatory floodplain and calculations of the impacts of development shall meet the standards of this ordinance and shall be prepared, signed, and sealed by a professional engineer. The signature and seal of such professional engineer shall stand as his or her opinion that the submittals which accompany the permit application meet the requirements of this ordinance.

(2) (A) For projects which include earth embankments which are subjected to a differential water pressure the submittal shall include evidence that the embankment design and construction specifications are adequate for the design conditions. This review shall include consideration of the existing foundation soils for the embankment, the materials from which the embankment is to be constructed, compaction requirements for the embankment and protection of the embankment from failure due to overtopping. Specifications for the construction and materials for all such embankments shall be included. When directed by the Administrator, or when the impounded water pressure differential exceeds three feet or when appropriate considering the volume impounded and water surface elevation differential to which the embankment is subjected, these calculations may be required to be reviewed, signed and sealed by a qualified geotechnical or registered structural engineer.

(B) For structures (not including earth embankments) that are subject to a differential water pressure greater than three feet the submittal shall, at a minimum, be reviewed by a professional engineer. Such reviews shall include stability of the structure under design conditions considering the protection of downstream life and property in the event of a failure. When directed by the Administrator the calculations submitted for such structures shall be reviewed, signed and sealed by a registered structural engineer.

(3) A topographical map of the site, record drawings and other required drawings shall be prepared, signed, and sealed by a professional land surveyor or professional engineer and referenced to the National Geodetic Vertical Datum, 1929 adjustment, any FEMA benchmarks and, if the site is more than 20 acres, to the Kane County Survey Control Network. Plats for new subdivisions more than 20 acres in size shall be submitted to the Director in one of the electronic formats designated by the County.

§ 501. Duration and revision of permits

(a) Permits expire on December 31 of the third year following the date of their issuance.

(b) If the permitted activity has begun but is not complete by the expiration date of the permit, the permittee may submit a written request for an extension to the Administrator with a copy to the Director. Upon receipt of such request, the Administrator may extend the expiration date for up to three years for permitted activities outside special management areas. Expiration dates for permitted activities within special management areas may also be extended for up to three years provided the activity is in compliance with the then current requirements of this ordinance. An permittee may apply for any number of extensions.

(c) If the permittee revises the approved plans after issuance of the permit, the permittee shall submit the revised plans to the Administrator with a copy to the Director, along with a written request for approval. If the Administrator determines that the revised plans are in compliance with the then current requirements of this ordinance, an amended permit may be issued.

§ 502. Required submittals

(a) Refer to Table 502 for the submittals required to accompany the permit application based upon the type of development. The Administrator may, in his or her discretion, modify the submittal requirements on a case by case basis considering the size, complexity and likelihood that a development will affect the discharge of stormwater. Such modifications shall be requested and approved in writing. The Administrator's response shall note the relevant findings and be specific as to what submittal requirements are

Table 502 - Permit submittal requirements

Type of Development	Required Submittals (refer to sections noted for specific requirements) Section No./Description								
	503	504	505	506	507	508	509	510	Art 15
	Application and Project Overview	Plan Set Submittal	Stormwater Submittal	Floodplain Submittal	Wetland Submittal	Performance Security	Maintenance Schedule and Funding	Record Drawings	Wetland Impacts & Mitigation
All requiring a permit	X	X				X	X	X	
All on sites with floodplain	X	X		X		X	X	X	
All on sites with or adjacent to waters of the United States	X	X			X	X	X	X	
All applications for variances	X	X	X	If on site	If on site	X	X	X	
All requiring site runoff storage	X	X	X			X	X	X	
All on sites having a wetland impact					X				X

changed. The Director shall be copied on all related correspondence. The Administrator may not modify submittal requirements for any aspect of the development requiring state or federal permits or approvals, nor for any application in which any variance is requested. The Director shall receive a copy of any wetland submittal under § 507 whether or not the County is the permitting authority.

§ 503. Application and project overview

(a) The applicant shall at a minimum, provide the following information on forms or in a format approved by the Administrator:

(1) the names and legal addresses of all owners of the site;

(2) the names and legal addresses of the developer or developers responsible for completing the development according to the plans submitted, the terms and conditions of the permit and the requirements of this ordinance;

(3) the common address, legal description and parcel identification number (PIN) of all parcels which comprise the site;

(4) the name of the project, area of the site in acres and type of development;

(5) a general narrative description of the development, existing and proposed conditions and project planning principles considered, including best management practices used;

(6) a statement of opinion by a qualified person as to the presence of special management areas on the site;

(7) a statement of opinion by a Qualified Wetlands Review Specialist as to the presence of wetlands on or near the site. This requirement may be waived if the Qualified Engineer Review Specialist determines in writing that it is obvious from the nature of the development or redevelopment that wetlands cannot be located on or near the site;

(8) copies of all other permits or permit applications as required;

(9) a subsurface drainage investigation report; and

(10) an engineer's estimate of probable construction cost of the stormwater facilities and the installation and maintenance of soil erosion and sediment control measures.

(b) The application shall be signed by all owners and developers identified in (a) (1) and (2) above and shall contain their attestation that they have read and understand the provisions of this ordinance and agree to bind themselves to the permitting authority to comply therewith. If at any time prior to completion and final inspection and approval of the development the identity of the persons required to be disclosed in (a)(1) and (2) above changes, an amended application containing the current information shall be filed and the permit shall be amended accordingly.

§ 504. Plan set submittal

All applicants for a stormwater permit shall provide the following basic plan exhibits: Site Topographical Map, General Plan View Drawing, Sediment/Erosion Control Plan and a Vicinity Topographical Map. Each exhibit may be on more than one drawing for clarity. The specific information to be included on each exhibit shall be as noted below.

(a) Site Topographical Map:

(1) map scales as 1 inch = 100 feet (or less) and accurate to +/- 0.5 feet;

(2) existing and proposed contours onsite (one foot maximum contour interval) and within 100 feet of the site;

(3) existing and proposed drainage patterns and watershed boundaries;

(4) delineation of pre-development regulatory floodplain and floodway limits;

(5) delineation of post-development regulatory floodplain and floodway limits;

(6) location of cross-sections and any other hydrologic or hydraulic computer modeled features;

(7) location of all onsite drain tiles;

(8) boundaries of all wetlands, lakes, ponds, etc. with normal water elevation noted; (show areas of wetlands to be impacted either under permit or otherwise if a permit is not required);

(9) location of all existing buildings and those to remain on the site noted;

(10) nearest base flood elevations;

(11) FEMA and reference benchmarks used; and

(12) all contours used in the calculation of depressional storage highlighted.

(b) General Plan View Drawing:

(1) drawing at the same scale as the Site Topographical Map;

(2) existing major and minor stormwater systems;

(3) proposed major and minor stormwater systems;

(4) design details for stormwater facilities (i.e. structure and outlet work detail drawings, etc.);

(5) scheduled maintenance program for permanent stormwater facilities including BMP;

(6) planned maintenance tasks and schedule;

(7) identification of persons responsible for maintenance;

(8) permanent public access maintenance easements granted or dedicated to, and accepted by, a government entity;

(9) proposed regulatory floodplain and floodway location (with the base flood and flood protection elevations noted);

(10) existing Waters of the U.S. including wetlands, a certified wetland determination obtained from NRCS if the development occurs on agricultural land wetlands and aquatic resources identified in ADID, and required buffers;

(11) areas of directly connected impervious areas and any off-setting landscaped areas as defined in § 203(g) indicated;

(12) all plan areas at elevations below the 100-year high water elevation of site runoff storage facilities highlighted; and

(13) where a 500-year regulatory flood profile is available, the plan limit of the 500 year floodplain.

(c) Sediment and Erosion Control Plan:

(1) drawings at the same scale as the Site Topographical Map;

(2) sediment and erosion control installation measures and schedule;

(3) existing and proposed roadways, structures, parking lots, driveways, sidewalks and other impervious surfaces;

(4) limits of clearing and grading;

(5) special management areas located;

(6) proposed buffer locations, existing soil types, vegetation and land cover conditions;

(7) list of maintenance tasks and schedule for sediment and erosion control measures; and

(8) the name, address and phone number at which the person responsible for erosion and sediment control may be reached on a 24-hour basis.

(d) Vicinity Topographical Map.

(1) vicinity topographical map identifying all offsite areas draining to the development and downstream to the receiving intermittent or perennial stream; (a two-foot contour map is preferred at a scale readable by the reviewer but a USGS Quadrangle map is acceptable);

(2) watershed boundaries for areas draining through or from the development;

(3) soil types related to hydrologic soils group, vegetation and land cover affecting runoff upstream of the site for any area draining through the site;

(4) location of site within the major watershed(s); and

(5) shows the overland flow path from the downstream end of the development to the receiving intermittent or perennial stream.

§ 505. Stormwater submittal

The stormwater submittal shall include a narrative discussion and calculations to support a finding by the qualified review specialist that the proposed development complies with the technical requirements of this ordinance. The submittal shall consist at a minimum of the following material:

(a) a narrative description of the existing and proposed site drainage patterns and conditions; include description of offsite conditions which help to identify stormwater issues considered in the design;

(b) a schedule for implementation of the site stormwater plan;

(c) onsite and offsite runoff calculations which address the following:

(1) documentation of the procedures and assumptions used to calculate hydrologic and hydraulic conditions for sizing major and minor systems;

(2) cross-section data for open channels;

(3) hydraulic grade line and water surface elevations under design flow conditions; and

(4) hydraulic grade line and water surface elevations under base flood flow conditions; and

(d) site runoff storage calculations, which address the following:

(1) calculation of hydraulically connected impervious area and corresponding retention volume;

(2) documentation of the procedures and assumptions used to calculate hydrologic and hydraulic conditions for determining the allowable release rate;

(3) documentation of the procedures and assumptions used to calculate onsite depressional storage;

(4) documentation of the procedures and assumptions used to calculated hydrologic and hydraulic conditions for determining the storage volume;

(5) elevation-area-storage data and calculations for site runoff storage; and

(6) elevation-discharge data and calculations specifically related to the outlet control structure depicted in the plan exhibits.

§ 506. Floodplain submittal

The applicant shall obtain approval from IDNR-OWR and FEMA when required for all new base flood and floodway determinations or as required in § 404. Documentation supporting a finding by the qualified review specialist that the proposed development is in compliance with § 403 shall be submitted with the application. At a minimum, the following material shall be submitted for approval with the application:

(a) regulatory floodplain boundary determination:

(1) provide source of flood profile information; and

(2) provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations, and floodplain map revisions;

(b) floodway hydrologic and hydraulic analyses for the following conditions:

(1) existing conditions (land use and stream systems);

(2) proposed conditions (land use and stream systems);

(3) tabular summary of 100-year flood elevations and discharges for existing and proposed conditions;

(4) calculations used for model development; and

(5) hydraulic/hydrologic computer model input/output;

(c) floodplain fill and compensatory storage calculations for below and above ten-year flood elevation up to the base flood elevation:

(1) tabular summary for below and above ten-year flood elevation of fill, compensatory storage and compensatory storage ratios provided in proposed plan; and

(2) cross-sections used for the above calculations; and

(d) floodproofing measures:

(1) narrative discussion of floodproofing measures including material specifications, calculations, design details and operation summary; and

(2) flood easements when required by this ordinance.

(e) statewide and regional self-issuing permits (Statewide Permits Nos. 1 through 14 and Regional Permit No. 3):

(1) such information as shall show that the development qualifies for particular permit in question under the regulations established therefor by IDNR-OWR.

§ 507. Wetland submittal

(a) The applicant shall obtain a permit for all federally regulated activities involving Waters of the U.S. from the appropriate federal authorities. The applicant shall obtain a permit from the County (or community certified under this ordinance to administer Article 15), for all developments having a wetland impact. The applicant shall indicate on the plan set the location of any onsite wetland mitigation required by a COE permit and, in narrative form, the location of all onsite mitigation.

(b) A wetland submittal in accordance with the detailed requirements of §§ 403, 414 and 415 shall be required. In general, the submittal will consist of the following material:

(1) wetland delineation report (COE format);

(2) calculation of required buffer (including size and quality when calculated); and

(3) Wetland Delineation Plan View Drawing:

(A) all existing and proposed impacted or undisturbed onsite wetlands;

(B) location of buffers;

(C) planting plan for buffers; and

(D) identify all required wetland management activities.

(4) For all stream modifications, the following shall be submitted:

(A) a plan and profile of the existing and proposed channel; and

(B) supporting calculations for channel width, depth, sinuosity, riffle locations and the like.

(c) If the development will have a wetland impact, the requirements of Article 15 shall be met.

§ 508. Performance security

Performance security in accordance with Article 12 shall be required prior to permit issuance.

§ 509. Maintenance schedule and funding

A completed maintenance schedule for the stormwater management facilities and special management areas in accordance with Article 6 shall be submitted along with identification of the persons responsible for maintenance and funding and back-up funding sources for maintenance in accordance with § 605.

§ 510. Record drawings

The permittee is required to submit record drawings of all permitted stormwater facilities. The record drawings shall be signed and sealed by a professional engineer or professional land surveyor who shall state that the project as constructed is substantially in conformance with the development as permitted.

§ 511. Terms of permit/denial—appeal

(a) Within 10 days after being served with the permit or notice that the permit has been denied, the applicant may appeal the terms or denial of the permit to the oversight committee. The appeal shall be made by filing a notice thereof with the oversight committee specifying the specific provisions appealed

from and the grounds therefor. The oversight committee shall conduct a hearing on the appeal not more than 60 days after the filing of the notice of appeal. The hearing shall be *de novo*. Notice of the hearing shall be served upon the applicant, the Administrator, the Director and upon all communities within the same watershed as the development to which the appeal relates. The hearing may be continued from time to time. The oversight committee may adopt rules for the taking of evidence and conduct of such hearings.

(b) Within 30 days of the conclusion of the hearing, the oversight committee shall decide whether to affirm or reverse, in whole or in part, the terms or denial of the permit. The decision of the oversight committee shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon all parties entitled to notice in accordance with § 1006.

(c) Within 10 days of being served with the order of the oversight committee, the applicant may (and if the denial of the permit or any of the terms thereof have been reversed, in whole or in part, by the oversight committee, the Administrator shall), further appeal to the decision-making authority. The decision-making authority shall decide the appeal upon the record before the oversight committee. The decision-making authority shall decide the appeal within 45 days of its receipt thereof. The decision-making authority shall affirm the order of the oversight committee if it is supported by substantial evidence in the record. A copy of the decision and order of the decision-making authority shall be served upon all parties entitled to notice in accordance with § 1006.

(d) Within 10 days of being served with the order of the decision-making authority, the applicant may (and if the effect of the decision-making authority's decision is that the denial of the permit or any of the terms thereof have been reversed, in whole or in part, the Administrator shall), further appeal to the Committee. The Committee shall decide the appeal upon the record below. The Committee shall decide the appeal within 45 days of its receipt thereof. The Committee shall affirm the order of the decision-making authority if it is supported by substantial evidence in the record. A copy of the decision and order of the Committee shall be served upon all parties entitled to notice in accordance with § 1006.

(e) From a final order of the Committee, the applicant may appeal to the courts under the Illinois Administrative Review Law.

ARTICLE 6—LONG TERM MAINTENANCE

§ 600. Long-term maintenance

The owner shall maintain that portion of a stormwater drainage system, including any special management areas, located upon his land. With the approval of the Administrator the stormwater drainage system and special management areas, or specified portions thereof, may be—

(a) dedicated or otherwise transferred to and accepted by the permitting authority or other public entity; or

(b) conveyed or otherwise transferred to and accepted by a homeowner's association, or similar entity, the members of which are to be the owners of all of the lots or parcels comprising the development; or

(c) conveyed to one or more persons or in one or more undivided interests to one or more persons.

Except for those portions of the stormwater drainage system and special management areas to be dedicated or otherwise transferred to the permitting authority or other public entity, included in the application for a stormwater permit shall be a plan for the long term management, operation and maintenance of the stormwater drainage system and special management areas and a description of the sources of funding therefor. Amendments to the plan must be approved by the Administrator.

§ 601. Transfer to permitting authority or other public entity

If any portion of the stormwater drainage system or special management areas are to be dedicated or otherwise transferred to the permitting authority or other public entity under § 600(a), appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of such entity on the final plat.

§ 602. Transfer to homeowner's or similar association

If any portion of the stormwater drainage system or special management areas are to be conveyed or otherwise transferred to a homeowner's or similar association under § 600(b) then—

(a) appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of such association and the permitting authority on the final plat;

(b) the final plat shall contain a legend imposing the maintenance obligations of this section upon the association and its successors in interest as a covenant running with the land and incorporating by reference the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;

(c) the final plat shall contain a legend reserving the right of the permitting authority to enter upon the land to perform the maintenance required in this section if the association does not do so and to place a lien against the land for the cost thereof;

(d) the association shall be duly incorporated and a copy of the Certificate of Incorporation, duly recorded, and bylaws, and any amendment to either of them, shall be delivered to the Administrator;

(e) the bylaws of the association shall, at a minimum, contain—

(1) a provision acknowledging and accepting the association's obligation to maintain those portions of the stormwater drainage system and special management areas conveyed or otherwise transferred to it under this ordinance;

(2) a mechanism for imposing an assessment upon the owners of all of the lots or parcels comprising the development sufficient, at a minimum, to provide for the maintenance of those portions of the

stormwater drainage system and special management areas conveyed or otherwise transferred to it under this ordinance; and the payment of all taxes levied thereon;

(3) a provision adopting the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;

(4) a provision identifying the officer of the association responsible for carrying out the obligations imposed upon the association under this ordinance;

(5) a provision requiring the consent of the permitting authority to any amendment of the bylaws changing any of the provisions of the bylaws required by this ordinance; and

(6) a provision requiring the consent of the permitting authority to the dissolution of the association; and

(f) any conveyance or other instrument of transfer delivered under § 600(b) shall include a covenant affirmatively imposing upon the association the obligations set forth in this section and the association's affirmative acceptance thereof.

§ 603. Conveyance to one or more persons

If any portion of the stormwater drainage system or special management areas are to be conveyed to one or more persons under § 600(c), then—

(a) appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of the permitting authority on the final plat;

(b) the final plat shall contain a legend imposing the maintenance obligations of this section upon the grantee and his successors in interest as a covenant running with the land and incorporating by reference the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;

(c) the final plat shall contain a legend reserving the right of the permitting authority to enter upon the land to perform the maintenance required in this section if the owner does not do so and to place a lien against the land for the cost thereof; and

(d) any conveyance delivered under § 600(c), and any subsequent conveyance, shall include a covenant affirmatively imposing upon the grantee the obligations, restrictions and provisions set forth in this section and the grantee's affirmative acceptance thereof.

§ 604. Incorporation of maintenance obligations in stormwater management permit

The provisions of this Article shall be incorporated by reference in the stormwater management permit and the applicant's acceptance of the permit shall be deemed to be the applicant's acceptance and assumption of the obligations imposed under this Article. At the option of the Administrator, the stormwater management permit may be recorded.

§ 605. Funding of long-term maintenance of stormwater facilities

Unless (a) a public entity has accepted primary maintenance responsibility for the stormwater drainage system and special management areas to be constructed, installed or preserved under the permit, or (b) a public entity has agreed and so states in the permit, to accept maintenance responsibility in the event the person designated by the applicant as having primary maintenance responsibility fails to adequately carry out its duties the Administrator will require, as a condition of approving of any application for a stormwater management permit, the establishment of a special service area pursuant to 35 ILCS 200/27-5, *et seq*, either as the primary means of providing for the long term maintenance of the facilities, or as a backup vehicle in the event the person designated by the applicant as having primary maintenance responsibility fails to adequately carry out its duties. If the establishment of a special service area is required, the

Administrator shall make a good faith estimate of the tax rate required to produce a tax to be levied upon all taxable property within the area, sufficient for the long term maintenance of the facilities and submit the same to the permitting authority which shall incorporate such rate into its enactment of the ordinances necessary for the establishment of the area. The ordinances to be enacted by the permitting authority shall be substantially in the form set forth in Appendix D. On or before August 1 of each year thereafter, the Administrator shall submit to the permitting authority a good faith estimate of the amount of tax required to be levied upon all taxable property within the area for the next fiscal year for the continued maintenance of the stormwater drainage system.

ARTICLE 7—ENFORCEMENT AND PENALTIES

§ 700. Inspection and maintenance authority

Pursuant to the authority granted by 55 ILCS 5/5-1104 and 5-1062, the County may, upon 30 days' notice to the owner or occupant, enter upon any lands or waters within the County for the purpose of inspecting and/or maintaining any stormwater facilities or causing the removal of any obstruction to an affected watercourse.

§ 701. Required inspections

Any development constructed pursuant to a stormwater management permit may be periodically inspected by the Administrator or Director to ensure its conformity with this ordinance and the terms and conditions of its permit.

§ 702. Offenses

(a) Any person who violates, disobeys, omits, neglects, refuses to comply with, or resists the enforcement of any provision of this ordinance (***ordinance violation***), or any requirement or condition in any permit issued pursuant to this ordinance (***permit violation***), and, in the case of a permit violation, fails to correct such violation, omission or neglect, or cease such disobedience, refusal or resistence after notice and reinspection as provided below, shall be guilty of an offense under this ordinance.

(b) Whenever the Administrator or Director, as the case may be, determines that a permit violation exists, he shall serve notice of the violation in the manner prescribed in § 1006 on the permittee. Such notice shall state the nature of the violation and fix a date not less than 10 days after the date of the notice by which the violation shall be corrected and the site reinspected, except in the case of a violation of Article 3, in which case the notice may require the correction of the violation and reinspection of the site within as little as two days.

§ 703. Offenses - penalties; remedies

(a) The Administrator or Director may pursue any one or more of the following remedies against any person found by him or her to be guilty of an offense under this ordinance:

(1) The Administrator or Director may impose a civil fine upon such person in an amount not less than $25 and not more than $750. Each calendar day during which such violation continues to exist shall constitute a separate offense.

(2) The Administrator or Director may revoke any stormwater management permit issued to such person.

(3) The Administrator or Director may issue an order requiring the suspension of any further work on the site. Such stop-work order shall be in writing, shall indicate the reason for its issuance, and shall specify the action, if any, required to be taken in order to resume work. One copy of the stop-work order shall be posted on the site in a conspicuous place and one copy shall be served in the manner prescribed in § 1006 upon the permittee, if any, or if none, upon the person in whose name the site was last assessed for taxes as disclosed by the records of the Supervisor of Assessments.

(4) The Administrator or Director may require that the area impacted be fully restored to its condition existing prior to such development, disturbance or impact. In the case of a wetland impact the area's pre-existing condition shall be determined by reference to a creditable wetland assessment performed within two years of such impact.

(5) The Administrator or Director may require the person to apply "after the fact" for the appropriate permit for an unpermitted development, disturbance or impact. In the case of a wetland impact the FQI of the wetland impacted shall be determined by the Director and mitigation shall be provided accordingly.

(b) In order to enforce any of the remedies set forth in the preceding paragraph, the Administrator or the Director may bring any action, legal or equitable, including an action for injunctive relief, deemed necessary. In any such action, in addition to any fine or other relief, the Administrator or the Director may recover all costs and expenses, including reasonable attorney fees, incurred.

ARTICLE 8—GENERAL PROVISIONS

§ 800. Scope of Regulation

This ordinance applies to all development within the County and to all development within the corporate boundaries of any certified community, including that under the control of any governmental entity, agency, or authority. Any person undertaking a development shall obtain a stormwater management permit from the permitting authority within whose boundaries the development is located. Any person undertaking a development having a wetland impact shall obtain a permit from the Director (or Administrator in a community certified under this ordinance to administer Article 15). Any certified community undertaking development in the regulatory floodway, or regulatory floodplain where no regulatory floodway has been designated, shall obtain a permit from IDNR-OWR if required prior to issuance of a stormwater management permit. All units of local government shall obtain stormwater management permits from the permitting authority within whose boundaries the development is located.

§ 801. Exemptions

(a) This ordinance does not apply to—

(1) development which has been substantially completed before January 1, 2002;

(2) development which has been determined to be exempt by the Committee; and

(3) wetland impacts occurring before the effective date.

(b) Nonconforming structures shall not be replaced or enlarged in any manner unless such replacement or enlargement conforms to the requirements of this ordinance.

§ 802. Committees's determination of exemption

(a) Before January 1, 2002, each community shall submit to the Director a list of proposed exempt developments prepared and adopted in accordance with § 803. At its next regularly scheduled meeting occurring not less than 15 days after the Directors's receipt of the list, the Committee shall consider the developments listed therein. Any member of the Committee may remove from the list for further consideration, any development located within the zone represented by that member on the Committee. Additionally, the Committee, upon motion made and seconded and passed by a majority of those members present, may remove any development from the list for further consideration. After such removals, the developments remaining on the list shall be determined to be exempt from the provisions of this ordinance.

(b) With respect to those developments removed from the list, the Committee shall determine each development to be exempt from the provisions of this ordinance if—

(1) substantial development has commenced; or

(2) the stormwater plan for such development—

(A) provides site runoff storage which at a minimum meets a 0.15 cfs/acre release rate standard;

(B) includes a designed conveyance system for flow rates up to the base flood for offsite and onsite flows without damage to structures; and

(C) provides for soil erosion and sediment control in accordance with the *Illinois Urban Manual*.

(c) Notwithstanding the Committee's determination that a particular development is exempt from the provisions of this ordinance, all mitigable wetland impacts from any development occurring after the effective date shall be mitigated.

§ 803. Community's list of proposed exempt developments

(a) A community may place a development on its list of proposed exempt developments only if—

(1) a stormwater plan has been submitted and substantially approved by the community engineer; or

(2) a contractual agreement, specifically exempting the development from the stormwater regulations of the community, was entered into before January 1, 2001.

(b) (1) A community's list of proposed exempt developments shall be adopted by an official action of the corporate authorities of the community. Prior to taking such action, the community shall publish in accordance with § 1007, a notice in substantially the following form:

> On [date], at [time], the [corporate authorities] of the [type of community] of [community] will consider and take formal action with respect to the approval of the following list of developments proposed as exempt from the provisions of the Kane County Stormwater Management Ordinance, adopted by the Kane County Board on November 14, 2000. Any person wishing to do so, may attend the meeting and be heard prior to the [corporate authorities] taking such action.
>
> [List of proposed exempt developments]

(2) In addition to the published notice, not less than 15 days prior to taking any such action, the community shall place a sign in a conspicuous place at each of the developments on the list advising the public that the development is on the list of developments proposed as exempt from the provisions of this ordinance and of the date and time of the meeting at which formal action with respect to the approval of the list will be taken and of the public's right to appear to be heard prior to such approval.

(c) Once submitted, the list may not be changed except that a developer of a development inadvertently omitted from the list by the community may apply directly to the Committee for a determination that the development meets all of the requirements of this Article for being exempt.

§ 804. Interpretation

(a) This ordinance shall be liberally construed to protect the health, welfare, safety, and the environment of the residents of the County and to effectuate the purposes of this ordinance and the enabling legislation.

(b) Nothing in this ordinance shall be deemed to consent to, license, permit to locate, construct, or maintain any structure, site, facility or operation, or to carry on any trade, industry, occupation, or activity.

(c) When provisions of this ordinance differ from any other applicable law, statute, ordinance, rule or regulation, the more stringent provision shall apply.

(d) The provisions of this ordinance are cumulative of all other laws, statutes, ordinances, rules and regulations which relate to the subject matter hereof and, except as otherwise expressly provided herein, nothing in this ordinance shall be construed as a limitation upon the application or enforcement of any such law, statute, ordinance, rule or regulation. To the greatest extent possible, the provisions of this ordinance shall be construed to be consistent with the provisions of such other laws, statutes, ordinances, rules or regulations, and with each other, to the end that all such provisions may be given their fullest application.

§ 805. Warning and disclaimer of liability

(a) The degree of flood protection provided by this ordinance is considered reasonable for regulatory purposes and is based upon engineering experience and scientific methods of study. Increased flooding may result from causes beyond the control of any governmental authority. This ordinance does not, therefore, guarantee that areas outside the floodplain or permitted land uses within the floodplain will be free from flooding and associated damages.

(b) Nothing in this ordinance shall be construed or applied in any manner to create liability on the part of or a cause of action against the County, any municipality or other governmental authority, or any elected official, or any officer, agent, or employee of any of the foregoing, or any qualified engineer review specialist or qualified wetland review specialist for any flood damage resulting from reliance on the provisions of this ordinance.

§ 806. Choice of planning jurisdiction

Pursuant to 55 ILCS 5/5-1062 (b), a community that is located in more than one county may choose, at the time of the formation of the Committee, and based upon watershed boundaries, to participate in the stormwater management planning program of either or both of the counties. Unless the community, at the time of the formation of the Committee, has chosen to participate in the stormwater management planning program of another County, the Committee shall include such community within the scope of its planning and enforcement jurisdiction.

§ 807. Severability

(a) The provisions of this ordinance shall be severable in accordance with the following rules:

(1) If any court of competent jurisdiction shall adjudge any provision of this ordinance to be invalid, such judgment shall not affect any other provision of this ordinance.

(2) If any court of competent jurisdiction shall adjudge to be invalid the application of any provision of this ordinance to a particular parcel of land, a particular structure, or a particular development, such judgment shall not affect the application of said provision to any other land, structure or development.

§ 808. Repealer

This ordinance repeals the original ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to replace any ordinance or resolution passed in order to establish initial eligibility for the National Flood Insurance Program.

§ 809. Amendments

No amendment to this ordinance may be passed without a public hearing first being held before the Committee upon notice published as provided in § 1007.

§ 810. Effective date

After its passage, approval and publication according to law, this ordinance shall take effect on January 1, 2002.

ARTICLE 9—VARIANCES

§ 900. Purpose

In order to provide a narrowly circumscribed means by which relief may be granted when strict compliance with the requirements of this ordinance is impossible or impracticable, variances from the specific provisions of this ordinance may be granted according to the standards set forth in this Article.

§ 901. Application for variance

An application for a variance, signed by at least one of the persons identified in § 503(a)(1) and (2) with respect to the development to which it relates, shall be filed with the Administrator. No application for a variance will be accepted for filing unless it relates to a previously or contemporaneously filed application for a stormwater management permit. Applications for a variance shall be filed in such number of duplicate copies as the Administrator may designate by administrative order. No action will be taken on an application for a variance unless it and the corresponding application for a stormwater management permit to which it relates are complete as determined by the Administrator. The Administrator shall send a copy of the complete application to the Director and to all other communities within the same watershed. Applications for a variance need not be made upon any specific form, but shall contain the information set forth in **Table 901**

Table 901 - Application for variance

An application for variance shall set forth—

1. the common address(es) and legal description of the site;

2. the persons identified in § 503(a)(1) and (2);

3. the names and addresses of all consultants retained in connection with the application for a variance;

4. the names and addresses of all owners of record of land within 250 feet of the site;

5. the specific feature or features of the development that require a variance;

6. the specific provisions of this ordinance from which a variance is sought and the precise extent of the variance therefrom;

7. a statement of the characteristics of the development that prevent compliance with the provisions of this ordinance;

8. a statement that the variance requested is the minimum variance necessary to permit the development;

9. a statement as to how the variance requested satisfies the standards set forth in Section 904 of this ordinance.

§ 902. Application fee

With the filing of the application for a variance, the applicant shall pay a fee to be prescribed by separate ordinance.

§ 903. Public hearing

When the application is complete, the Administrator will so notify the applicant and will schedule a public hearing on the application before the oversight committee. Notice of the hearing shall be published as provided in § 1007 and served as provided in § 1006 upon the applicant, the Director, all owners of record of land within 250 feet of the site as disclosed in the application, and upon each community within the same watershed as the development. The notices given under the section shall set forth the common name, address and legal description of the development and a brief description of the variance is requested.

§ 904. Granting of variances

(a) The oversight committee shall not recommend nor shall the decision-making authority grant a variance from the provisions of this ordinance unless the variance is consistent with the purposes of this ordinance and meets the following standards based upon substantial evidence submitted at the hearing:

(1) The variance will not increase the probability of flood damage or create an additional threat to the public health, safety and welfare.

(2) The variance is the minimum required considering each of the following statements of policy underlying this ordinance and there are no means other than the requested variance by which the demon-

strated hardship can be avoided or remedied to a degree sufficient to permit the reasonable continuation of the development:

(A) Site runoff storage of stormwater shall also contribute to the improvement of the quality of stormwater runoff.

(B) The volume of site runoff storage provided in open-air vegetated facilities is maximized consistent with other site constraints on land use, including zoning requirements essential for the proposed development.

(C) Conveyance of stormwater shall not disproportionately absorb the design capacity of existing offsite conveyance facilities for any storm event from the two-year to the 100-year flood frequency.

(D) High quality natural areas shall be preserved on the site, including without limitation, stands of native trees, existing wetlands, natural floodplain storage or other valuable environmental and biological resources.

(3) The variance is not requested solely for the purpose of increasing the density of the development nor impervious areas on the site.

(4) The variance is not requested solely as a result of economic hardship.

(5) If applicable, the variance is required due to unique, natural topographical features of the site.

(6) The applicant's circumstances are not self-imposed.

(b) Variances requested in connection with the restoration of an historic structure may be granted using criteria more permissive than those set forth above provided that—

(1) the repair or rehabilitation is the minimum necessary to preserve the historic character and design of the historic structure; and

(2) the repair or rehabilitation will not result in the structure no longer meeting the definition of an historic structure under this ordinance.

(c) No variance shall be granted for any development in the regulatory floodway, regulatory wetlands or critical wetlands, the effect of which would be to create regulations less restrictive than the federal or state minimum standards applicable to development in such areas.

(d) When a variance would lessen the degree of protection to any structure, the Administrator shall notify the applicant that the variance, if granted, may result in increased rates for flood insurance.

§ 905. Recommendations

(a) The Administrator shall review the application for a variance and present his or her written recommendations to the oversight committee at the public hearing.

(b) Not more than 45 days after the close of the hearing, the oversight committee shall forward the application with its written recommendations to the decision-making authority. If the oversight committee fails to act within 45 days, it shall be deemed to have forwarded the application with no recommendation to the decision-making authority. The written recommendations of the oversight committee, when forwarded, shall be accompanied by written findings of fact with respect to each of the elements set forth in § 904 with citations to the evidence taken at the public hearing.

§ 906. Decision

The decision-making authority shall grant the variance, grant the variance with modifications or conditions, or deny the variance in writing within 45 days after receipt of the application from the oversight committee. The failure of the decision-making authority to act within 45 days, absent the agreement of the applicant to any extension of the time, shall be deemed to be a decision approving the variance.

§ 907. Conditions

(a) A variance less than or different from that requested may be granted when the record supports the applicant's right to some relief, but not to the relief requested.

(b) In granting a variance, the decision-making authority may impose such specific conditions and limitations on the applicant concerning any matter relating to the purposes and objectives of this ordinance as may be necessary or appropriate.

(c) Whenever any variance is granted subject to any condition to be met by the applicant, upon meeting such condition, the applicant shall file evidence to that effect with the Administrator.

ARTICLE 10—ADMINISTRATION

§ 1000. Responsibility for administration

(a) The oversight committee shall oversee the enforcement of this ordinance.

(b) The Director and Administrator shall administer this ordinance. In performing their duties, the Director and the Administrator may delegate routine responsibilities to any named designee.

(c) Each community shall remain solely responsible for its standing in the National Flood Insurance Program, including —

(1) the maintenance of all records and the submission of all reports required for eligibility in the program, including elevation certificates, floodproofing certificates, and lowest floor elevations; and

(2) the notification of the Director, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any proposed amendment to this ordinance.

§ 1001. Duties of Director

The Director shall —

(a) supervise the enforcement of this ordinance;

(b) supervise the development, revision and implementation of the Plan for approval by the Committee and the County;

(c) supervise the review of complex stormwater management permits for any community that requests such assistance;

(d) notify all of the communities in the County, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any amendments to the Plan or to this ordinance;

(e) administer the qualified engineer review specialist and qualified wetland review specialist programs;

(f) maintain a current list of all maps considered regulatory under this ordinance; and

(g) administer Article 15 except in those community certified under this ordinance to administer Article 15.

§ 1002. Duties of Administrator

The Administrator shall —

(a) ensure that all required stormwater related federal, state, regional and County permits and approvals are received prior to issuing any permit under this ordinance;

(b) ascertain whether any special management areas exist on any site which is the subject of an application for a permit under this ordinance;

(c) use qualified engineer review specialists and qualified wetland review specialists for the review of permit applications and consider their recommendations in granting or denying any permit under this ordinance, unless the review of the developer's qualified wetland review specialist indicates that there are no

wetlands on site in which case the Administrator may rely upon that review without having it independently verified;

(d) ensure that the required notice of an application for a variance has been given and published in accordance with §§ 1006 and 1007;

(e) notify an applicant for a variance that such variance may result in increased rates for flood insurance, if applicable;

(f) notify the Director of an application for a CLOMR or LOMR;

(g) provide for inspections of developments as required by this ordinance;

(h) investigate complaints of violations of this ordinance within his or her community;

(i) notify violators within regulatory floodplains that failure to comply with the provisions of the National Flood Insurance Program could make them ineligible to receive flood insurance;

(j) initiate any proceeding necessary to enforce this ordinance within his or her community;

(k) advise, consult and cooperate with other governmental agencies to promote the purposes of this ordinance;

(l) maintain copies of all applications and submittals, federal and state permits, variances, CLOMR, LOMR, CLOMA, LOMA and all documentation associated with any of the foregoing for public inspection;

(m) maintain documentation and data on the cost of any improvement to a structure in the floodplain in order to enforce the provisions of this ordinance pertaining to substantial improvements to such structures;

(n) notify adjacent communities in writing 30 days prior to the issuance of a stormwater management permit involving the alteration or relocation of a watercourse; and

(o) ensure that all wetland impacts have been mitigated.

§ 1003. Representative capacity

In all cases when any action is taken by the Director or the Administrator, or his or her duly appointed designee, to enforce the provisions of this ordinance, such action shall be taken either in the name of the County or the certified community, as the case may be, and neither the Director nor the Administrator, nor his or her designee, in so acting shall be rendered personally liable.

§ 1004. Oversight committee

The corporate authorities of each certified community within the County shall establish an oversight committee to oversee the implementation and enforcement of this ordinance within its jurisdiction and to perform the duties assigned to the oversight committee in this ordinance. The oversight committee may be comprised of the corporate authorities or any committee thereof, plan commission, zoning board of appeals, or other existing body, or the corporate authorities may, according to their own rules and procedures, establish a separate oversight committee. The Executive Committee of the County Board shall designate the oversight committee for the County. The oversight committee, when considering an appeal or request for a variance under this ordinance, may request an opinion from a qualified engineer review specialist or qualified wetland review specialist on technical issues.

§ 1005. Decision-making authority

The corporate authorities of each certified community within the County shall by separate resolution designate a decision-making authority to perform the duties assigned to the decision-making authority in this ordinance. The decision-making authority may be comprised of the corporate authorities or any committee thereof, plan commission, zoning board of appeals, or other existing body, or the corporate authorities may, according to their own rules and procedures, establish a separate decision making authority. The Development Committee of the County Board shall act as the decision-making authority for the County. The decision-making authority, when considering an appeal or request for a variance under this ordinance, may request an opinion from a qualified engineer review specialist or qualified wetland review specialist on technical issues.

§ 1006. Service

Unless otherwise provided herein, service of any notice or other instrument under this ordinance may be made upon any person—

(a) by first class mail, postage prepaid, addressed to address then on file for such person, if any, or if none, to such person's last known address; or

(b) by any method prescribed under the Illinois Code of Civil Procedure.

§ 1007. Publication

Unless otherwise provided herein, publication of any notice or other instrument under this ordinance shall be made by publishing such notice or other instrument once in a newspaper published within the community having jurisdiction over the matter to which the publication relates (or, if no newspaper is published within the community, then a newspaper published in the County and having a general circulation within the community), such publication being not less than 15 nor more than 30 days before the hearing or other event to which the publication relates.

ARTICLE 11—CERTIFIED COMMUNITY ENFORCEMENT

§ 1100. Enforcement authority

Pursuant to Section 5-1062 of the Counties Code (55 ILCS 5/5-1062 (1996))—

(a) The County shall enforce all of the provisions of this ordinance within (1) the unincorporated areas of the County, (2) within the limits of any County highway, County right-of-way or any highway or right-of-way upon which the County is constructing or causing to be constructed a highway improvement or appurtenance, (3) in connection with the development of any site owned by the County, (4) within any portion of an uncertified community that lies within the County, and (5) pursuant to intergovernmental agreement, within any portion of an uncertified community that lies outside the County. For the purposes of this section the terms "highway" and "right-of-way" shall have the meanings ascribed to them under the Illinois Highway Code (605 ILCS 5/1-101 *et seq*.).

(b) Unless such community has been certified under this Article to administer Article 15 before January 1, 2006, the County shall enforce the provisions of Article 15 within that portion of any certified community that lies within the County and, pursuant to intergovernmental agreement, within that portion of any certified community that lies outside the County.

(c) A community certified under this Article shall enforce all of the provisions of this ordinance within the community for which it has received certification.

§ 1101. Petition for certification and waiver of enforcement

Any community that wishes to enforce the provisions of this ordinance within its borders shall file a petition for certification and waiver of enforcement (***petition for certification***), on or before January 8, 2002. After January 8, 2002, petitions for certification may be filed during the month of June of each year.

§ 1102. Filing and contents of petition for certification

A petition for certification shall be filed with the Director. The petition need not be on any particular form but, at a minimum, shall set forth and be accompanied by—

(a) the agreement of the corporate authorities of the community to adopt, if certified, this ordinance by reference;

(b) the community's plan for the implementation and enforcement of this ordinance, including proposed staffing;

(c) the agreement of the corporate authorities of the community to include in any new annexation agreement a provision requiring every other party to the agreement to affirmatively agree to comply with the provisions of this ordinance, as amended from time to time;

(d) the agreement of the corporate authorities of the community that the community will follow the rules and procedures of the Committee in any proceeding concerning its certification and be bound by the decision of the Committee in granting or failing to grant, or suspending or revoking its certification and reasserting County jurisdiction over the enforcement of this ordinance within the boundaries of the community;

(e) if a portion of the community lies outside the County and the community has not requested, or if requested does not receive, certification to administer Article 15, the agreement of the corporate authorities of the community to enter into, if certified to administer the remaining provisions of this ordinance, an intergovernmental agreement with the County providing for the County's enforcement of Article 15 within those portions of the community lying outside the County;

(f) evidence of the community's ability to comply with Article 14 pertaining to the use of qualified review specialists and qualified wetland review specialists;

(g) the list of projects to which this ordinance or some portion of this ordinance do not apply pursuant to the requirements of Article 8.

§ 1103. Committee consideration of petition for certification

The Committee shall consider each properly filed petition for certification at a regular or special meeting called for such purpose not later than 60 days after the filing of the petition. The meeting may be continued from time to time. The Committee may adopt rules for the taking of evidence and conduct of such meetings.

§ 1104. Standards for certification

Upon a finding of the committee that the community has complied with §§ 1101 and 1102, that the community's plan for the implementation and enforcement of this ordinance is reasonably feasible, and that the community has demonstrated the ability to comply with Article 14, the Committee shall grant the petition for certification. The Committee's decision shall be in writing, and shall specify the reasons for granting or denying the petition.

§ 1105. Certified community records

(a) Every certified community shall maintain adequate records of every stormwater management permit issued and every variance granted under this ordinance for development within its borders.

(b) Every certified community shall retain record drawings of all improvements made pursuant to a stormwater management permit issued or variance granted by such community.

(c) The records of each certified community maintained under this ordinance may be periodically inspected by the Department.

(d) Every certified community shall report annually to the Director on forms provided by the Department concerning stormwater management permits issued in the preceding year.

§ 1106. Committee review of enforcement by certified community

The Committee shall periodically review the implementation and enforcement of this ordinance by each certified community.

§ 1107. Investigations; compliance

(a) The Director upon his own initiative or at the request of any person may conduct an investigation into a certified community's implementation and enforcement of this ordinance. Such investigation may include, but is not limited to, an examination of all relevant records maintained by the community and field inspections of relevant developments, structures or stormwater facilities. If upon such investigation, the Director determines that the community has failed in some significant way, or has repeatedly failed, to implement or enforce this ordinance, then he shall prepare a report of his findings along with a complaint for the suspension, revocation or partial revocation of the community's certification and file them with the Committee. The complaint shall contain a short and plain statement describing how the certified community has failed in some significant way, or has repeatedly failed, to implement or enforce this ordinance.

(b) Upon receipt of a written complaint, the Committee shall serve a copy thereof along with a copy of the report of the Director upon the community named therein in accordance with § 1006. A copy of the complaint and report shall also be served upon IDNR-OWR, FEMA, all communities within the same watershed, and upon any person who has requested an investigation of the community's enforcement of this ordinance by the Director within six months immediately preceding the filing of the complaint. The community may file a written answer to the complaint within 30 days after being served.

§ 1108. Hearing on complaint

The Committee shall conduct a hearing on the complaint not less than 75 nor more than 120 days after service of the complaint upon the community. Notice of the hearing shall be served upon the community and all parties which received a copy of the complaint and published in accordance with § 1007. The hearing may be continued from time to time. The Committee may adopt rules for the taking of evidence and conduct of such hearings.

§ 1109. Committee decision

Within 30 days of the conclusion of the hearing, the Committee shall decide whether or not to suspend or to revoke in whole or in part the certification of the community. The decision of the Committee shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon the community and all parties which received a copy of the complaint in accordance with § 1006. The decision of the Committee to suspend or to revoke the certification of the community in whole or in part, is final and may not be appealed to any court. If the community's certification is suspended, the community shall automatically become re-certified upon the expiration of the period of suspension. If the community's certification is revoked in whole or in part, the community may reapply for certification at or after such time as the Committee shall specify in its order of revocation.

ARTICLE 12— PERFORMANCE SECURITY

§ 1200. General security requirements

(a) To secure the performance of the developer's obligation to complete the construction of the stormwater facilities required by the stormwater management permit, and to pay all costs, fees and charges due under this ordinance, and to fully and faithfully comply with all of the provisions of this ordinance, the applicant shall, prior to the issuance of a stormwater management permit—

(1) post the security provided in § 1201; and

(2) post the security provided in § 1202 if an erosion and sediment control plan is required under this ordinance; and

(3) post the security provided in § 1203 if mitigation for a wetland impact is required under this ordinance and the applicant chooses to mitigate within a wetland mitigation facility.

(b) The applicant shall bear the full cost and responsibility of obtaining and maintaining the security required by this Article.

§ 1201. Development security

(a) In all cases the applicant shall post—

(1) a schedule, agreed upon by the applicant and the Administrator for the completion of any stormwater facilities required by the permit;

(2) a statement of the estimated probable cost to complete the construction of any stormwater facilities required by the permit which estimate is subject to the approval of the Administrator; and

(3) an irrevocable letter of credit in favor of the permitting authority, or such other adequate security as the Administrator may approve, in an amount equal to 110% of the approved estimated probable cost to complete the construction of any required stormwater facilities.

(b) The security required by this section shall be maintained by the applicant in favor of the permitting authority until all stormwater facilities required by the permit have been completed, all conditions set forth in the permit have been satisfied and the applicant has complied with all of the provisions of this ordinance.

(c) The Administrator may approve periodic reductions in the amount of the security based upon the progress of construction. At no time, however, shall more than 90% of the security be released prior to approval of record drawings and final inspection. A minimum of 10% of the original amount of the security shall be retained for a period of one year after completion of all required stormwater facilities.

§ 1202. Erosion and sediment control security

(a) If an erosion and sediment control plan is required under this ordinance the applicant shall post—

(1) a statement of the estimated probable cost to install and maintain the erosion and sediment control measures required by the plan which estimate is subject to the approval of the Administrator; and

(2) an irrevocable letter of credit in favor of the permitting authority, or such other adequate security as the Administrator may approve, in an amount equal to 110% of the approved estimated probable cost to install and maintain the required erosion and sediment control measures.

(b) The security required by this section shall be maintained by the applicant in favor of the permitting authority until construction has been completed, vegetation had been established, sediment has been re-

moved from all stormwater facilities and the development has been finally inspected and approved by the Administrator at which time it shall be released.

§ 1203. Wetland mitigation and performance security

(a) If mitigation for a wetland impact is required under this ordinance and the applicant chooses to mitigate within a wetland mitigation facility, the applicant shall post—

(1) a statement of the estimated probable cost to install, monitor and maintain the wetland mitigation facility required by the plan for five years which estimate is subject to the approval of the Director (or Administrator in a community certified to administer Article 15); and

(2) An irrevocable letter of credit in favor of the County (or community in any community certified to administer Article 15), or such other adequate security as the Director (or Administrator in a community certified to administer Article 15), may approve, in an amount equal to 110% of the approved estimated probable cost.

(b) The security required by this section shall be maintained by the applicant in favor of the County (or community in a community certified to administer Article 15), until construction has been completed, vegetation has been established and the wetland mitigation facility has been evaluated by the Director (or Administrator in a community certified to administer Article 15), and found to meet the performance standards of § 1506 at which time it shall be released.

§ 1204. Letters of credit

(a) Letters of credit posted pursuant to this Article shall be in a form satisfactory to the Administrator.

(b) Each letter of credit shall be drawn on an institution (1) acceptable to the Administrator; (2) having assets of at least $10 million; (3) having an office in the Chicago metropolitan area; and (4) that is a member of the Federal Deposit Insurance Corporation.

(c) Each letter of credit shall provide that—

(1) it is irrevocable;

(2) the consent of the applicant is not required prior to its presentment for payment; and

(3) if at any time it will expire within 45 or any lesser number of days, and if it has not been renewed and the renewal submitted to the Administrator, and if any obligation of the applicant for which it stands as security remains uncompleted or is unsatisfactory, then the Administrator may, without notice and without being required to take any further action of any nature whatsoever, present the letter of credit for payment and thereafter either hold all proceeds as security for the satisfactory completion of all such obligations or employ the proceeds to complete all such obligations and reimburse the permitting authority for any and all costs and expenses, including legal fees and administrative costs, incurred by the permitting authority.

(d) If the Administrator at any time determines that the amount of the letter of credit is not, or may not be, sufficient to pay in full the remaining unpaid cost of the construction of all stormwater facilities or the installation and maintenance of all erosion and sediment control measures, then, within 10 days following a demand by the Administrator, the applicant shall increase the amount of the letter of credit to the amount determined by the Administrator to be sufficient to pay such unpaid costs. Failure to increase the amount of the letter of credit shall be grounds for the Administrator to present the letter of credit for payment.

(e) If at any time the Administrator determines that the bank issuing the letter of credit is without assets of at least $10 million, is unable to meet any federal or state requirement for reserves, is insolvent, is in danger of becoming any of the foregoing, or is otherwise in danger of being unable to honor such letter of credit at any time during its term, or if the Administrator otherwise reasonably deems the permitting authority to be insecure, then the Administrator shall have the right to demand that the applicant provide

a replacement letter of credit from a bank meeting the requirements of this section. Such replacement letter of credit shall be deposited with the Administrator not less than 10 days following such demand. Upon such deposit, the Administrator shall surrender the original letter of credit to the applicant.

(f) If the applicant fails or refuses to fully meet any of its obligations under this ordinance then the Administrator may, in his or her discretion, present the letter for payment and thereafter either hold all proceeds as security for the satisfactory completion of all such obligations or employ the proceeds to complete all such obligations or otherwise mitigate the effects of such failure or refusal and may reimburse the permitting authority for any and all costs and expenses, including legal fees and administrative costs, incurred by the permitting authority. If as a result of such default, the remaining amount of the letter of credit is less than the amount otherwise required to be then maintained under this Article, then the applicant shall, upon demand of the Administrator therefor, immediately deposit with the Administrator such additional funds as the Administrator determines to be required to be then maintained.

ARTICLE 13—FEE-IN–LIEU OF SITE RUNOFF STORAGE AND WETLAND MITIGATION

§ 1300. Fee-in-lieu of site runoff storage

(a) The Director or the Administrator may require, or in the limited circumstances prescribed in Article 2 an applicant may request approval of, the payment of a fee-in-lieu of site runoff storage to fulfill all or part of the site runoff storage requirement for a development. The fee to be paid in lieu of site runoff storage shall be the lesser of—

(1) the fee for each acre-foot or part thereof of storage otherwise required computed under a schedule adopted for such purpose by the permitting authority; or

(2) the verifiable cost of otherwise providing the required storage, including the value of the land required and all construction costs. For this purpose the land required shall be valued according to the use to which it will ultimately be put if not used to provide the required storage.

§ 1301. Procedures; use of funds

(a) An applicant's request for approval of the payment of a fee-in-lieu of site runoff storage shall be submitted to the Administrator with a copy to the Director. The Administrator shall grant or deny the request with 45 days, unless the applicant agrees to an extension.

(b) Fees paid in lieu of site runoff storage shall be deposited by the community in a separate fund created for such purpose. Provisions shall be made so that all receipts and disbursements of such funds may be accounted for according to the individual watershed in which the development for which they were paid was located.

(c) Fees paid in lieu of site runoff storage may be expended to plan, design, construct or improve stormwater management systems. A preference will be given to projects within the watershed for which the fee was paid.

§ 1302. Fee-in-lieu of wetland mitigation

If a wetland mitigation is required under this ordinance and the applicant chooses to satisfy the mitigation requirement by paying a fee-in-lieu of mitigation, the applicant shall—

(a) prepare a statement of the estimated probable cost to acquire the land, install, monitor and maintain a wetland mitigation facility for five years (which estimate is subject to the approval of the Director (or Administrator in a community certified to administer Article 15)), as if the applicant had chosen to satisfy the mitigation requirement by mitigating within a wetland mitigation facility; and

(b) if mitigation credits are available from any wetland mitigation bank, the applicant shall also prepare a statement of the estimated probable cost of satisfying the mitigation requirement through the purchase of credits from a wetland mitigation bank (which estimate is subject to the approval of the Director (or Administrator in a community certified to administer Article 15)), as if the applicant had chosen to satisfy the mitigation requirement in such manner.

(c) The fee-in-lieu of wetland mitigation to be paid under this section shall be the lesser of (a) or (b) above.

§ 1303. Procedures; use of funds

(a) An applicant's statement of its intention to satisfy the wetland mitigation requirement by the payment of a fee-in-lieu of wetland mitigation shall be in writing and filed with the Director (or Administrator in a community certified to administer Article 15), along with the estimates described in the preceding section.

(b) Fees paid in lieu of wetland mitigation shall be deposited by the County (or community if certified to administer Article 15), in a separate fund created for such purpose. Provisions shall be made so that all receipts and disbursements of such funds may be accounted for according to the individual watershed in which the development for which they were paid was located.

(c) Fees paid in lieu of mitigation for wetland impacts within the County shall be expended to plan, design, construct, improve, acquire, create or enhance wetlands within the County, or wetland mitigation facilities and wetland mitigation banks. Fees paid in lieu of mitigation for wetland impacts within any other county may be expended to plan, design, construct, improve, acquire, create or enhance wetlands within such county or within the County, or wetland mitigation facilities and wetland mitigation banks.

ARTICLE 14— QUALIFIED REVIEW SPECIALISTS

§ 1400. General

The review of an application for a stormwater management permit shall be performed by a qualified engineer review specialist and a qualified wetland review specialist. The qualified engineer review specialist and qualified wetland review specialist together with the Administrator shall determine whether the permit application meets the requirements of this ordinance. The Director shall maintain a list of qualified engineer review specialists and qualified wetland review specialists together with the categories of review in which they have obtained qualification. Review of wetland submittals by a qualified wetland review specialist may be waived if a COE permit is required.

§ 1401. Requirements for qualified engineer review specialists

In order to be included on the list of qualified engineer review specialists an applicant must—

(a) be a professional engineer registered in Illinois;

(b) have expertise either by training or significant experience in the following areas:

(1) design and permitting of stormwater management facilities;

(2) identification of floodplains and floodways, familiarity with FEMA and IDNR-OWR floodplain maps and their policies and procedures;

(3) erosion and sediment control practices and procedures; and

(4) construction practices and inspection procedures;

(c) complete, sign, and professionally seal the Qualified Engineer Review Specialist Statement in the form included as Appendix B to this ordinance; and

(d) file the Qualified Engineer Review Specialist Statement with the Department and pay a fee in an amount to be prescribed by separate ordinance.

§ 1402. Requirements for qualified wetland review specialists

In order to be included on the list of qualified wetland review specialists an applicant must—

(a) complete a COE approved or other wetland delineation course approved by the Director; and

(b) have a Bachelors's Degree in an earth science, biological science or engineering together with at least one of the following:

(1) three years (cumulative) full-time experience in the Upper Midwest Region engaged in consulting on wetland related projects; or

(2) the completion of 100 wetland delineations in the Upper Midwest Region; or

(3) six years (cumulative) full-time experience engaged in consulting on wetlands related projects; or

(4) 300 hours spent in field review of wetland indications in the Upper Midwest Region; and

(c) have personally been involved with the design of at least 10 wetland mitigation areas; and

(d) complete and sign the Qualified Wetland Review Specialist Statement in the form included as Appendix C to this ordinance; and

(e) file the Qualified Wetland Review Specialist Statement with the Department and pay a fee in an amount to be prescribed by separate ordinance.

§ 1403. Review of qualifications

(a) Within 30 days of filing of the application, the Director will notify the applicant of his or her inclusion on the list of qualified engineer review specialists and/or qualified wetland review specialists, as the case may be. If the applicant is not accepted for inclusion in the list, the Director shall specify the reasons for his decision. Within 30 days of his receipt of the decision of the Director, the applicant may appeal to the RSQC by filing a notice thereof with the Department. The RSQC shall conduct a hearing on the appeal in the manner prescribed by §§ 1406 and 1407 from which the applicant may further appeal in the manner prescribed by § 1408.

(b) Once accepted, the applicant, no later than January 1 of each year, shall resubmit the Qualified Engineer Review Specialist Statement and/or Qualified Wetland Review Specialist Statement together with an annual maintenance fee in an amount to be prescribed by separate ordinance in order to maintain his or her inclusion on the list.

§ 1404. Review Specialist Qualification Committee

There is hereby created a Review Specialist Qualification Committee ***("RSQC")***. The RSQC shall consist of three members, one of them designated as chairman, appointed by the Chairman of the County Board with the approval of the County Board. Each member shall be a qualified engineer review specialist or qualified wetland review specialist. One member of the committee shall serve for an initial term of one year, another for an initial term of two years and the third for an initial term of three years. The members shall decide which of them shall serve for a one, two or three year term by lot at the first meeting of the RSQC. Thereafter, each member of the committee shall serve for a term of three years. No member may serve for more than two consecutive terms.

§ 1405. Investigation; compliance

(a) The Director upon his own initiative or at the request of any person may conduct an investigation into the qualifications of a qualified engineer review specialist or qualified wetland review specialist, or such specialist's performance of permit reviews under this ordinance. Such investigation may include, but is not limited to, an examination of all relevant records maintained by the community and field inspections of relevant developments, structures or stormwater facilities. If upon such investigation, the Director determines that the specialist has failed in some significant way, or has repeatedly failed to conduct such reviews in conformance with this ordinance, then he shall prepare a report of his findings along with a complaint for the suspension or revocation of the specialist's certification and file them with the RSQC. The complaint shall contain a short and plain statement describing how the specialist has failed in some significant way, or has repeatedly failed to conduct such reviews in conformance with this ordinance.

(b) Upon receipt of a written complaint, the RSQC shall serve a copy thereof along with a copy of the report of the Director upon the specialist named therein in accordance with § 1006. A copy of the complaint and report shall also be served upon every community for whom the specialist has conducted permit reviews. The specialist may file a written answer to the complaint within 30 days after being served.

§ 1406. Hearing on complaint

The RSQC shall conduct a hearing on the complaint not less than 75 nor more than 120 days after service of the complaint upon the specialist. Notice of the hearing shall be served upon the specialist and upon any community which received a copy of the complaint and published in accordance with § 1007. The hearing may be continued from time to time. The RSQC may adopt rules for the taking of evidence and conduct of such hearings.

§ 1407. Decision of the RSQC

Within 30 days of the conclusion of the hearing, the RSQC shall decide whether or not to remove, either temporarily or permanently, the name of the specialist from the list of qualified review specialists. The decision of the RSQC shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon the specialist and upon any community which received a copy of the complaint in accordance with § 1006. If the specialist's name is to be temporarily removed from the list, the specialist shall automatically become requalified upon the expiration of the designated period. If the specialist's name is to be permanently removed, the specialist may apply for qualification at or after such time as the RSQC shall specify in its order.

§ 1408. Appeals

(a) Within 30 days after being served with the order of the RSQC, the specialist may appeal to the Committee. The appeal shall be made by filing a notice thereof with the Department. The Committee shall conduct a hearing on the appeal not less than 75 nor more than 120 days after the filing of the notice of appeal. The hearing shall be *de novo*. Notice of the hearing shall be served upon all parties as for the hearing before the RSQC. The hearing may be continued from time to time. The Committee may adopt rules for the taking of evidence and conduct of such hearings.

(b) Within 30 days of the conclusion of the hearing, the Committee shall decide whether to affirm or reverse, in whole or in part, the order of the RSQC. The decision of the Committee shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon all parties in accordance with § 1006 as for the hearing before the RSQC.

(c) From a final decision of the Committee, the specialist may appeal to the courts under the Illinois Administrative Review Law.

ARTICLE 15— WETLAND IMPACTS AND MITIGATION

§ 1500. General

All developments having a wetland impact shall comply with this Article. A permit for any wetland impact shall be obtained from the Director (or Administrator in a community certified to administer Article 15).

§ 1501. Unmitigable wetlands—exceptions

(a) Wetlands identified as having an FQI greater than or equal to 25 shall not be filled or dredged as part of any development. The FQI shall be based solely on the wetland vegetation. Buffers and adjacent plant communities shall not be included in the calculation.

(b) If the application of this section would (i) have the effect of depriving the owner of all economically beneficial or productive use of the land; or (ii) make the construction or installation of an essential public improvement by a public entity impossible or highly impracticable the applicant may apply for a variance from the requirements of this section under Article 9. If such a variance is granted mitigation for the wetland impact allowed shall be made according to §§ 1503(a) and 1503(e).

§ 1502. Mitigation required

All mitigable wetland impacts shall be mitigated as described herein with the following exceptions:

(a) A wetland impact created by the dredging of a wetland with an FQI of less than 7 need not be mitigated.

(b) A wetland impact upon manmade wetlands created by excavation or other unfinished development activities in previously non-wetlands areas need not be mitigated.

(c) Wetland impacts upon wetlands created by irrigation which would revert to non-wetlands areas if irrigation were to cease need not be mitigated.

(d) Wetland impacts upon wetlands created by the construction of manmade stormwater management facilities in previously non-wetlands areas need not be mitigated. Proof may be required to verify the purpose and use of the facility.

(e) Wetland impacts created by the construction of manmade ponds in previously non-wetlands areas need not be mitigated.

(f) Wetland impacts occurring on agricultural land that has been enrolled in any program under the Food Security Act for the previous three years need not be mitigated.

§ 1503. Mitigation requirements

(a) For all mitigable wetland impacts—

(1) mitigation may be made within a wetland mitigation facility;

(2) mitigation may be made by the purchase of credits from a wetland mitigation bank;

(3) mitigation may be made by the payment of a fee-in-lieu of mitigation under § 1302;

(b) Wetland impacts upon wetlands with an FQI of less than 7 shall be mitigated at a ratio of 1:1. The applicant may request permission to mitigate within the site runoff storage facility area. The applicant may earn wetland credits by enhancing preserved wetlands with an FQI of 5 or less at the ratio of one-quarter wetland credit per one acre of wetland enhanced. If this option is chosen the entire wetland shall be en-

hanced even if credit in excess of that required for the development is generated. The enhanced wetland shall meet the performance standards of § 1506. For purposes of this section, a farmed wetland is assumed to have an FQI less than 7.

(c) Wetland impacts upon wetlands with an FQI of 7 or more but less than 16 shall be mitigated at a ratio of 2:1.

(d) Wetland impacts upon wetlands with an FQI of 16 or more but less than 25 shall be mitigated at a ratio of 3:1.

(e) Wetland impacts upon wetlands with an FQI of more than 25 shall be mitigated at a minimum ratio of 10:1 plus one half for each point by which the FQI exceeds 25 rounded up to the nearest whole number. For example, a wetland having an FQI of 32 shall be mitigated at a ratio of 14:1 ((32-25)/2 = 3½ rounded up to the nearest whole number = 4); 10 + 4 = 14).

(f) Wetland impacts upon wetlands inhabited by a threatened or endangered species shall be mitigated at a ratio of 3:1.

(g) Mitigation for wetland impacts upon more than one wetland within a site shall meet the standards applicable to the highest quality wetland impacted.

(h) FQI assessments made before June 1 or after October 15 shall be considered to be preliminary. Mitigation requirements based upon such preliminary assessments shall not be considered to be final unless an FQI of 16 is assumed or the Director (or Administrator in a community certified to administer Article 15), accepts such security as he shall deem appropriate to ensure that the required mitigation will be achieved.

(i) The applicant may propose an alternative mitigation plan combining wetland creation, purchase of credits from a wetland mitigation bank, payment of a fee-in-lieu of wetland mitigation, and/or enhancing existing wetlands either onsite or offsite. The Director (or Administrator in a community certified to administer Article 15), shall determine if a proposed alternative mitigation plan meets the requirements of this section and his or her decision shall be final.

§ 1504. Wetland mitigation plan

(a) In addition to the requirements of Article 5, if wetland mitigation is required a wetland mitigation plan shall be submitted. At a minimum the plan shall contain—

(1) a narrative of the proposed plan including a description of the proposed hydrologic regime, soils and site geomorphology, where applicable;

(2) drawings depicting each wetland impacted and each wetland mitigation facility together with an individual listing contained in a summary table;

(3) specifications for rough and final grading, soil types, soils placement, plant procurement, water control structures and a planting plan that lists the plant materials by scientific and common name, seeding rate or spacing distance and special planting provisions; and

(4) maintenance and monitoring provisions including an annual work schedule describing each task in detail and time of year when it will be performed.

(b) The wetland mitigation plan shall be designed so that—

(1) every wetland mitigation facility shall contain at least two wetland plant communities (for example, wet prairie, emergent, floating vascular, forested wetland, sedge meadow, or hemi marsh); and

(2) open water shall not constitute more than 20% of the entire wetland mitigation facility.

§ 1505. Buffer requirements for wetland mitigation facilities

Wetland mitigation facilities shall be buffered according to the requirements of § 418. Reductions are allowed in accordance with § 418(a)(3)(B)(ii), 418(a)(3)(B)(iii) and 418(a)(3)(B)(iv). No buffer is required for that portion of a wetland mitigation facility which is adjacent to an existing preserved wetland.

§ 1506. Wetland mitigation performance standards

(a) All wetland mitigation facilities shall meet the following performance standards:

(1) They shall meet the definition of a wetland under this ordinance.

(2) All vegetated zones within any wetland mitigation facility shall achieve 85% cover.

(3) The emergent community shall achieve 60% aerial coverage.

(4) The floating vascular community shall meet 25% aerial coverage.

(5) Open water shall have 0% vegetative coverage.

(b) A wetland mitigation facility designed to mitigate for impacts upon wetlands with an FQI of less than 7 shall achieve a minimum FQI 3 points greater than the FQI of the wetland impacted within the five-year monitoring period.

(c) A wetland mitigation facility designed to mitigate for impacts upon wetlands with an FQI of 7 or more but less than 25 shall achieve a minimum FQI 5 points greater than the FQI of the wetland impacted within the five-year monitoring period.

(d) A wetland mitigation facility shall not be dominated or contain cumulatively more than 25% cover of the following species: Buckthorn (*Rhamnus cathartica* or *frangula*), Reed-Canary Grass (*Phalaris arundinacea*), Purple Loosestrife (*Lythrum salicaria*), or Giant Reed *(Phragmites australis*).

§ 1507. Mitigation monitoring

The wetland mitigation facility shall be monitored and managed for five years beginning on the day the wetland planting is completed. The procedures for monitoring wetland mitigation facilities shall be those set forth in the current Chicago District protocol promulgated by COE. An annual report shall be filed with the Director by February 15 of each year for every wetland mitigation facility under permit. Once a wetland mitigation facility reaches its required FQI and meets the performance standards of § 1506, a request for the release of the performance security may be made to the Director. A release of the performance security may be requested of the Director as early as the end of the third full growing season. At the end of the five-year monitoring and management period, or upon acceptance by the Director, the wetland mitigation facility shall be maintained in accordance with Article 6.

§ 1508. Mitigation required for non-performing wetland

At the end of the five-year monitoring period or upon an earlier request for the release of the performance security, the Director shall evaluate the wetland mitigation facility for compliance with the performance standards of § 1506. If the Director determines that the facility meets the standards he shall release the performance security. If the Director determines that the facility does not meet the standards he shall make an estimate of the probable cost of mitigating for the shortfall in performance. The Director shall reduce so much of the performance security to cash as is required to mitigate for the shortfall in performance and shall release the remainder. The amount withheld for mitigation shall be deposited in the fund created under and expended in the manner described in § 1303.

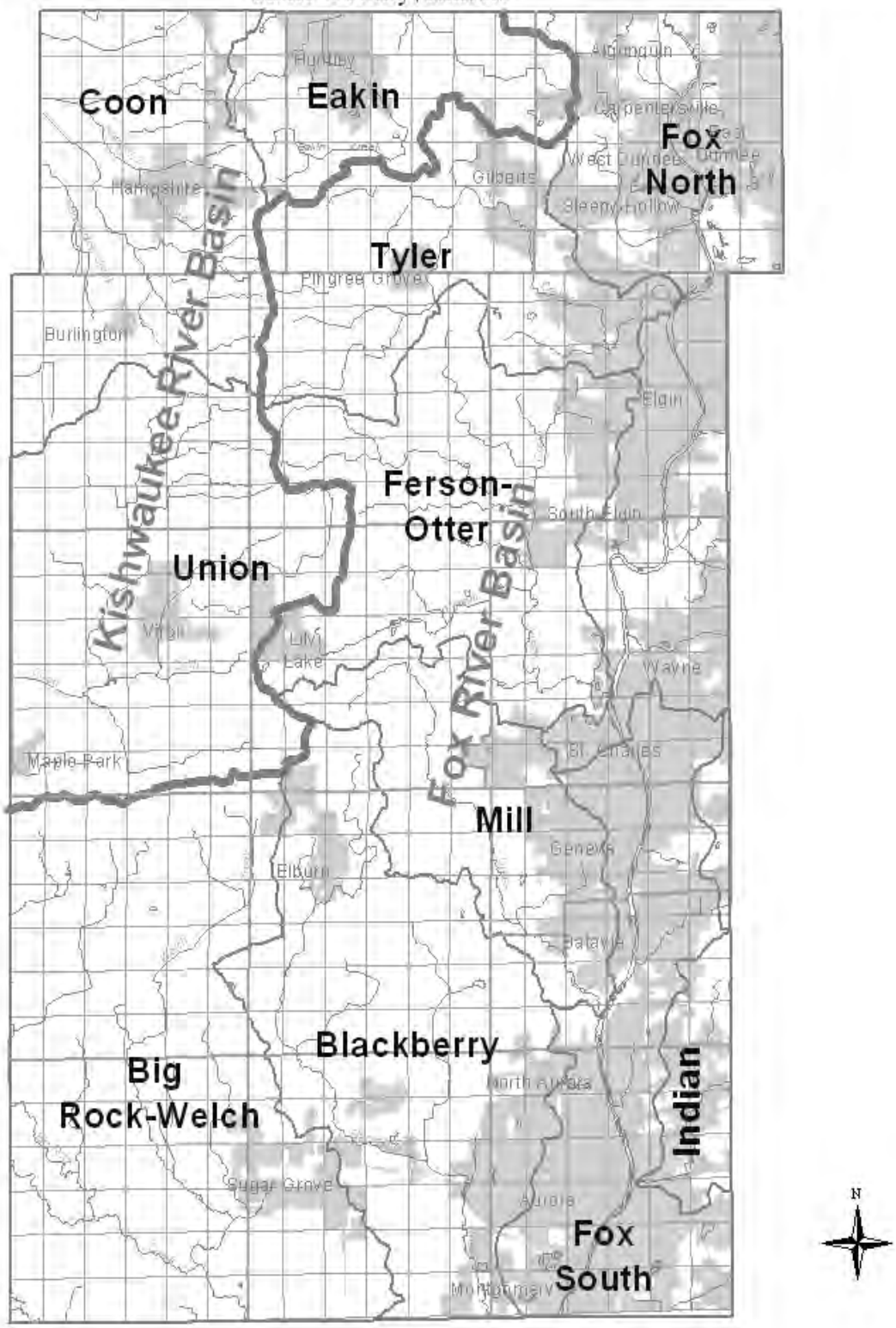
§ 1509. Denial of permit—appeal

The denial of a permit under this Article may be appealed in the manner described in § 511.

APPENDIX A—WATERSHED BOUNDARIES

Appendix A. Watershed Boundaries for Major Watersheds

Kane County, Illinois



APPENDIX B—QUALIFIED ENGINEER REVIEW SPECIALIST STATEMENT

I, _____, of _____, with professional licensure in the State of Illinois, do hereby state that I have read and understand the Kane County Stormwater Ordinance and the Technical Manual which accompanies it, and will obtain, read and abide by any amendments thereto. I affirmatively state that I meet the requirements set forth in § 1401 of the ordinance. I will review projects for compliance with the ordinance using my expertise in stormwater management system design and permitting, floodplain and floodway policies and procedures, soil erosion and sediment control procedures and practices, and construction practices and inspections. I will exercise professional judgment with respect to projects submitted for my review in accordance with the customary standard of care applicable to persons providing similar services in the same or similar communities in order to insure substantial conformance with the ordinance. I understand that failure to adequately discharge this obligation may, with due process, result in loss of this status. It is my responsibility to provide the Director with any changes to the information provided.

_____
Signed

_____
P. E. Registration Number Expiration Date

(Seal)

Telephone:_____

Fax:_____

Email:_____

Employer:_____

(Attach a one-page summary of your qualifications under § 1401 of the ordinance.)

APPENDIX C—QUALIFIED WETLAND REVIEW SPECIALIST STATEMENT

I, _____, of _____, do hereby state that I have read and understand the Kane County Stormwater Ordinance and the Technical Manual which accompanies it, and will obtain, read and abide by any amendments thereto. I affirmatively state that I meet the requirements set forth in § 1402 of the ordinance. I will review projects for compliance with those sections of the ordinance pertaining to wetlands, including, without limitation, wetland delineation and the calculation of buffer widths. I will use my expertise in wetland delineations or field identification of wetland indicators in the Upper Midwest. I understand that failure to adequately discharge this obligation may, with due process, result in loss of this status. It is my responsibility to provide the Director with any changes to the information provided.

_____
Signed

Telephone:_____

Fax:_____

Email:_____

Employer:_____

(Attach a one-page summary of your qualifications under § 1402 of the ordinance.)

APPENDIX D—SAMPLE SPECIAL SERVICE AREA ORDINANCES

[CITY/VILLAGE] OF _____

ORDINANCE NO. _____

AN ORDINANCE PROPOSING THE ESTABLISHMENT OF THE _____ SPECIAL SERVICE AREA [or SPECIAL SERVICE AREA NO. _____]) OF _____, ILLINOIS AND THE LEVY OF TAXES FOR THE PURPOSE OF PAYING THE COST OF PROVIDING SPECIAL SERVICES IN AN FOR SUCH AREA

ADOPTED BY THE
[MAYOR AND CITY COUNCIL/PRESIDENT AND BOARD OF TRUSTEES]
OF THE
[CITY/VILLAGE] OF _____

[DATE]

Published in pamphlet form by authority of the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois,
[Date].

ORDINANCE NO. _____

AN ORDINANCE PROPOSING THE ESTABLISHMENT OF THE _____ SPECIAL SERVICE AREA [or SPECIAL SERVICE AREA NO. _____] OF _____, ILLINOIS AND THE LEVY OF TAXES FOR THE PURPOSE OF PAYING THE COST OF PROVIDING SPECIAL SERVICES IN AN FOR SUCH AREA

WHEREAS pursuant to the provisions of the 1970 Constitution of the State of Illinois (the ***Constitution***), the [City/Village] of _____, Kane County, Illinois (the ***[City/Village]***), is authorized to create special service areas in and for the [City/Village]; and

WHEREAS special service areas are established by non-home rule[1] units pursuant to Section 7(6) of Article VII of the Constitution, which provides that—

> [M]unicipalities…which are not home rule units shall have…powers…to levy or impose additional taxes upon areas within their boundaries in the manner provided by law for the provision of special services to those areas and for the payment of debt incurred in order to provide those special services;

and are established "in the manner provided by law" pursuant to the provisions of "AN ACT to provide the manner of levying or imposing taxes for the provision of special services to areas within the boundaries of home rule units and non-home rule municipalities and counties," approved September 21, 1973, as amended, and pursuant to the Revenue Act of 1939 of the State of Illinois, as amended; and

WHEREAS it is in the public interest that the establishment of the area hereinafter described as a special service area for the purposes set forth herein and to be designated as the _____ Special Service Area [or Special Service Area No. _____], of the [City/Village] (the ***Area***) be considered; and

WHEREAS the Area is compact and contiguous, totally within the corporate limits of the [City/Village]; and

WHEREAS the Area will benefit specially from the municipal services to be provided by the [City/Village] (the ***Services***), and the Services are unique and in addition to the services provided to the [City/Village] as a whole, and it is, therefore, in the best interests of the [City/Village] that the establishment of the Area be considered; and

WHEREAS it is in the public interest that the levy of a direct annual *ad valorem* tax upon all taxable property within the Area be considered for the purpose of paying the cost of providing the Services; and

WHEREAS the revenue from such tax shall be used solely and only for Services for which the [City/Village] is authorized under the provisions of the Illinois Municipal Code, as amended, to levy taxes or special assessments or to appropriate the funds of the [City/Village], all of the Services to be in and for the Area and all of the necessary construction and maintenance to be on property now owned or to be acquired by the [City/Village], or property in which the [City/Village] will obtain an interest sufficient for the provision of the Services; and

WHEREAS said direct annual *ad valorem* tax shall be levied upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law; and

---

[1]Home rule municipalities should alter this language accordingly.

WHEREAS a public hearing will be held at _____, on the _____ day of _____, _____, in the [City/Village] Hall, _____, _____, Illinois _____ (the ***Hearing***), to consider the establishment of the Area for the purpose of providing the Services and the levy of an additional direct annual *ad valorem* tax for the purpose of paying the cost thereof, all as described in the Notice of Public Hearing set forth in Section 2 hereof (the ***Notice***); and

WHEREAS the Notice shall be given by publication and mailing. Notice by publication shall be given by publication on a date, such date being not less than 15 days prior to the Hearing, in a newspaper published within the [City/Village] [or, of general circulation within the [City/Village], there being no newspaper published therein]. Notice by mailing shall be given by depositing the Notice in the United States Mail addressed to the person or persons in whose name the general taxes for the last preceding year were paid on each lot, block, tract, or parcel of land lying within the Area. The Notice shall be mailed not less than 10 days prior to the time set for the Hearing. In the event taxes for the last preceding year were not paid, the Notice shall be sent to the person last listed on the tax rolls prior to that year as the owner of said property.

NOW, THEREFORE, Be it Ordained by the [Mayor and City Council/President and the Board of Trustees] of the [City/Village] of _____, Kane County, Illinois, as follows:

§1. Incorporation of preambles

The preambles of this ordinance are hereby incorporated into this text as if set out herein in full.

§2. Notice

The [Mayor and City Council/President and Board of Trustees] determine that the Notice is in the proper statutory form as set forth as follows:

NOTICE OF PUBLIC HEARING
[City/Village] OF _____, KANE COUNTY, ILLINOIS
_____ SPECIAL SERVICE AREA [or NO. _____]

NOTICE IS HEREBY GIVEN that on _____, at _____, in the [City/Village] Hall, _____, _____, Illinois, a public hearing (the ***Hearing***) will be held by the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois (the ***[City/Village]***), to consider the establishment of the _____ Special Service Area [No. _____], (the ***Area***), of the [City/Village], consisting of the following described territory:

SEE ATTACHED EXHIBIT A

Said territory consists of approximately ___ acres lying [insert general description of location]. An accurate map of said territory is on file in the office of the [City/Village] Clerk and is available for public inspection.

The purpose of the establishment of the Area is to provide the following special services (the ***Services***) to the Area: the operation, maintenance, repair, rehabilitation, replacement and reconstruction of any storm water site runoff storage area, drainageway, ditch, swale, storm sewer or other stormwater facility; costs of design, engineering and other consulting services, surveying and permits, public liability insurance, and all administrative, legal and other costs or expenses incurred in connection therewith and with the administration of the Area, including the repayment of any loan or debt incurred for the provision of any of such Services, all of the Services to be in and for the Area.

All of the Services are to be on property now owned or to be acquired by the [City/Village], or property in which the [City/Village] will obtain an interest sufficient for the provision of the Services.

The levy of a direct annual *ad valorem* tax upon all taxable property within the Area for the purpose of paying the cost of the Services will also be considered at the Hearing. The tax shall be levied upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and

shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law.

All interested persons affected by the establishment of the Area or tax levy, including all owners of real estate located within the Area, will be given an opportunity to be heard at the Hearing regarding the establishment of the Area and the tax levy and an opportunity to file objections to the establishment of the Area or the tax levy.

At the Hearing, any interested persons affected by the Area may file with the [City/Village] Clerk written objections to and may be heard orally in respect to any issues embodied in this notice. The [Mayor and City Council/President and Board of Trustees] shall hear and determine all protests and objections at the Hearing, and the Hearing may be adjourned to another date without further notice other than a motion to be entered upon the minutes fixing the time and place of its adjournment.

If a petition signed by at least 51% of the electors residing within the Area and by at least 51% of the owners of record of the land included within the boundaries of the Area is filed with the [City/Village] Clerk within 60 days following the final adjournment of the Hearing objecting to the creation of the Area or the levy or imposition of a tax for the provision of the Services to the Area, no such Special Service Area may be created or no tax may be levied or imposed.

By order of the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois.

DATED this _____ day of _____, _____.

/s/ _____
[City/Village] Clerk, [City/Village] of _____, Kane County, Illinois

§3. Miscellaneous

The [City/Village] agrees to produce or file such forms, statements, proceedings and supporting documents as may be required and in a timely manner in order to establish the Area and levy the taxes and, if deemed necessary or advisable by its officers, to employ and pay fiscal agents, financial advisors, attorneys and other persons to assist the [City/Village] in these endeavors.

§4. Repealer; effective date

All ordinances, orders and resolutions and parts thereof in conflict herewith be and the same are hereby repealed, and this ordinance be in full force and effect forthwith upon its passage, approval and publication as provided by law.

DATED: _____.

Alder-man/Trustee	***Aye***	***Nay***	***Absent***	***Abstain***
Totals				

Approved:

_____
[Mayor/President]

Attested, Filed in my office, and published in pamphlet form on _____, 20__:

_____
Clerk of the [City/Village] of _____, Kane County, Illinois

[CITY/VILLAGE] OF _____

ORDINANCE NO. _____

AN ORDINANCE ESTABLISHING THE
_____ SPECIAL SERVICE AREA [OR NO. _____]
OF _____, ILLINOIS
AND PROVIDING FOR THE LEVY OF TAXES FOR THE PURPOSE OF
PAYING THE COST OF PROVIDING SPECIAL SERVICES
IN AND FOR SUCH AREA

ADOPTED BY THE
[MAYOR AND CITY COUNCIL/PRESIDENT AND BOARD OF TRUSTEES]
OF THE
[CITY/VILLAGE] OF _____

[DATE]

Published in pamphlet form by authority of the [Mayor and City Council/President and Board of Trustees] of the
[City/Village] of _____, Kane County, Illinois
[Date]

ORDINANCE NO. _____

AN ORDINANCE ESTABLISHING THE _____ SPECIAL SERVICE AREA [or NO. _____] OF _____, ILLINOIS AND PROVIDING FOR THE LEVY OF TAXES FOR THE PURPOSE OF PAYING THE COST OF PROVIDING SPECIAL SERVICES IN AND FOR SUCH AREA

WHEREAS, pursuant to the provisions of the 1970 Constitution of the State of Illinois (the ***Constitution***), the [City/Village] of _____, Kane County, Illinois (the ***[City/Village]***), is authorized to create special service areas in and for the [City/Village]; and

WHEREAS, special service areas are established by non-home rule[2] units pursuant to Section 7(6) of Article VII of the Constitution, which provides that—

> municipalities…which are not home rule units shall have only the powers granted to them by law and the powers…(6) to levy or impose additional taxes upon areas within their boundaries in the manner provided by law for the provision of special services to those areas and for the payment of debt incurred in order to provide those special services;

and

WHEREAS, special service areas are established "in the manner provided by law" pursuant to the provisions of "AN ACT to provide the manner of levying or imposing taxes for the provision of special services to areas within the boundaries of home rule units and non-home rule municipalities and counties," approved September 21, 1973, as amended (the ***Act***), and pursuant to the provisions of the Revenue Act of 1939 of the State of Illinois, as amended; and

WHEREAS, it is in the public interest that the area hereinafter described be established as the _____ Special Service Area [or No. _____] of the [City/Village] for the purposes set forth herein (the ***Area***); and

WHEREAS, the Area is compact and contiguous and totally within the boundaries of the [City/Village]; and

WHEREAS, the Area will benefit specially from the services to be provided by the [City/Village] (the ***Services***), and the Services are unique and in addition to the services provided to the [City/Village] as a whole, and it is, therefore, in the best interests of the [City/Village] that the Area be established; and

WHEREAS, the cost of providing the Services shall be paid by the levy of a direct annual *ad valorem* tax upon all taxable property within the Area; and

WHEREAS, said direct annual tax shall be levied upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of ._____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law; and

WHEREAS, the establishment of the Area was proposed by the [City Council/Board of Trustees] of the [City/Village] (the ***[Council/Board]***) pursuant to Ordinance No. _____, entitled:

> AN ORDINANCE proposing the establishment of the _____ Special Service Area [or No. _____] of _____, Illinois, and the levy of

[2]Home rule units should alter this language accordingly.

taxes for the purpose of paying the cost of providing special services in and for such Area.

(the ***Proposing Ordinance***), duly adopted on _____, and was considered at a public hearing (the ***Hearing***) held by the [Council/Board] on _____; and

WHEREAS, notice of the Hearing was given by publication at least once not less than 15 days prior to the Hearing in _____, the same being a newspaper published in the [City/Village] [or, of general circulation with the [City/Village], there being no newspaper published therein]; and

WHEREAS, mailed notice of the Hearing was given by depositing notice in the United States mails addressed to the person or persons in whose name the general taxes for the last preceding year were paid on each lot, block, tract or parcel of land lying within the Area not less than 10 days prior to the time set for the Hearing, and in the event taxes for the last preceding year were not paid, the notice was sent to the person or persons last listed on the tax rolls prior to that year as the owner or owners of said property; and

WHEREAS, said notice complied with all of the applicable provisions and requirements of the Act; and

WHEREAS, all interested persons affected by the establishment of the Area or the levy of the tax to pay the cost of providing the Services, including all owners of real estate located within the Area, were given an opportunity to be heard at the Hearing regarding the establishment of the Area and the levy of said tax and an opportunity to file objections to the establishment of the Area or the levy of said tax; and

WHEREAS, at the Hearing, all interested persons affected by the Area were permitted to file with the [City/Village] Clerk written objections to and to be heard orally in respect to any issue embodied in the notice given of the Hearing; and

WHEREAS, the Council/Board has determined and does hereby determine that it is in the public interest and in the interest of the [City/Village] and the Area that the Area be established;

NOW, THEREFORE, Be It Ordained by the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois, as follows:

§1. Incorporation of preambles

The preambles of this ordinance are hereby incorporated into this text as if set out herein in full.

§2. Final adjournment of Hearing

The Hearing was finally adjourned on _____.

§3. Establishment of Area

(a) The _____ Special Service Area [or No. _____] of the [City/Village] is hereby established in and for the [City/Village] and shall consist of the territory legally described in Exhibit A attached.

(b) Said territory consists of approximately _____ acres lying [insert a general description of the location of the area] in the [City/Village]. An accurate map of the Area is attached hereto and made a part hereof.

§4. Purpose of the establishing the Area

The purpose of establishing the Area is to provide the Services to the Area, including the operation, maintenance, repair, rehabilitation, replacement and reconstruction of any site runoff storage area, drainageway, ditch, swale, storm sewer, or other stormwater facility; costs of design, engineering and other consulting services, surveying and permits, public liability insurance, and all administrative, legal

and other costs or expenses incurred in connection therewith and with the administration of the Area, including the repayment of any loan or debt incurred for the provision of any of such Services, all of the Services to be in and for the Area and all of said construction and improvements to be on property now owned or to be acquired by the [City/Village], or property in which the [City/Village] will obtain an interest sufficient for the provision of the Services.

§5. Tax Levy

The cost of the Services shall be paid by the levy of a direct annual *ad valorem* tax upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law.

§6. Filing

The [City/Village] Clerk is hereby directed to file a certified copy of this ordinance, including an accurate map of the Area, in the office of the Kane County Clerk and in the office of the Kane County Recorder forthwith after its adoption and approval.

§7. Repealer

All ordinances, orders and resolutions and parts thereof in conflict herewith be and the same are hereby repealed, and this ordinance be in full force and effect forthwith upon its adoption.

DATED: _____.

Alder-man/Trustee	*Aye*	*Nay*	*Absent*	*Abstain*
Totals				

Approved:

_____
[Mayor/President]

Attested, Filed in my office and published in pamphlet form on _____, 20__:

_____
Clerk of the [City/Village] of _____, Kane County, Illinois

KANE COUNTY STORMWATER TECHNICAL GUIDANCE MANUAL

KANE COUNTY STORMWATER MANAGEMENT COMMITTEE

KANE COUNTY STORMWATER TECHNICAL GUIDANCE MANUAL

INTRODUCTION

	Page No.
Purpose	1
Organization	2

PART 1 – TECHNICAL GUIDANCE **3**

			Page No.
ARTICLE 2 – REQUIREMENTS FOR STORMWATER MANAGEMENT			**4**
§	T200	General Requirements	4
§	T200(b)	Site Runoff Storage Requirements	4
§	T201	General Stormwater Requirements	6
§	T201(d)	Overland Flow Paths	6
§	T201(e)	Protection of Buildings	8
§	T201(f)	Planning Principles	10
§	T201(g)	Depressional Storage	10
§	T202	Site Runoff Requirements	11
§	T202(a)	Stormwater Facility Discharges	11
§	T202(b)	Minor Stormwater System Criteria	15
§	T202(c)	Major Stormwater System Criteria	15
§	T202(d)	Existing Sub-Surface and Surface Drainage Systems	17
§	T202(e)	Design Runoff Rate	18
§	T202(f)	Design Rainfall	18
§	T202(g)	Stormwater System Easements	19
§	T202(h)	Flow Depths	20
§	T202(i)	Diversions of Flow to Another Watershed	20
§	T202(j)	Best Management Practices Requirements	20
§	T203	Site Runoff Storage Requirements (Detention)	23
§	T203(a)	Area of Disturbance	23
§	T203(b)	Release Rate	23
§	T203(c)	Design Methods	25
§	T203(d)	Existing Release Rate Less Than Allowable	31
§	T203(e)	Downstream Water Surface Elevations	31
§	T203(g)	Retention Requirement	31

			Page No.
§	T203(h)	Site Runoff Storage Facility Design Requirements	39
§	T203(i)	Site Runoff Storage Facility Requirements Within the Regulatory Floodplain	40
§	T203(j)	Requirements Within the Regulatory Floodway	40
§	T203(l)	Off-Site Facilities	40
§	T203(m)	Structures Built Across a Channel for Site Runoff Storage Facilities	41

ARTICLE 3 – EROSION AND SEDIMENT CONTROL **43**

§	T300(a)	Site Planning	43
§	T300(a)(1)	Phased Construction	45
§	T300(b)	Standards and Specifications	47
§	T300(c)	General Requirements	47
§	T300(d)	Extended Construction Shutdown Periods	48
§	T300(e)	Hydraulic and Hydrologic Design Requirements	48
§	T300(f)	“As Needed” Practices on the Plans	49
§	T300(g)	Limitation on Site Disturbance	54
§	T300(h)	Sediment and Erosion Control Plan Requirements	54
§	T300(i)	Conveyance of Off-Site Flow	57
§	T300(j)	Stockpiles	57
§	T300(l)	Construction Dewatering	57
§	T300(m)	Protection of Public/Private Roadways	57
§	T300(n)	Temporary Stream Crossings	58

ARTICLE 4 – PROTECTION OF SPECIAL MANAGEMENT AREAS **60**

§	T401	Disclaimer	60
§	T402	Statewide & Regional Permits	60
§	T403	Floodplain Management	61
§	T404	Floodplain, Regulatory Floodplain, Base Flood Elevation (BFE) & Regulatory Floodway Locations	61
§	T407	Building Protection Standards	63
§	T408	Non-Conforming Structures	69
§	T409	Lowest Opening	70
§	T410	Compensatory Storage Volume Standards	70
§	T411	Floodway Standards	73
§	T412	Riverine Floodplain	79
§	T413	Bridge and Culvert Standards	80
§	T414(a-c)	Requirements for Wetland Delineation	81
§	T414(d)	Delineation Hierarchy	85
§	T415	Mitigation to be Local	86
§	T416	Threatened and Endangered Species Consultation	86
§	T417	Wetland Preservation During Development	86

			Page No.
§	T418	Buffer Requirements	87
§	T418(a)	Buffer Width Requirements	87
§	T418(a)(3)(a)	Linear and Water Body Buffers	89
§	T418(b)	Plantings in Buffers	91
§	T418(c)	Measurement Reference	93
§	T418(d)	Disturbance During Construction	95
§	T418(e)	Access	95
§	T418(f)	Exemptions from Buffer Requirements	95

ARTICLE 5 – STORMWATER MANAGEMENT PERMIT SUBMITTAL REQUIREMENTS **96**

§	T500	Stormwater Management and Other Permits Required	96
§	T500(d)	Professional Seals and Certification Required	96
§	T501(a)	Permit Expiration	97
§	T501(b)	Permit Extension	97
§	T501(c)	Permit Revision	97
§	T502	Required Submittals	97
§	T502(a)	Required Submittals	98
§	T503	Application and Project Overview	98
§	T504	Plan Set Submittal	98
§	T505	Stormwater Submittal	98
§	T506	Floodplain Submittal	100
§	T507	Wetland Submittal	101

ARTICLE 6 – LONG-TERM MAINTENANCE **104**

§	T600	Long-Term Maintenance	104

ARTICLE 7 – ENFORCEMENT AND PENALTIES **108**

§	T701	Required Inspections	108

Page No.

ARTICLE 13 – FEE-IN-LIEU OF SITE RUNOFF STORAGE AND WETLAND MITIGATION **109**

§ T1300 Fee-in-Lieu of Site Storage Runoff 109
§ T1301 Procedures; Use of Funds 109
§ T1302 Fee-in-Lieu of Wetland Mitigation 109

ARTICLE 15 – ENFORCEMENT AND PENALTIES **110**

§ T1500 General 110
§ T1501 Unmitigable Wetlands – Exception 110
§ T1502 Mitigation Required 110
§ T1503 Mitigation Requirements 111
§ T1504 Wetland Mitigation Plan 112
§ T1505 Buffer Requirements for Wetland Mitigation Facilities 113
§ T1506 Wetland Mitigation Performance Standards 114
§ T1507 Mitigation Monitoring 115
§ T1508 Mitigation Required for Non-Performing Wetlands 115
§ T1509 Denial of Permit Appeal 116

PART 2 – FORMS AND APPENDICIES **117**

Forms 118
Appendix A – Manning's Roughness Coefficient 138

LIST OF TABLES

No.	Name	Page No.
1	Site Runoff Storage Requirements	5
2	Illinois State Water Survey Bulletin 70 Rainfall Depths	19
3	Huff Rainfall Distributions	25
4	Huff Quartile Distributions	26
5	Soil Erodibility	43
6	Seed Mixtures for Temporary Stabilization Remaining Less Than One Year	45
7	Seed Mixtures for Temporary or Permanent Stabilization Remaining More Than One Year	46
8	Permanent Stabilization Practices	56
9	Date Requirements for Revisions to Mapped Areas	78
10	Factors Influencing FQI	83
11	Buffer Width Calculation Scenarios	90
12	Water Body Buffer Widths	91
13	Sources of Buffer Plant Materials	93
14	Mitigation Requirements	112
15	Floristic Quality Mitigation Performance	114

APPENDIX A

Table A1	Composite Runoff Coefficients for Unlined Channels	138
Table A2	Typical Roughness Coefficients for Open Channels	139
Table A3	Manning's Roughness Coefficients for Straight Channels Without Shrubbery or Trees	142

LIST OF FIGURES

No.	Name	Page No.
1	Geometric Elements of Channel Sections	7
2	Required Flood Protection Elevation	9
3	Detention Example	13
4	Maximum Allowable Flow Depths on Roadways	21
5	Hydrologically Disturbed Area Example	24
6	Median Time Distribution of Heavy Storm Rainfall at a Point	27
7	100-Year Detention Volume Vs Percent Impervious	30
8	Conceptual Park Area to Compensate for Retention Volume	33
9	Detention Configuration for Proposed Requirements When Water Table is Above Pond Bottom	34
10	Detention Configuration for Proposed Requirements When Water Table is Below Pond Bottom	35
11	Detention Configuration for Proposed Requirements When Water Table is Above Pond Bottom	36
12	Control Structure Configuration Requirements for Agricultural Drain Tile Connection	37
13	Separation for Subsurface Drainage Pipes and Detention Pond Discharge Pipes	38
14A	Sediment Control Practices	50
14B	Sediment Control Practices	51
15A	Soil Stabilization Practices	52
15B	Soil Stabilization Practices	53
16	Sediment and Erosion Control Plan Example	55
17	Stabilized Construction Entrance	59
18	Required Flood Protection Elevation	68
19	Compensatory Storage Example	70
20	Floristic Quality Assessment Example	84
21	Linear and Water Body Buffers	88
22	Buffer Width Scenarios	92
23	Measurement Reference for Linear and Water Body Buffers	94
24	Wetland Delineation Example	103

INTRODUCTION

The Kane County Stormwater Technical Guidance Manual (Manual) is, as the name suggests, a technical guide to provide developers and applicants assistance in complying with the Stormwater Ordinance and the technical requirements of a stormwater permit application.

Purpose

The purpose of the Technical Guidance Manual is to supplement the Kane County Stormwater Ordinance (Ordinance) by providing background, detail, and intent of the technical requirements in the Ordinance. This manual contains discussion, tables, figures and exhibits covering most of the topics found in the Ordinance to assist the applicant in preparing a complete Stormwater Permit Application. The examples illustrated in this Manual are general and attempt to cover the most common requirements. In practice there will be situations that arise in the design of a development that will not be directly related to one of the examples in this manual. The concepts illustrated can be applied to a variety of developments.

The Manual is linked directly to the Kane County Stormwater Management Ordinance by using the same Section numbers as those contained in the Ordinance, with a “T” added to the number.

The Manual is to facilitate implementation and provide guidance necessary to achieve the objectives and standards of the Ordinance. This document has no authority to mandate new criteria and provides a conservative approach for complying with the intent and letter of the criteria. Other techniques may exist that will meet the criteria with less effort or at a lower cost. The applicant accepts the burden of demonstrating the technical adequacy of the development design and is completely responsible for conformance with the criteria of the Ordinance.

The different technical requirements are further defined in this Manual by use of charts, tables and example problems. Recommended forms for compliance with the Ordinance are also provided.

Organization

The Manual is comprised of two parts:

- **Part 1** – Technical guidance covering stormwater management criteria, floodplain criteria and permit application requirements; and

- **Part 2** – Forms covering many of the required submittals used by the applicant or certified community; plus appendices.

PART 1 – TECHNICAL GUIDANCE

ARTICLE 2 – REQUIREMENTS FOR STORMWATER MANAGEMENT

§ T200 General Requirements

The guidance in this manual provides the minimum interpretation of the requirements of the Ordinance. In order to determine if a development requires a Kane County Stormwater Management permit, the applicant must refer to § 500 of the Ordinance. In general, a stormwater management permit does not apply to hydraulically disturbed areas less than or equal to 5,000 s.f. of aggregate development, unless the development is located in a Special Management Area, as defined in § 104 of the Ordinance. For activities exempt from the Ordinance, the applicant is referred to § 801. For any project with more than one permitting authority, it is advisable to have one review specialist.

The flowchart, Part 2, Form 1, assists the developer/applicant in determining which components of the stormwater permit submittal will be required. A copy of the flowchart is contained in the Forms section that should be copied and submitted with an application.

Road development in the right-of-way, under the ownership or control of a unit of local government with greater than one acre of new impervious surfaces in aggregate will require stormwater detention. When questions arise regarding the one acre provision, the Administrator will be the sole judge in determining if the one acre of new impervious surfaces in aggregate has been exceeded.

Existing agricultural land uses are not addressed directly in the Ordinance, but in general only agricultural activities that create new impervious surfaces are regulated, and some hydraulic disturbances greater than 5000 s.f. will require a permit. The definition of development excludes maintenance of existing agricultural systems for cultivated areas and crop productions. It also excludes activities undertaken as part of an NRCS conservation plan, such as terracing or other soil erosion prevention measures. When new rooftops or roadways on existing agricultural lands total 25,000 s.f. or more in aggregate, then detention is required similar to additions to other existing land uses.

§ T200(b) Site Runoff Storage Requirements

The criteria for site runoff storage requirements is listed in § 200. Table 1 was created to help illustrate the criteria for when site runoff storage facilities are required.

TABLE 1
Site Runoff Storage Requirements [§ T200(b)]

Land Use	Parcel Size	Site Runoff Storage Required
Residential		
Single family	< 3 acres	No
	≥ 3 acres	Yes if ≥ 2 family residences are to be constructed on the site
Multi family	≤ 1 acre	No
	> 1 acre	Yes
Non-Residential	≤ 1 acre	No
	> 1 acre	Yes
New Development on Existing Residential Land Use		
Single family	Any size	No
Multi-family	≥ 1 acre	Yes if development > 25,000 ft^2 (aggregate)
New Development on Existing Non-residential Land Use	< 1 acre	No
	≥ 1 acre	Yes if development >25,000 ft^2 (aggregate)
Road (New Development)		No if area < 1 acre
		Yes if area > 1 acre
Mass Grading	≤ 1 acre	No
	> 1 acre	Yes
Agriculture	> 1 acre	Yes if development >25,000 ft^2 (aggregate)

For developments requiring a general Stormwater Management Permit application, the owner and developer must attest to an understanding of the Ordinance criteria and an intent to comply, before initiating development.

Fee-In-Lieu of Detention

For a commercial or industrial redevelopment project where fee-in-lieu of detention is requested, the applicant must address the release rate and quantity of runoff to demonstrate that the redevelopment will not increase existing flood damages. For example, if the outlet of a redevelopment area is into a storm sewer, the applicant should determine the existing capacity of the storm sewer accounting for all upstream flow into the storm sewer. By determining the hydraulic grade line of the storm sewer for existing and with-project conditions, the applicant can demonstrate the effect of the redevelopment on the existing outlet. The overland flow paths for the runoff that exceeds the storm sewer capacity should be determined and addressed, so as not to increase existing flood damages.

In addition, a redevelopment project requesting fee-in-lieu of detention must demonstrate a net benefit in water quality will need to be realized. One way to improve the water quality associated with runoff from redevelopment is for the

applicant to provide retention volume in a basin or swale within the project area. To facilitate evaporation, the depth of a retention basin should not exceed 18-inches and the flow length between the inlet and outlet should be maximized. The applicant should refer to § T203(g) to determine the volume of retention required. The amount of runoff directed to the retention basin should be controlled so as not to exceed the volume available. An overflow conveyance mechanism can be used to safely convey excess flow. The applicant must go through the variance process if it is their desire to not provide the required retention volume.

If a retention basin or swale is not used, some other mechanism such as centrifugal separators should be considered to reduce the contaminants associated with urban runoff. Showing that the site plan has a net decrease in impervious area is also presumed to benefit water quality compared to the currently developed condition.

For a project that involves only mass grading, the developer has the option of requesting fee-in-lieu of detention for the project. The mass grading project can not contain any net increase in impervious surfaces and can not re-construct a structure, if it is to be considered for fee-in-lieu of detention.

§ T201 General Stormwater Requirements

Stormwater drainage requirements are applied to all development and redevelopment throughout Kane County to prevent inappropriate site drainage contributing to increased flood damage. Proper site drainage analysis is meant to protect existing and future structures, as well as sub-surface infrastructure. The developer must consider possible adverse effects of the proposed activity and avoid knowingly undertaking any activity that will cause a violation of the general Standards specified in § 201 of the Ordinance.

The drainage and stormwater storage system must be functional before the issuance of building permits and before commencing general construction. Establishing functional stormwater facilities prior to general construction is required unless it can be demonstrated that this is not practical for single parcel developments. For residential and non-residential subdivision the stormwater facility must be functional and can often be used as a sedimentation basin during the construction of the project.

§ T201(d) Overland Flow Paths

Overland flow paths should be designed to safely convey the 1% annual chance flood event. Overland flow paths can be:

- Side/rear yard swales,
- Roadways,
- Storm sewers for upstream tributary areas <20 acres.

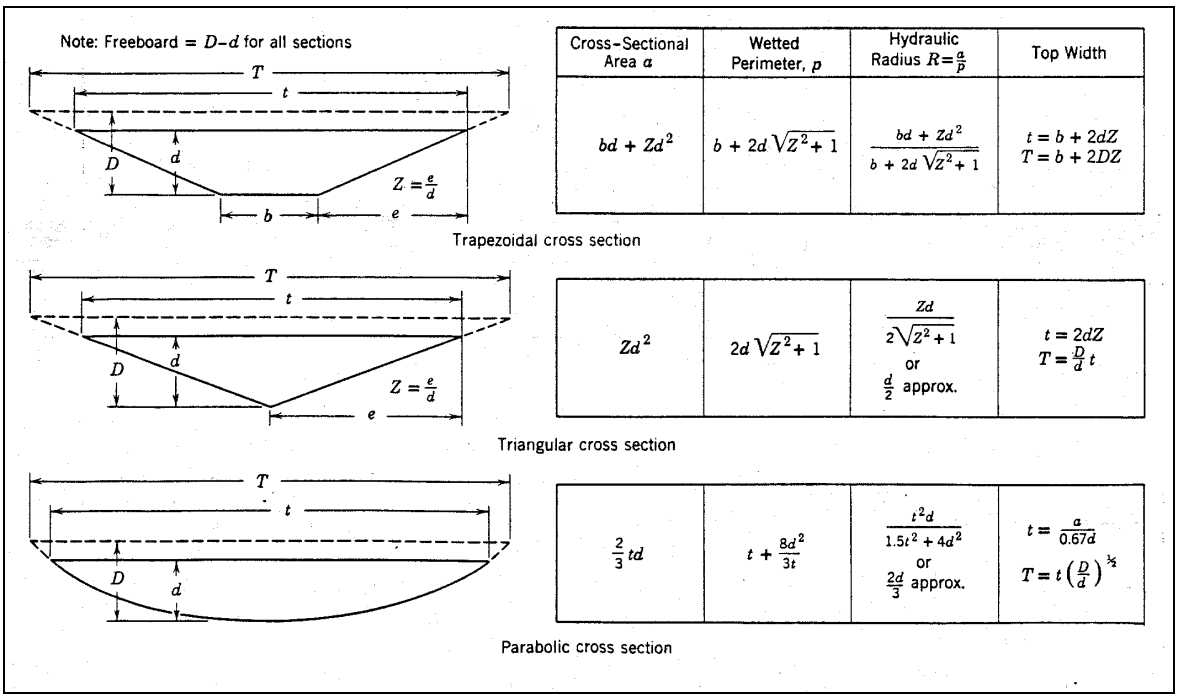
The design of an overland flow path must account for the lowest opening of adjacent structures. For sites with the tributary area greater than 20 acres, the lowest entry elevation opening shall be at least 2 feet above the design water surface elevation of the overland flow route. The design flow rate for overland flow routes should be a minimum of 1 cfs per tributary acre. For sites with less than 20 acres of tributary area, the 2 feet of freeboard does not apply. For areas adjacent to the Fox River, with greater than 20 acres of tributary area, there must be 3 feet of freeboard.

The overland flow paths can be sized using Manning's equation:

$$Q = (1.49/n)\, AR^{2/3}\, S^{1/2}$$

where *n* is the channel roughness coefficient. Appendix A contains tables of applicable Manning's roughness coefficients. The cross-sectional area (A), wetted perimeter (P) and hydraulic radius (R) can be determined from Figure 1.

FIGURE 1
Geometric Elements of Channel Sections
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)

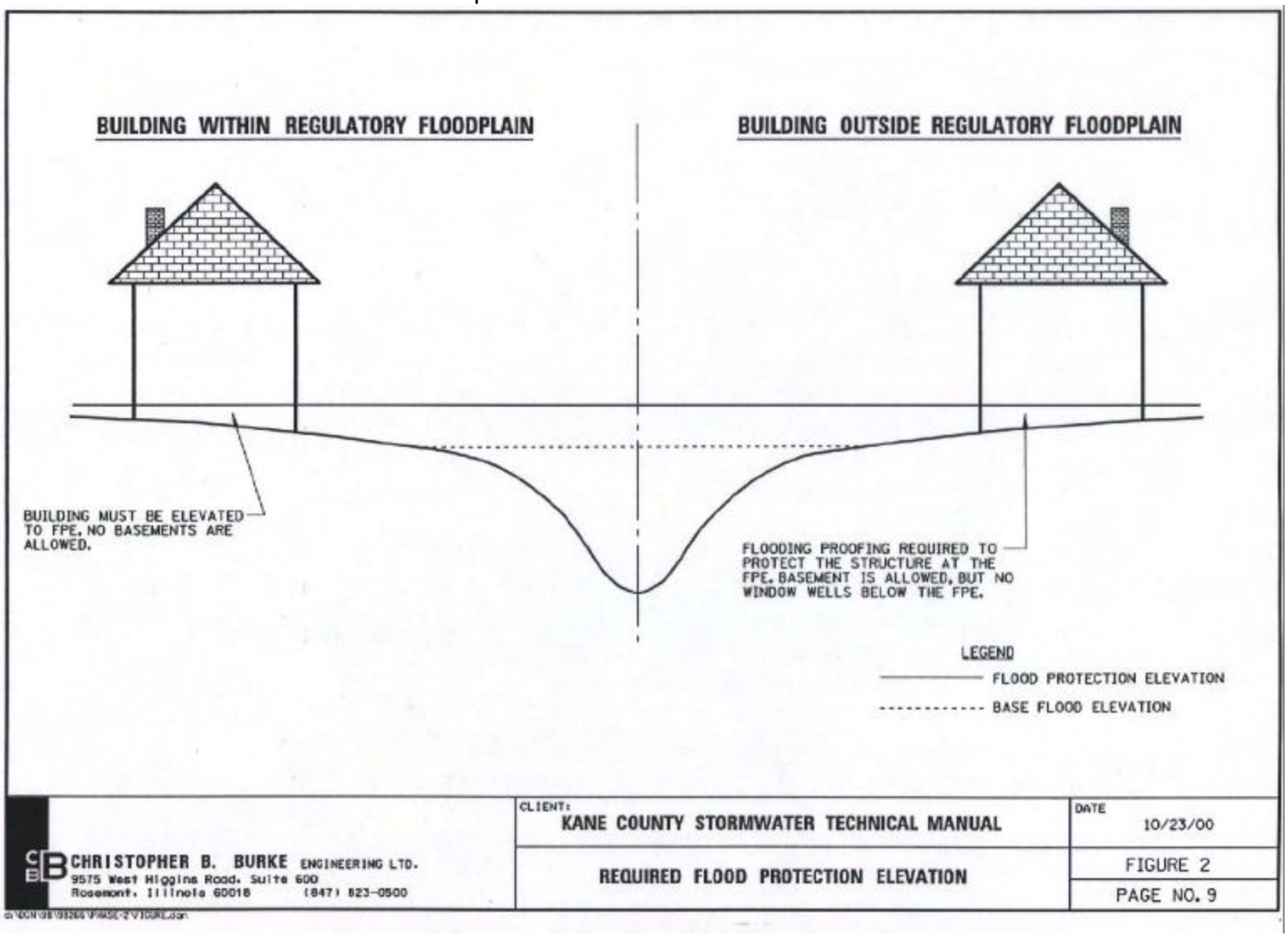


Cross-Sectional Area a	Wetted Perimeter, p	Hydraulic Radius $R=\frac{a}{p}$	Top Width
$bd + Zd^2$	$b + 2d\sqrt{Z^2+1}$	$\frac{bd + Zd^2}{b + 2d\sqrt{Z^2+1}}$	$t = b + 2dZ$ $T = b + 2DZ$
Zd^2	$2d\sqrt{Z^2+1}$	$\frac{Zd}{2\sqrt{Z^2+1}}$ or $\frac{d}{2}$ approx.	$t = 2dZ$ $T = \frac{D}{d}t$
$\frac{2}{3}td$	$t + \frac{8d^2}{3t}$	$\frac{t^2d}{1.5t^2 + 4d^2}$ or $\frac{2d}{3}$ approx.	$t = \frac{a}{0.67d}$ $T = t\left(\frac{D}{d}\right)^{1/2}$

§ T201(e) Protection of Buildings

All usable space in new buildings, additions, and buildings undergoing substantial improvement must be protected against flooding from the base flood. A measure of protection has been added to the usable space of a building by requiring the usable space to be protected to the flood protection elevation (FPE), which is higher than the base flood elevation (BFE). This can be accomplished by elevating the buildings or floodproofing. Requirements for elevating and floodproofing are described in § T401. All usable space in buildings must be 2 feet above the base flood elevation, except along the Fox River and within its backwater, where the usable space must be protected from flooding for up to 3 feet above the base flood elevation. The required flood protection elevations for buildings is illustrated in Figure 2. Buildings proposed to be located in the floodplain must be elevated to the flood protection elevation whereas, buildings outside the floodplain must be protected to the flood protection elevation.

FIGURE 2
Required Flood Protection Elevation



§ T201(f) Planning Principles

Meeting the requirements of this Ordinance has to be considered long before a site plan is approved, and this section defines some planning criteria necessary to accomplish this. It also states that zoning variances should be considered where current zoning creates a conflict, such as excessive set-back requirements and the intent to minimize impervious surfaces. The Ordinance of course does not require the applicant to request these types of variances officially, they should at least be discussed at a staff level when the site plan is being developed.

§ T201(g) Depressional Storage

Note that by definition, the depressional storage does not have a direct gravity outlet but if in agricultural production, it is more than likely drained by a tile and should be modeled as "empty" at the beginning of a storm. Flood storage on-site with a positive gravity surface outlet does not need to be compensated for, except when it qualifies as floodplain storage in Article 4 or when its loss causes a violation of a requirement of § 201.

The function of any existing depressional storage should be modeled using an event hydrograph model [acceptable event hydrograph models are listed in § T202(e)] to determine the volume of storage that exists and its effect on existing site release rate. In order to prepare such a model, certain information must be obtained, including delineating the tributary drainage area, the stage-storage relationship and discharge rating curve, and identifying the capacity and elevation of the outlet(s).

The tributary area should be delineated on the best available topographic data. When the tributary area is confined to the project site, the site topographic map (1' contour interval) shall be used. If the tributary area to the depressional storage extends beyond the project limits, the Kane County 2' topographic maps should be used to supplement on-site survey data. If the County maps are not available, the United States Geological Survey (USGS) maps may be used for off-site areas.

After determining the tributary area, a hydrologic analysis of the watershed should be performed, including a calculation of the appropriate composite runoff curve number and time of concentration. Stage-storage data for the depressional area should be obtained from the site topographic map. The outlet should be clearly marked and any calculations performed to create a stage-discharge rating curve should be included with the stormwater submittal.

A critical duration analysis should be performed within the depressional storage and the corresponding storage volume. The 100-year recurrence interval storm should be used for the 1-, 2-, 3-, 6-, 12-, 18-, 24-, 48-, 72-, 120- and 240-hour storm events. See § T202(f) for more information on the critical duration analysis.

Any depressional storage to be filled by the proposed development must be compensated for at a 1:1 ratio. If the entire existing tributary area is conveyed to the site runoff storage facility, the compensatory storage may be provided in the facility. If the off-site area tributary to the depressional area is not conveyed to the detention basin, a separate detention basin should be considered at the location of the existing depressional storage location so off-site flow is attenuated to the same degree in pre-project compared to in post-project conditions. The required compensatory storage should be added to the site storage requirement, and this total volume requirement should be available below the detention basin overflow elevation. It is not necessary to provide incremental compensatory storage for fill of depressional storage.

§ T202 Site Runoff Requirements

§ T202 lists some of the appropriate hydrologic and hydraulic calculation methods with which runoff can be calculated and suggest ways in which it can be adequately collected and conveyed without causing any negative impacts for a given design frequency. A site runoff example is contained in Figure 3, where the proposed site drains to one facility.

§ T202(a) Stormwater Facility Discharges

For simple developments with few drainage facilities, these criteria should be met if:

1. All site runoff exits the site through vegetated swales (i.e., runoff velocities are minimized); and

2. All site runoff exits the site either into an adjacent drainage way or spreads overland in the same direction as the predevelopment drainage, or into a drainage easement that is continuous until it reaches an existing downstream drainageway.

3. The runoff from the site demonstrated to be safely conveyed to a stream.

For larger developments or smaller developments that do not meet the above conditions, these criteria require that the developer consider the full impact site drainage system may have on downstream locations. It is necessary to:

1. Identify all points where runoff will exit the drainage site. This will include point discharge locations (where sump pumps discharge or where flows from drainage pipes, culverts, swales, or other drainage ways exit the site) as well as areas where diffused overland flow will exit the site.

2. Determine whether these immediate discharge points will be affected by the discharge. This will include considering the exit points susceptibility to water damage (i.e., is the drainage ditch expected to convey water, or is a walkway expected to stay dry, etc.?).

3. Determine whether the discharge quantity will affect the discharge point adversely. In general, if:

   a) The existing drainage patterns have been retained such that the points of discharge from the site have the same tributary areas as before discharges; and

   b) The discharge quantity at each point will be less than the pre-development flow rate to that point under pre-development conditions; and

   c) The point has been historically free from flood damage; then

FIGURE 3
Detention Example

DETENTION EXAMPLE

(Section 202(a))

Site Information

Existing Conditions:

- Project area = 206 acres
- Off-site tributary area = none
- Existing outlet = drain tile to existing storm sewer along west property boundary
- Existing depressional storage = none
- Floodplain = none

Proposed Conditions:

- Project development – Residential subdivision with 1/3 acre lots
- Proposed outlet – Storm sewer along west property boundary
- Hydrologically disturbed area = 206 acres

FIGURE 3
Page No. 13

FIGURE 3
Detention Example (continued)

PROCEDURE TO DETERMINE REQUIRED STORAGE

Step 1: Calculate volume to be retained

VOLUME = RUNOFF x DCI AREA
DCI AREA = HYDROLOGICALLY DISTURBED AREA x 0.30
Using this equation, the retention volume below the invert of the outlet is 3.86 acre-ft.

Step 2: Calculate the allowable release rates

Q_{100} = 0.1 cfs/acre = 20.6 cfs

Step 3: Calculate Detention Storage Volume

To calculate the detention storage volume, begin by using the methodology found in the Natural Resources Conservation Service (NRCS) TR-55 manual. Find the runoff depth of the 100-year design storm event. Using values associated with this example, the following runoff value is:
Q_{100} = 5.00 in.

Using the following equation, the preliminary detention volume may be found (converted to acre-feet):
VOLUME = RUNOFF x CN-SITE TRIBUTARY AREA
V_{100} = 85.9 acre-feet

To finalize the detention basin design, a hydrologic model will be used to proposed detention basin designs and outlet release rates. Using the NRCS TR-20 (a computer modeling software), enter in the data from the project site. After running the program for the 100-year event, the dimensions for the retention/detention facility will be found through several iterations.

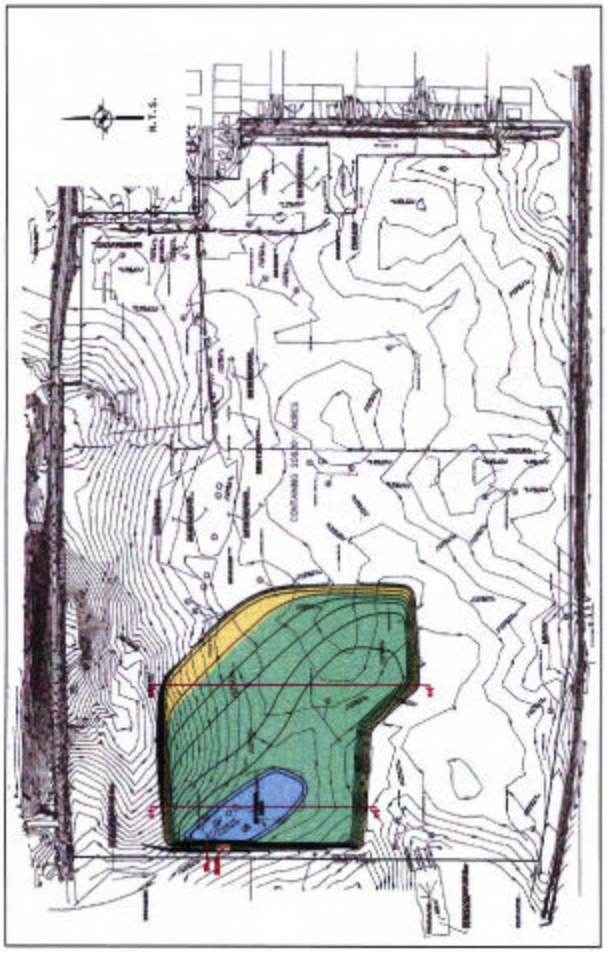
Step 4: Add the Retention Volume to the Detention Facility

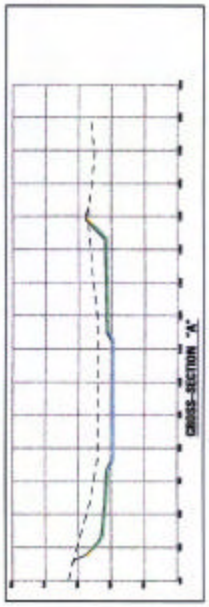
After designing the detention facility, the retention portion of the basin can be added. The retention volume will be added to the bottom of the detention facility, below the gravity outlet. Calculate the area of the bottom of the detention facility. With this value and the retention volume from step 1, calculate the depth below the outlet. This depth should not be greater than 18-inches. If the depth is greater than 18-inches, the detention area may need to be redesigned. The design should account for evaporation and duration of inundation of the retention area.

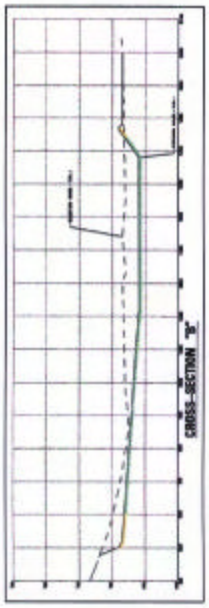
Step 5: Surcharge Storage Area

Two additional feet have been added to the top of the detention facility to control the overflow from the detention basin in the event the gravity outlet is blocked. A weir has been designed at the elevation of the top of the green area. The width of the weir is calculated by designing 2 feet of head and passing the pre-developed flow rate from the site, as required in the ordinance.

The final facility dimensions and layout are located on the figure to the left.







The discharge quantity will probably not cause damage to the adjacent property. It is the responsibility of the applicant to check if the waterway can handle the post development flows long term without causing severe erosion. The applicant should consider using an energy dissipater system at the outlet of a storm sewer system that empties into a waterway.

If all the conditions above are not met, the developer must demonstrate that the proposed site drainage will not affect adjacent properties adversely. The developer is not responsible for rectifying off-site pre-existing failures to meet the criteria of the Ordinance. However, the developer is responsible for demonstrating that the development will not exacerbate existing related flood problems.

§ T202(b) Minor Stormwater System Criteria

Minor stormwater system drainageways are swales, channels, catch basins, drains, pumps, storm sewers, etc., that are designed for the motoring safety and convenience of the public (the normal drainage systems that convey water during frequent storms rather than allowing the runoff to pond or run on walkways, streets, or other locations where it would inconvenience public access or use of a site). The 10-year recurrence frequency is typically selected to define the upper limit for the minor stormwater system, however the choice of design frequencies is a matter of local ordinances such as subdivision codes and highway department policy.

§ T202(c) Major Stormwater System Criteria

Major stormwater system drainageways are flow paths used only during major storms when the minor systems are overloaded. Restricting major stormwater flows to drainageways reduces the potential for flood damage.

All drainageways through the property that convey flows from areas off the development site should be left undisturbed or sized in accordance with the guidance set forth below.

Design of the major/minor systems may require:

1. Calculation of runoff rates for both the minor system criteria (typically 10-year design storm event) and the major system criteria (the 100-year design storm event);

2. Designing culverts, swales, catch basins and other “minor” drains to convey the minor design event fully; and

3. Calculating overland flow paths (broad swales, roadways, etc.) sufficient to carry the major design event flows and verifying that these flow paths do not result in property damage.

Sizing of the drainageways should:

1. Use the Manning's equation for open channels as shown in § T201(d). All drainageways should be designed for open-channel flow conditions. Surcharged design is acceptable only where the designer has fully considered the potential for hydrodynamic transients and the impacts on all connected drainageways. For minor stormwater systems that do not use open-channels, the drainageways may be calculated using the Modified Rational Method.

2. Have major stormwater system hydraulic gradelines (water surface elevation plus the pressure head) below elevations that could potentially cause damage. Hydraulic grade line evaluations must proceed upstream from:

   a) A demonstrated free overflow; or

   b) The expected base flood elevation of the most downstream point analyzed; or

   c) An alternative assumption demonstrated to be appropriate and conservative.

   Steady-state backwater calculations are appropriate for calculating hydraulic grade lines in low-impact systems remote from the floodplain. Such calculations must consider at least the pressure and velocity heads of all drainageways. Tools that may be appropriate to assist in calculations include spreadsheets, WSP-2, HEC-2, HEC-RAS and, FHWA's HYDRA and Hydraflow.

3. Employ flood routing techniques for hydraulic evaluations for drainageways downstream of storage systems that address the time-varying nature of the storage facility adequately. If all storage basins are off-line or not in sequence, time-varying hydraulic routing need not be considered. Include the maximum discharge rate~~d~~ from the storage facility in the flow estimate at all downstream points.

   For in-line or sequential basins, the routing downstream must consider explicitly, or estimate conservatively, the impact of sequential storms, alternative storm patterns, and routing impacts between storage facilities. Continuous hydrologic routing techniques provide the explicit treatment of these factors. Such routing can be accomplished manually or by using

appropriate time-varying hydraulic programs (e.g., STORM, SWMM, FEQ, UNET, HSPF).

4. Control maximum drainage system velocities in flow over roadways to address public safety needs. A commonly applied guide is that the product of velocity (ft./sec.) and depth (ft.) should not exceed a value of 4 for the storm with a 0.01 probability of occurrence in any year. § T202(h) defines the maximum allowable flow depths for transverse stream crossings of roads. This Guidance does not apply to existing watercourses for which the applicant has no control over the design.

Design of drainageways should:

1. Have sufficient energy dissipation at the outlet to prevent scouring of the streambank, bed, or downstream land. Armoring of the stream channel should not be considered in lieu of energy dissipation. Energy dissipation is essential to avoid transferring scour and stability problems further downstream.

2. To the extent possible, open-channel drainageways should have permanently deep rooted vegetated side slopes and inverts with velocities sufficiently limited to prevent scouring. This guide addresses the Plan requirement to control sediment and erosion from drainageways.

3. Have reasonable sideslopes given the engineering properties of the materials. A 3:1 sideslope typically provides adequate stability in an earth channel and is a mowable slope. A 4:1 or shallower sideslope is desirable. Deviations from the minimum value should be justified by appropriate calculations (e.g., slope stability calculations) and maintenance plans that do not require mowing.

§ T202(d) Existing Sub-Surface and Surface Drainage Systems

The applicant must locate all existing field tile systems on the project site. Particular attention should be paid to those field tile systems that are used to convey off-site flow through the site to a downstream location. It is the responsibility of the developer to maintain adequate capacity of off-site drain tile systems entering the site. The potential for expansion of an existing agricultural drain can be determined by checking the topography tributary area upstream of a development which contains hydric soil and multiplying by 0.003 cfs/acre. If a drain tile system outlets into an adjacent property's drain tile system, the downstream drain tile capacity must be calculated using the slope and size of the drain tile. If the developer is not able to determine the capacity of the downstream system, then the assumption for the capacity should be limited to 0.003 cfs/acre multiplied by the amount of acres of hydric

soil tributary to the downstream system at the point where it exits the developer's property. The developer has the option of:

1. Release into the existing drain tile system at the pro-rated capacity of the downstream field tile or 0.003 cfs/acre, whichever is less; or
2. Negotiate with the downstream property owner to upsize the field tile system to a greater capacity.

If the developer releases at 0.003 cfs/acre for the storm with 1% probability of occurrence in any year, the remaining 0.097 cfs/acre would need to be safely conveyed overland to the downstream property and discharged without scouring. The pro-rated capacity of a field tile can be determined as a percentage of the tributary area.

All field tile systems that do not serve a particular benefit (i.e., - draining open space) must be removed. It is not acceptable to only remove a few sections of the tile system. The concentration and conveyance of infiltrated runoff may cause problems if partial tile systems are left in place. Any on-site field tiles which remain on-site must be identified in record drawings.

§ T202(e) Design Runoff Rate

The design runoff rate for a development shall be the lesser of:

1. The runoff rate ~~a~~ at the time of permit application, without the proposed project (i.e.- existing runoff rate); or
2. 0.1 cfs/acre of development.

The pre-developed runoff rate must account for any depressional storage and all other hydrologic features (e.g., soil conditions, ground cover and topography).

Acceptable event hydrograph computer models for determining the allowable release rate are: HEC-HMS, HEC-1 with SCS runoff method, SWMM, TR-20, and TR-55 tabular method. For calculation of design rates for conveyance, the Rational Method can be used for small subareas if the total drainage area at the point of design is 20 acres or less. The Administrator has the discretion to allow other event hydrograph models. The models listed in the Ordinance are all public domain models.

§ T202(f) Design Rainfall

For design storm events, the Illinois State Water Survey (ISWS) Bulletin 70 Northeast Sectional Rainfall Statistics shall be used. When designing for storage volume the 24-hour duration must be used. To design the conveyance capacity for stormwater system, the critical duration with the

highest peak discharge shall be selected. The duration's that comprise a critical duration analysis are the 1-. 2-. 3-, 6-, 12-, 18-, 24-, 48-, 72-, 120-, 240- hour storm events. Table 2 lists the ISWS Bulletin 70 precipitation depths for various duration's and recurrence intervals.

TABLE 2
Illinois State Water Survey Bulletin 70
Rainfall Depths for Northeast Sectional

Duration	Frequency						
	1-year	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
5 min	0.30	0.36	0.46	0.54	0.66	0.78	0.91
10 min	0.55	0.67	0.84	0.98	1.21	1.42	1.67
15 min	0.68	0.82	1.03	1.21	1.49	1.75	2.05
30 min	0.93	1.12	1.41	1.65	2.04	2.39	2.80
1 hour	1.18	1.43	1.79	2.10	2.59	3.04	3.56
2 hour	1.48	1.79	2.24	2.64	3.25	3.82	4.47
3 hour	1.60	1.94	2.43	2.86	3.53	4.14	4.85
6 hour	1.88	2.28	2.85	3.35	4.13	4.85	5.68
12 hour	2.18	2.64	3.31	3.89	4.79	5.62	6.59
18 hour	2.30	2.79	3.50	4.11	5.06	5.95	6.97
24 hour	2.51	3.04	3.80	4.47	5.51	6.46	7.58
48 hour	2.70	3.30	4.09	4.81	5.88	6.84	8.16
72 hour	2.93	3.55	4.44	5.18	6.32	7.41	8.78
120 hour	3.25	3.93	4.91	5.70	6.93	8.04	9.96
240 hour	4.12	4.95	6.04	6.89	8.18	9.38	11.14

§ T202(g) Stormwater System Easements

The criteria of § 202(g) of the Ordinance suggests the land should be graded to drain to an existing public easement on the property (e.g., a public utility easement or existing drainage easement). If no such easement exists on the property, easements providing public access for maintenance shall be granted on the property title for any stormwater structures (e.g., culverts, swales, ponds).

For development sites, the easement determination criteria required are:

1. Mapping of both the major and minor stormwater systems.

2. Mapping of an easement sufficient for maintenance for each of the stormwater facilities shown. A sufficient maintenance easement should be at least 10 feet wide around the perimeter of storage basins and along the drainageway, and extend continuously from a public roadway.

3. Dedication of the mapped easement on all plats or titles of all parcels containing the easement. The dedication must indicate clearly that the

purpose of the easement is for maintenance access to the stormwater facilities. This requirement does not require access for other public purposes, such as trails.

§ T202(h) Flow Depths

The major stormwater system may use roadways for conveyance of flows if such use of roadways is not otherwise prohibited (e.g., use of major traffic routes may be prohibited by highway regulations for safety reasons). In cases where roadways are included in the major drainage system, the depth of flow shall be calculated by the hydraulic methods described in § T202(c). Figure 4 helps explain the criteria of the Ordinance in regards to the maximum allowable flow depths on roadways.

§ T202(i) Diversions of Flow to Another Watershed

The criteria of § 202(i) of the Ordinance can be met best by designing all post-project runoff flow to a discharge from the site at the same location where it drained in pre-project conditions. Illinois drainage law must be consulted with regard to diversions and this Ordinance does not allow diversions prohibited by Illinois drainage law.

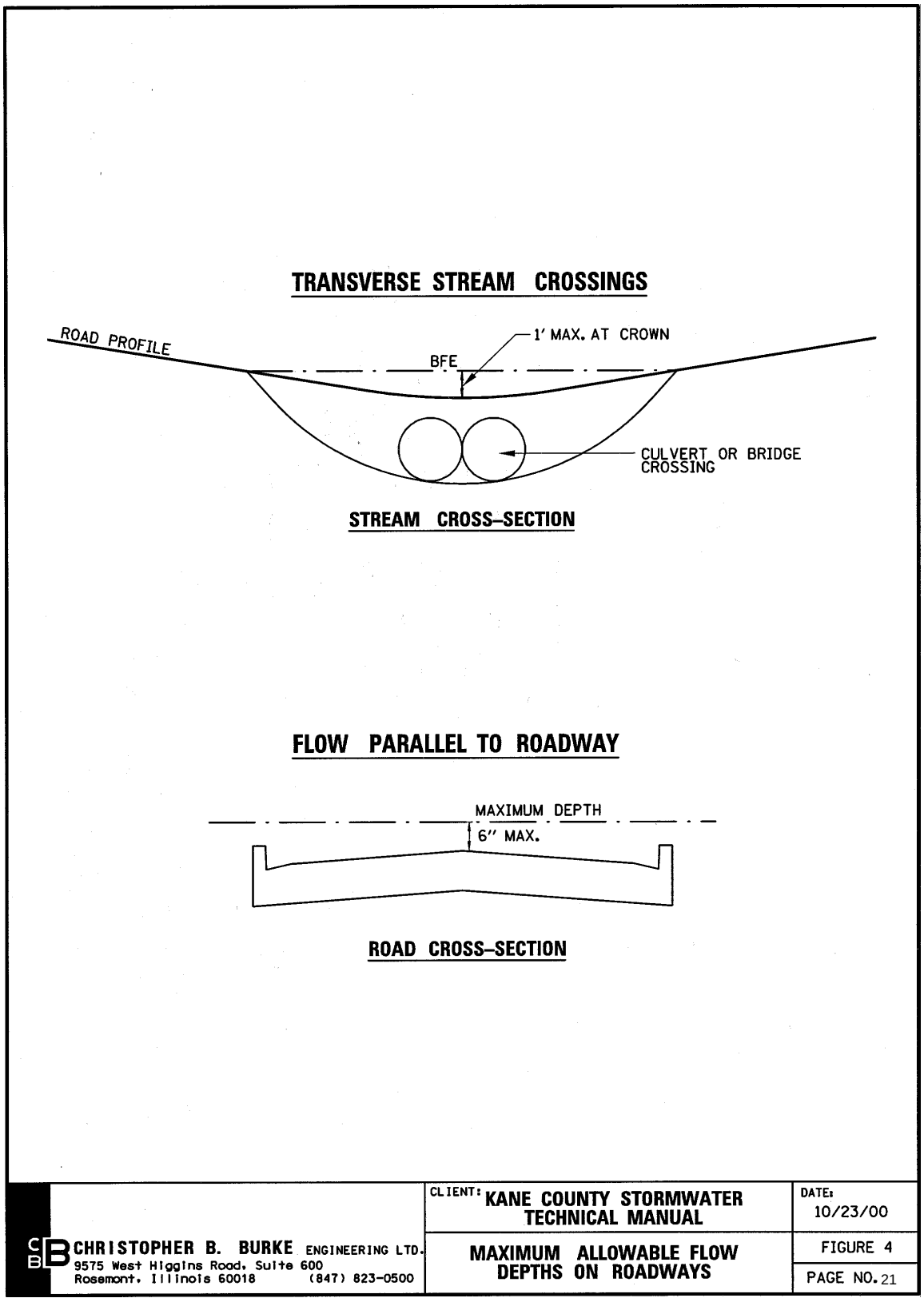
If the developer wishes to change the discharge locations this discharge must be approved in writing by the Administrator [§ 202(a)]. It will be necessary to calculate flows and hydraulic grade lines on all affected waterways for both the minor system design criteria and the major system design criteria, and to verify that the resultant hydraulic grade lines are below low entry point elevations or other damaging elevations.

The calculations should extend down both affected drainageways to the point where the prediversion flow direction joins the postdiversion flow stream, and up the affected drainageways to the point where the prediversion hydraulic grade line is calculated to be within 0.1 foot of the postdiversion hydraulic grade line. If any of these drainageways have defined floodplains, the calculations must be accomplished in accordance with the guidance for floodplain hydraulic analysis [see § T401(a)].

§ T202(j) Best Management Practices Requirements

Compliance with the need to incorporate the U.S. EPA best management practices requires nothing beyond the requirements cited in the U.S. Clean Water Act.

FIGURE 4
Maximum Allowable Flow Depths on Roadways



In general:

1. Impervious surfaces on the property should be minimized. Reducing impervious surfaces is one method for controlling increases of stormwater runoff, and, controlling future increases in stormwater damages. This method of reducing stormwater increases also provides control at the most site-specific or local level possible.

2. Natural flow paths and vegetated channels should be used and left undisturbed to the maximum extent possible. By using natural drainage features and keeping them undisturbed, site-specific and simple methods can be employed as encouraged by the Plan.

3. On-site infiltration of stormwater should be encouraged where soils and subsurface conditions are sufficiently permeable. As encouraged by the Plan, onsite infiltration accomplishes site-specific or local control of future increases in stormwater damages while preserving groundwater recharge.

4. To the extent practicable, drainage from impervious areas (i.e., roofs, driveways, sidewalks, parking lots, and streets) should drain across pervious areas. Directing drainage from impervious areas across pervious areas is one method to control increases of stormwater runoff, and thus control future increases in stormwater damages. This method of reducing stormwater increases will also provide control at the most site-specific or local level possible.

5. Directing sump pump flow away from storm sewer systems is one method for controlling increases of peak stormwater runoff, and thus controlling future increases in stormwater damages. Many homeowners view sump-pump discharges as a nuisance and it can cause continual “wet spots” in a yard making mowing difficult. In residential developments, these concerns must also be addressed. However, redirecting sump pumps to sanitary sewers is prohibited by water quality regulations.

6. To the extent practicable, drainage should be directed to and through on-site storage swales. The swales should be vegetated with water-tolerant species to prevent erosion and promote infiltration and pollutant capture.

The Northern Illinois Planning Commission (NIPC) has given regular courses of instruction in BMP design, and the course notebook “Urban Stormwater Best Management Practices for Northeastern Illinois” is a comprehensive reference. The manual is available from NIPC, which is located at 222 S. Riverside Plaza, Suite 1800, Chicago, Illinois, 60606, or by telephone at (312) 454-0400.

§ T203 Site Runoff Storage Requirements (Detention)

The objective of § T203 is to discuss the hydrologic models that can be used to develop peak-discharge frequency estimates for any watershed in question. The hydrologic models are used to size appropriate stormwater system(s) that are used to attenuate the increase in peak discharges due to additional impervious surfaces.

§ T203(a) Area of Disturbance

Site runoff storage volume is required for only the area of the site that has been hydrologically disturbed. If the development on a 60-acre site disturbs only 40-acres of the site, then the site runoff storage volume is necessary for only 40-acres. Figure 5 shows an example of this requirement.

§ T203(b) Release Rate

The peak release rate from a development site shall not exceed 0.1 cfs/acre of development for the 0.01 probability in any year. The Ordinance release rate is a conservative public policy decision setting a uniform standard and level of protection. It is reflective of the relatively low capacity of stormwater infrastructure in Kane County.

There is no minimum outlet size specified in the Ordinance. However, if the design requires an outlet size smaller than 4-inches, appropriate protection of the outlet shall be designed to avoid the opening from being plugged.

The release rate is to be calculated by determining the hydrologically disturbed area of the development. If the site has more than one outlet, the allowable release for each discharge point shall be calculated based on the hydrologically disturbed area of the development to that particular outlet.

FIGURE 5
Hydrologically Disturbed Area Example

§ T203(c) Design Methods

In order to calculate the required storage volume, an event hydrograph routing method shall be used. There are several computer programs developed explicitly for determining the required storage volume using event hydrograph routing methods. Acceptable models include HEC-1 (only when used with SCS runoff method), HEC-HMS (also, using the SCS runoff method), SWMM, TR-20 or TR-55 tabular method. The HEC-1 and HEC-HMS are U.S. Army Corps of Engineers hydrologic models. TR-20 and TR-55 were developed by the Soil Conservation Service (now named the Natural Resources Conservation Service). The HEC programs can be downloaded off the internet from:

http://www.hec.usace.army.mil/software/software-distrib/index.html

The TR-20 program can be downloaded off the internet from:

http://www.wcc.nrcs.usda.gov/water/quality/common/tr20/tr20.html

The SWMM program can be downloaded off the internet from:

http://www.epa.gov/ceampubl/DOS/SWMM.INSTALSW.EXE

All event hydrograph routing methods shall use the Huff rainfall distribution appropriate for the storm duration as shown in Tables 3 and 4. Rainfall depths for different frequencies and durations are shown in Table 2 in § T202(f). Figure 6 shows the four Huff Quartile Distributions in graphical format. The only exception to using the Huff Quartile Distributions is when the TR-55 tabular method is used. When using the TR-55 tabular method it is acceptable to use the SCS Type II rainfall distribution. An antecedent moisture condition of 2 must be used when using the TR-20 event hydrograph program.

TABLE 3
Huff Rainfall Distributions

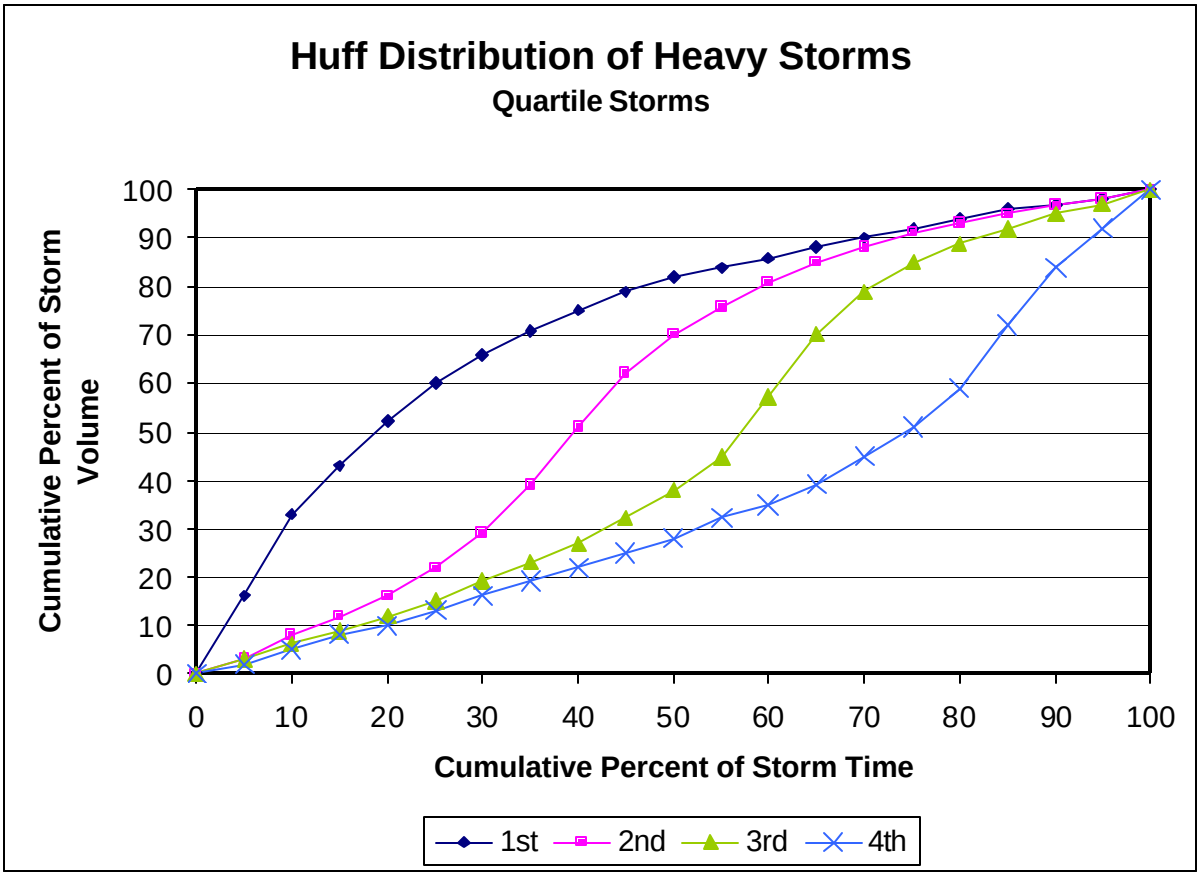
Rainfall Duration (hours)	Huff Distribution
1	1st
2	1st
3	1st
6	1st
12	2nd
18	3rd
24	3rd
48	4th
72	4th
120	4th
240	4th

TABLE 4
Huff Quartile Distributions*

Cumulative Storm Percentage	Percent of Total Rainfall			
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
05	16	03	03	02
10	33	08	06	05
15	43	12	09	08
20	52	16	12	10
25	60	22	15	13
30	66	29	19	16
35	71	39	23	19
40	75	51	27	22
45	79	62	32	25
50	82	70	38	28
55	84	76	45	32
60	86	81	57	35
65	88	85	70	39
70	90	88	79	45
75	92	91	85	51
80	94	93	89	59
85	96	95	92	72
90	97	97	95	84
95	98	98	97	92

* Applies to drainage areas less than 10 square miles.

FIGURE 6
Median Time Distribution of Heavy Storm Rainfall at a Point
(Reference: ISWS, 1992; Rainfall Frequency Atlas of the Midwest)



Example: A development has an off-site drainage area of 100 acres as delineated on the Kane County 2-foot topographic map. The time of concentration for the off-site area is 1.5 hours, and the Runoff Curve Number is 80. Determine the critical duration and peak discharge to be by-passed through the development.

Solution: A TR-20 hydrologic model was used for the critical duration analysis. The following data was input to the model:

Drainage Area =	0.15625 square miles (100ac)
Time of Concentration =	1.5 hours
Runoff Curve Number =	80

The rainfall tables used (RAINFL 6, 7, 8, 9) are the Huff 1st, 2nd, 3rd, and 4th quartile distributions. The rainfall depths used are ISWS Bulletin 70 values, as listed in Table 2. The TR-20 hydrologic model input/output is listed below.

FIGURE 6
Median Time Distribution of Heavy Storm Rainfall at a Point
(continued)

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20                                                NOPLOTS
TITLE     Kane County Technical Manual
TITLE     Critical Duration Analysis Example       JJJ APR00
 5 RAINFL 6            0.05                                          HUFF 1ST
 8         0.00        0.16        0.33        0.43        0.52      QUARTILE
 8         0.60        0.66        0.71        0.75        0.79
 8         0.82        0.84        0.86        0.88        0.90
 8         0.92        0.94        0.96        0.97        0.98
 8         1.          1.          1.          1.          1.
 9 ENDTBL
 5 RAINFL 7            0.05
 8         0.00        0.03        0.08        0.12        0.16      HUFF 2ND
 8         0.22        0.29        0.39        0.51        0.62      QUARTILE
 8         0.70        0.76        0.81        0.85        0.88
 8         0.91        0.93        0.95        0.97        0.98
 8         1.          1.          1.          1.          1.
 9 ENDTBL
 5 RAINFL 8            0.05
 8         0.00        0.03        0.06        0.09        0.12      HUFF 3RD
 8         0.15        0.19        0.23        0.27        0.32      QUARTILE
 8         0.38        0.45        0.57        0.70        0.79
 8         0.85        0.89        0.92        0.95        0.97
 8         1.00        1.00        1.00        1.00        1.00
 9 ENDTBL
 5 RAINFL 9            0.05
 8         0.00        0.02        0.05        0.08        0.10      HUFF 4TH
 8         0.13        0.16        0.19        0.22        0.25      QUARTILE
 8         0.28        0.32        0.35        0.39        0.45
 8         0.51        0.59        0.72        0.84        0.92
 8         1.          1.          1.          1.          1.
 9 ENDTBL
 6 RUNOFF 1   1      2 .15625      80.          1.50              1 100ac
   ENDATA
 7 INCREM 6            1.00
 7 COMPUT 7   1    1     0.0        3.56        1.     6 2      1  1hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        4.47        2.     6 2      1  2hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        4.85        3.     6 2      1  3hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        5.68        6.     6 2      1  6hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        6.59        12.    7 2      1  12hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        6.97        18.    8 2      1  18hr
   ENDCMP 1
1
```

```
**********************80-80 LIST OF INPUT DATA (CONTINUED)**********************

 7 COMPUT 7   1    1     0.0        7.58        24.    8 2      1  24hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        8.16        48.    9 2      1  48hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        8.78        72.    9 2      1  72hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        9.96        120.   9 2      1  120hr
   ENDCMP 1
 7 COMPUT 7   1    1     0.0        11.14       240.   9 2      1  240hr
   ENDCMP 1
   ENDJOB 2
0*******************************END OF 80-80 LIST*******************************
```

FIGURE 6
Median Time Distribution of Heavy Storm Rainfall at a Point
(continued)

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 0 STORM 1													
+													
XSECTION 1	RUNOFF	.16	6	2	1.00	.0	3.56	1.00	1.81	---	1.34	91.84	587.8
XSECTION 1	RUNOFF	.16	6	2	1.00	.0	4.47	2.00	2.48	---	1.82	111.32	712.5
XSECTION 1	RUNOFF	.16	6	2	1.00	.0	4.85	3.00	2.75	---	2.03	112.13	717.7
XSECTION 1	RUNOFF	.16	6	2	1.00	.0	5.68	6.00	3.44	---	2.28	103.48	662.2
XSECTION 1	RUNOFF	.16	7	2	1.00	.0	6.59	12.00	4.31	---	6.02	88.89	568.9
XSECTION 1	RUNOFF	.16	8	2	1.00	.0	6.97	18.00	4.66	---	12.18	77.53	496.2
XSECTION 1	RUNOFF	.16	8	2	1.00	.0	7.58	24.00	5.22	---	15.92	67.74	433.5
XSECTION 1	RUNOFF	.16	9	2	1.00	.0	8.16	48.00	5.76	---	41.30	39.02	249.7
XSECTION 1	RUNOFF	.16	9	2	1.00	.0	8.78	72.00	6.36	---	61.20	28.64	183.3
XSECTION 1	RUNOFF	.16	9	2	1.00	.0	9.96	120.00	7.47	---	101.62	20.08	128.5
XSECTION 1	RUNOFF	.16	9	2	1.00	.0	11.14	240.00	8.61	---	204.00	11.38	72.8
1													

TR20 XEQ 10-18-00 13:01 Kane County Technical Manual JOB 1 SUMMARY
REV PC 09/83(.2) Critical Duration Analysis Example JJJ APR00 PAGE 5

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
0 XSECTION 1	.16	
+		
ALTERNATE 0		11.38
1END OF 1 JOBS IN THIS RUN		

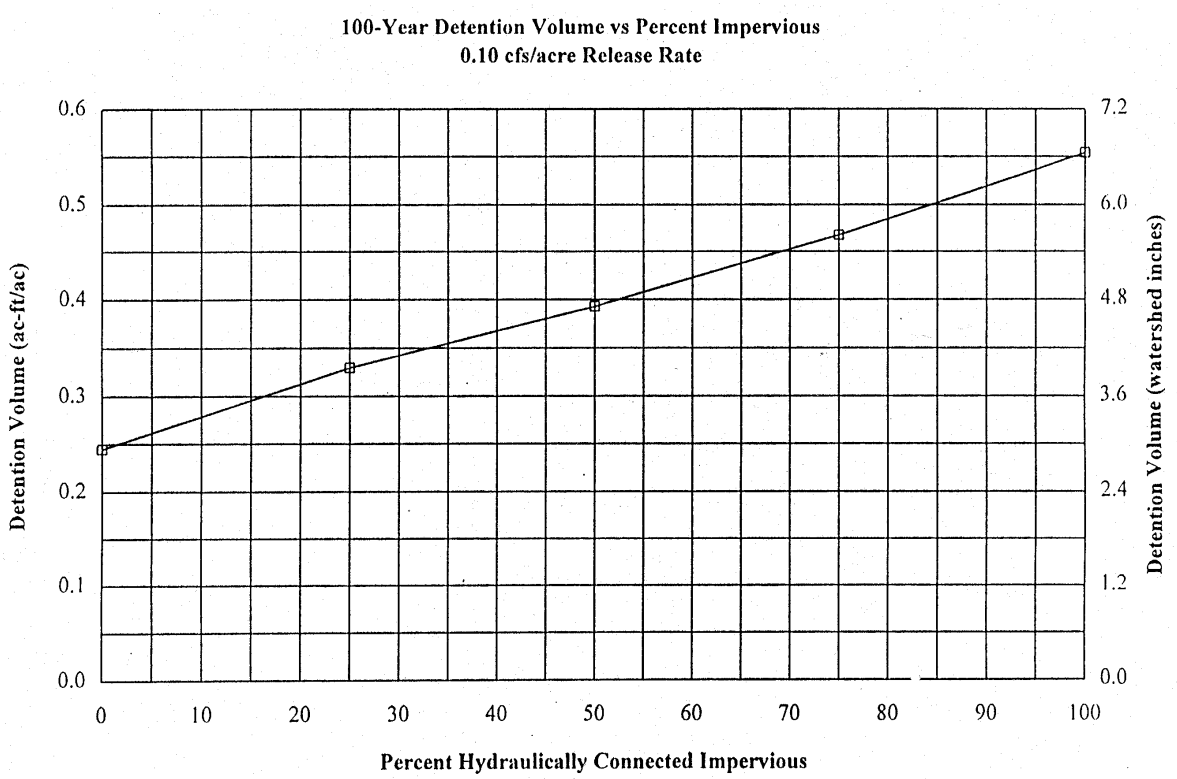
Summary Table 1 shows that the peak discharge from the 100 acre offsite basin is 112 cfs, and the corresponding critical duration is the 3-hour event.

All runoff volumes shall be calculated using the 24-hour duration with a 1% probability of occurrence in any one year. An antecedent moisture condition (AMC) of 2 shall be used for all runoff calculations. An AMC=2 represents average soil moisture conditions.

A simple method for approximating the required storage volume for a development can be determined using the unit area detention method. The Northeastern Illinois Planning commission in their publication, Investigation of Hydrologic Methods for Site Design in Northeastern Illinois (Dreher and Price, 1991), have developed a chart by which unit area detention volumes can be determined from the impervious percentage of the developed site. Figure 7 shows a graph which can be used to approximate the storage. The actual required storage must be determined from an event hydrograph routing method.

Small detention basins serving less than 5 acres of tributary area, where the entire tributary area is within the development, may be sized using the results of a NIPC study that related the percent of impervious area to unit area detention volume.

FIGURE 7
100-Year Detention Volume vs. Percent Impervious



§ T203(d) Existing Release Rate Less Than Allowable

For all developments, the existing conditions release rate must be computed. If the existing release rate for the design storm event with a 1% probability of occurrence in any one year with a 24-hour duration is less than 0.1 cfs/acre, then that will be the developed release rate. It is common for sites with small amounts of tributary area and significant depressional storage to have the existing undeveloped release rate less than 0.1 cfs/acre.

§ T203(e) Downstream Water Surface Elevations

Outfalls are hydraulic structures whose capacity is governed by a balance between upstream and downstream head. Outfall capacity must be calculated within the range of differences in upstream and downstream hydraulic grade line that can be expected to occur statistically for a 100-year return period. It is important to make realistic assumptions about the outfall capacity.

Calculations should assume free outfall conditions only if hydraulic grade line calculations for the discharge channel indicate the outfall will be free during major storms. Hydraulic grade line evaluations must proceed upstream from:

1. A demonstrated free overflow; or

2. The expected 1% probability in any 1-year flood elevation at the most downstream point analyzed; or

3. An alternative assumption demonstrated to be appropriate and conservative.

When the outfall occurs in a regulatory floodplain, see the discussion in T203(i).

§ T203(g) Retention Requirement

The retention requirement compensates for the amount of rainfall that typically is absorbed into the ground from pervious areas, prior to surface runoff. Studies have been performed that indicate the first 0.75 inches of rainfall are absorbed into the ground from pervious areas before the ground becomes saturated under typical agricultural row-crop uses. To compensate for the hydraulically connected impervious areas that do not provide any possible absorption of rainfall into the ground, the development must retain the hydraulically connected impervious area times 0.75 inches. The volume is to be retained below the primary gravity outlet for which the 1% probability storm event is designed. The retained volume should be designed to infiltrate into the ground at a rate that empties the retention volume no earlier than 5 days after the storm event.

The retention volume may be reduced or compensated for, by providing other measures on-site. An alternative plan to providing the retention volume required must be presented and deemed acceptable by the Administrator. In order to reduce the amount of the retention volume, the developer can plant in open areas deep-rooted native vegetation that are capable of greater infiltration than typical lawn/turf grasses. The soils in the areas of deep rooted native grasses should be susceptible to infiltration. Such planted areas should be dedicated as part of the stormwater easements for the site and have a short and long term maintenance program. Most importantly, the runoff from the hydraulically connected impervious areas should be directed into the planted areas to obtain the benefit of runoff reduction. There is practically no benefit to a planted area that is located upstream of the hydraulically connected impervious areas.

Figure 8 illustrates the concept of providing deep rooted native vegetation around a detention pond. The area provided for the plantings is larger than the hydraulically connected impervious area, therefore, assuming the plan meets the Administrator's approval, no retention volume is required. Figure 8 also illustrates that the runoff conveyed from the storm sewer system is discharged across the planting area prior to entering the detention system. The planted area negates the requirement for the retention volume due to the increased infiltration volume but does not or will not affect the required detention volume for the development.

Subsurface drainage systems, such as field tiles, can be used to assist in the infiltration of the retention volume. Figures 9, 10 and 11 illustrate the use of a field tile system in conjunction with the discharge of the retention volume. Because the bottom will be wet over an extended period of days, wetland vegetation should be used which can handle the extended wet durations. The Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois (NRCS, et. al., 1997) has a list of applicable wetland plantings. The wetland plantings will benefit the water quality of the runoff being filtered through the retention pond. Figure 12 illustrates how the retention volume can be designed for a give project.

Evaporation can be accounted for over the designed retention area. A typical average evaporation rate for the summer months is 4.2 in/month. All subsurface drainage pipes shall be separated by at least 10 feet from those drainage pipes connected to the detention basin, as illustrated in Figure 13.

FIGURE 8
Conceptual Park Area to Compensate for Retention Volume

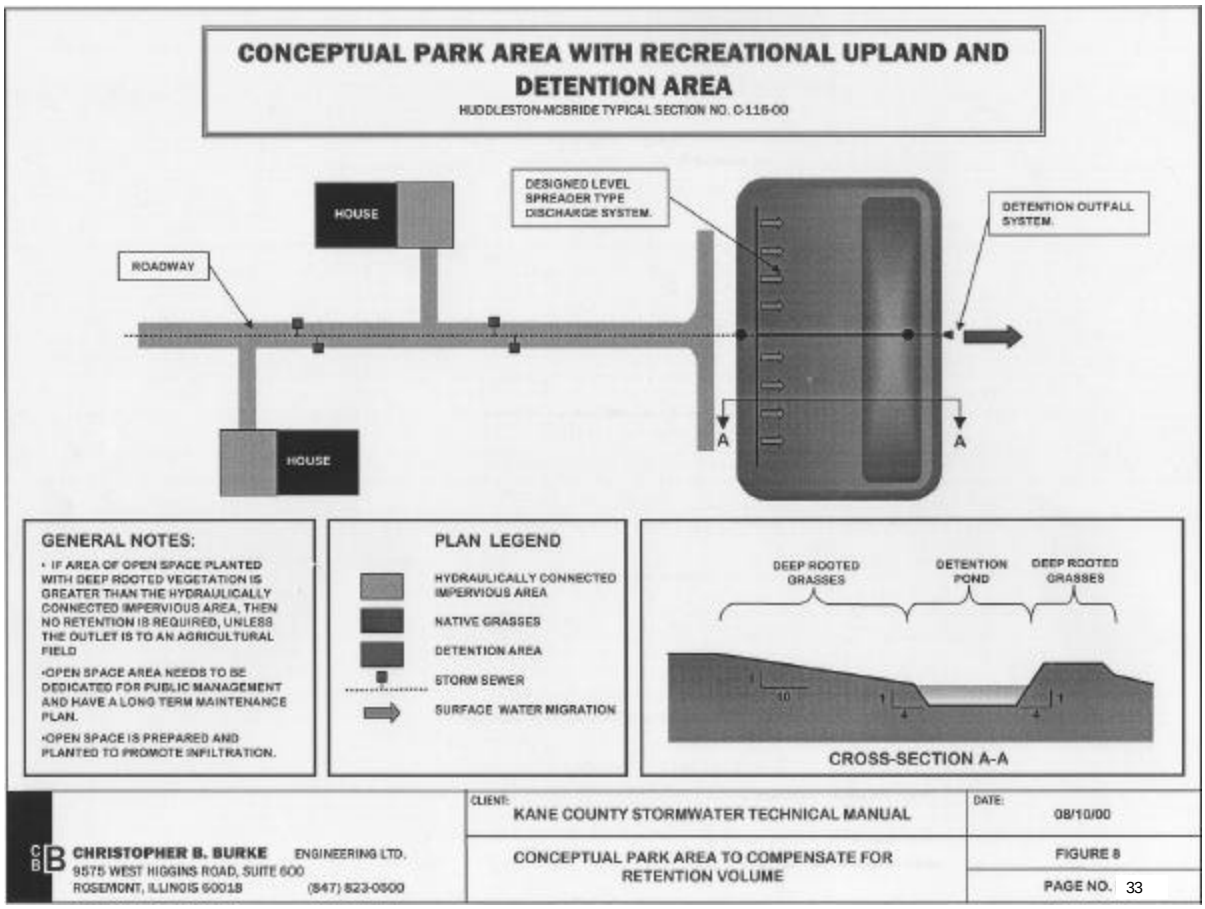


FIGURE 9
Detention Configuration for Proposed Requirements
When Water Table is Above Pond Bottom

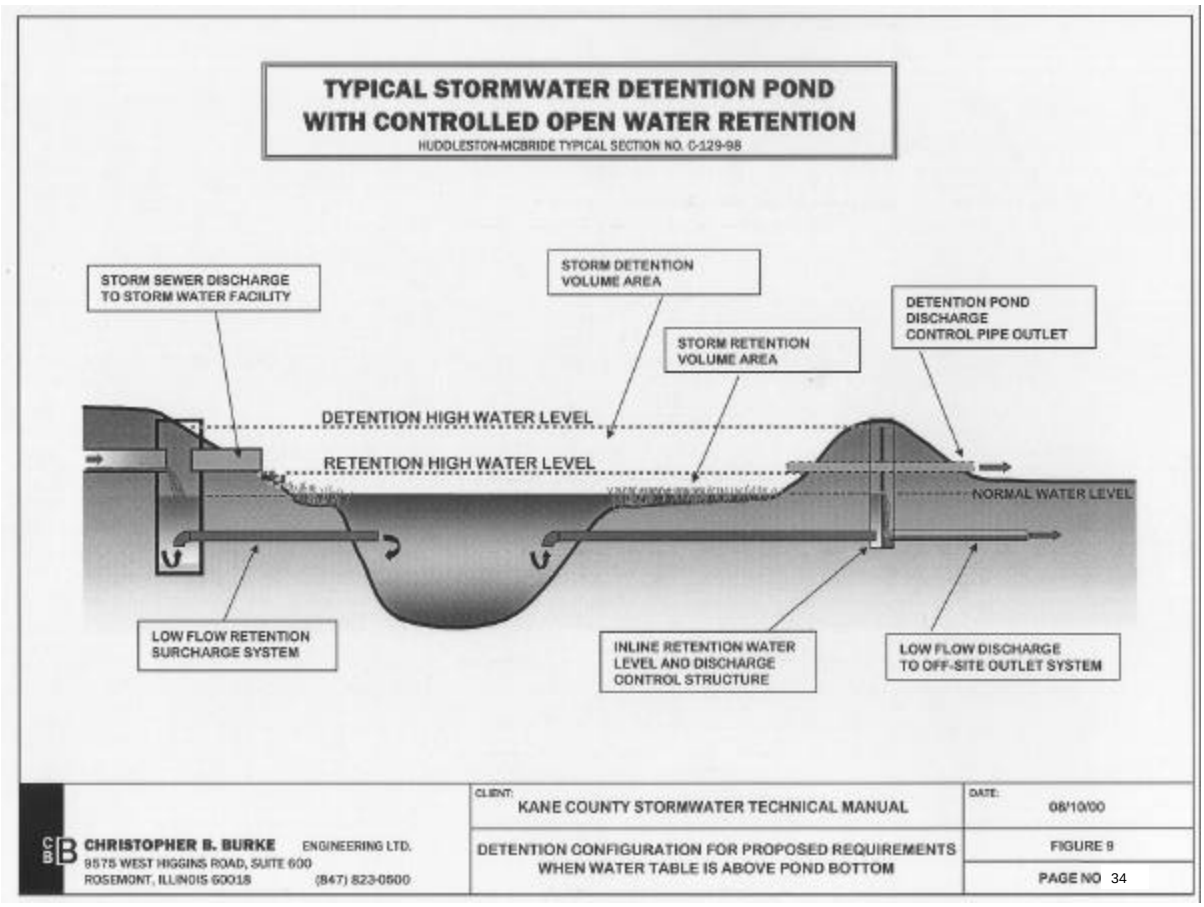


FIGURE 10
Detention Configuration for Proposed Requirements
When Water Table is Below Pond Bottom

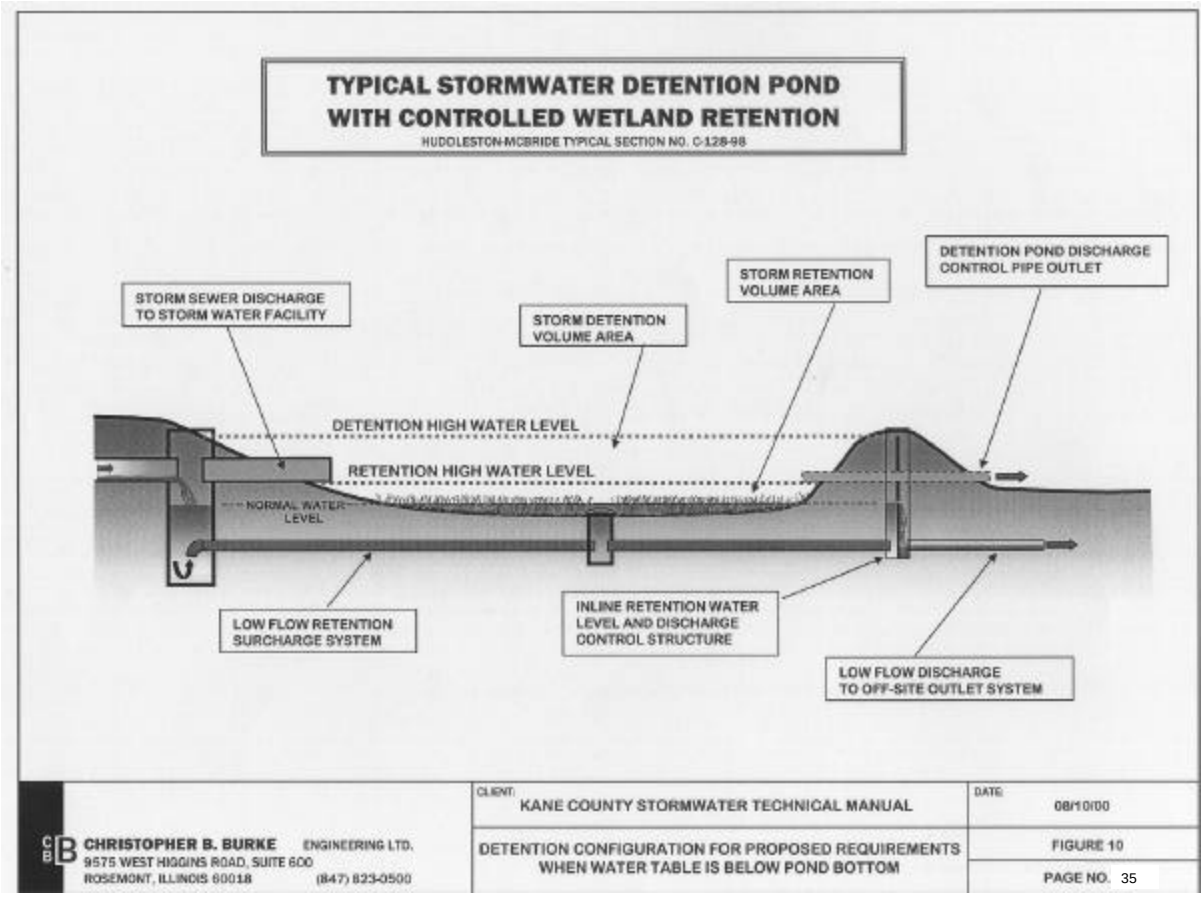


FIGURE 11
Detention Configuration for Proposed Requirements
When Water Table is Above Pond Bottom

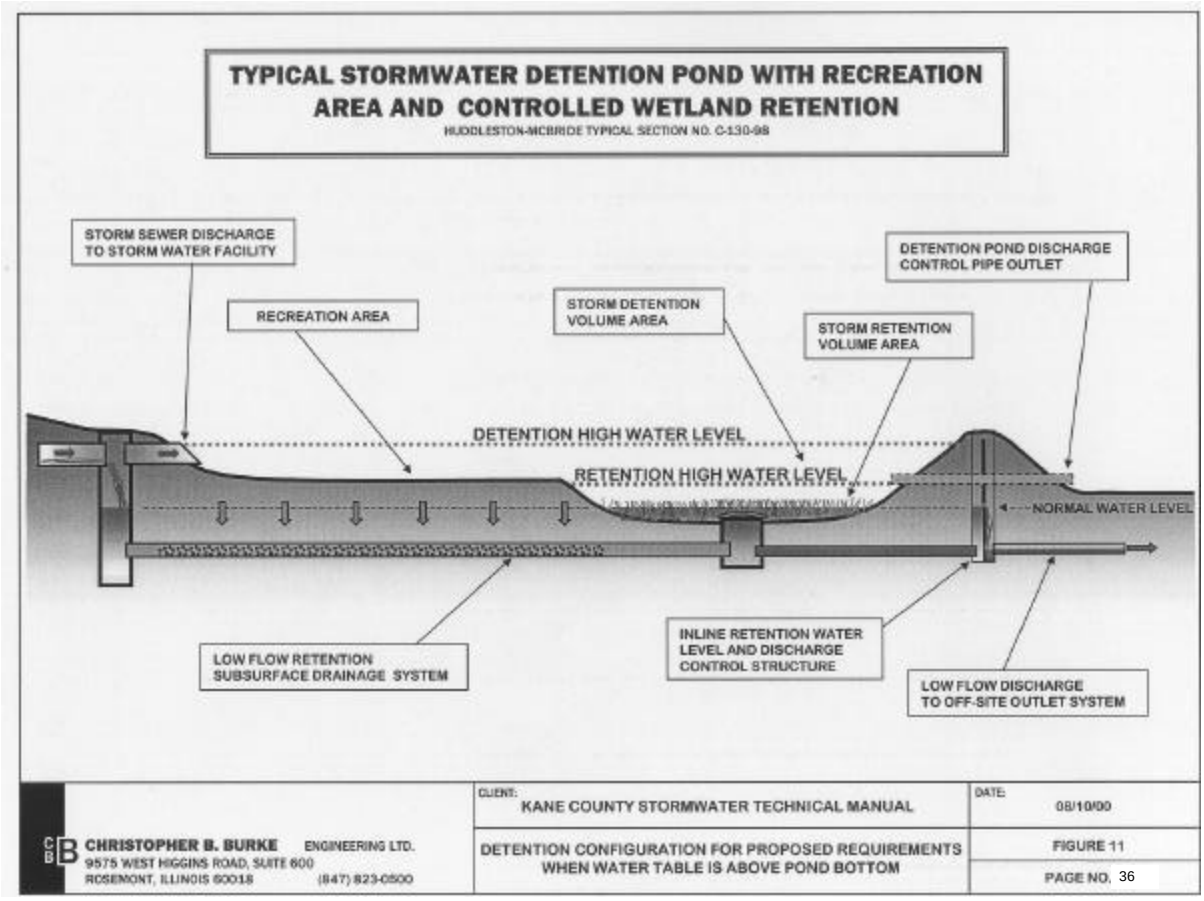


FIGURE 12
Control Structure Configuration Requirements for
Agricultural Drain Tile Connection

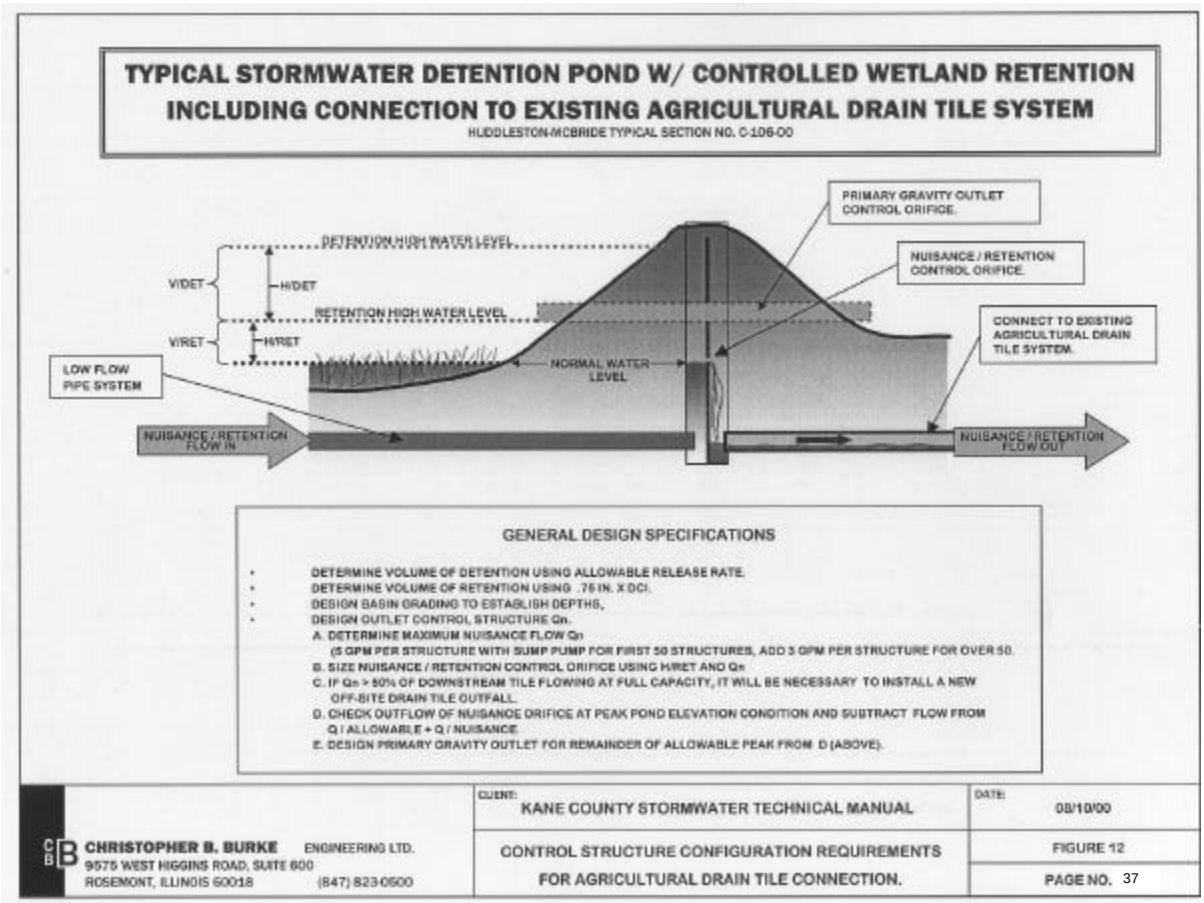
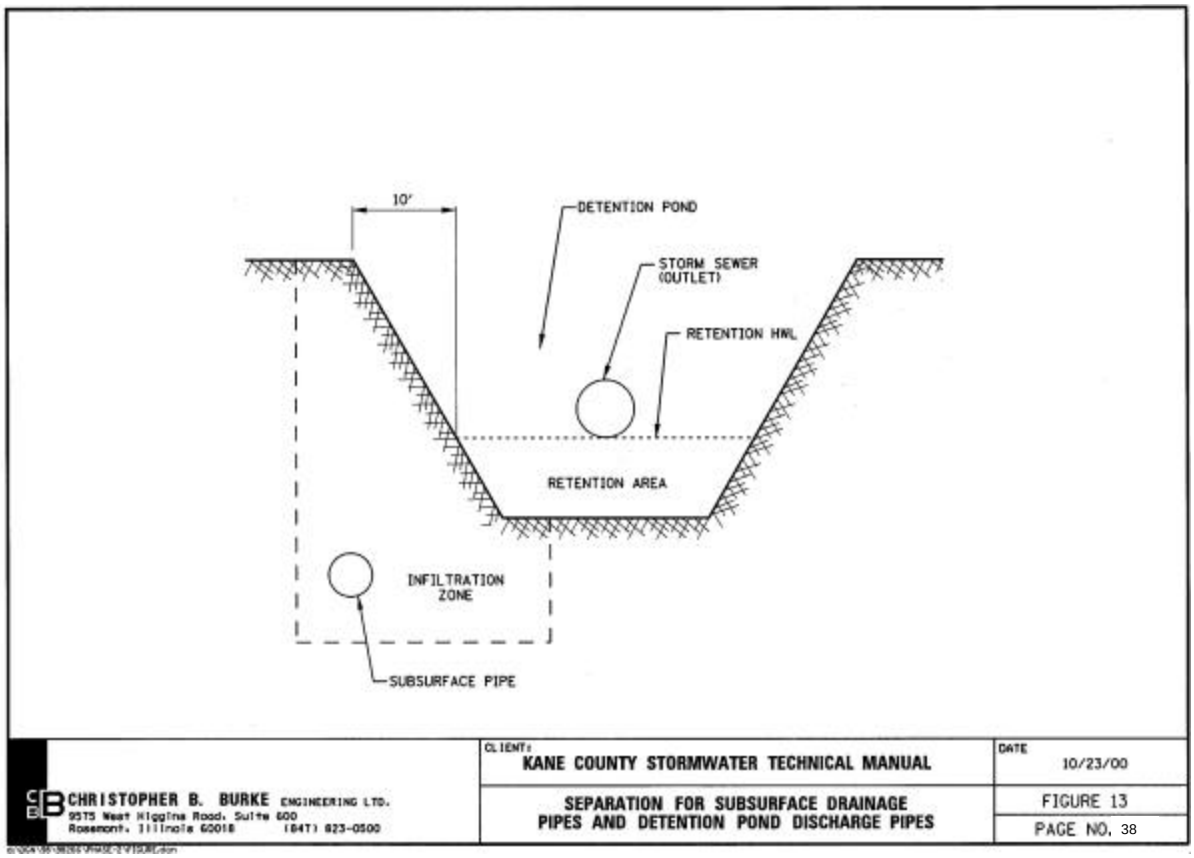


FIGURE 13
Separation for Subsurface Drainage Pipes and
Detention Pond Discharge Pipes



§ T203(h) Site Runoff Storage Facility Design Requirements

The steps in designing the site runoff storage facility are as follows:

1. Determine the site and development area and the natural outlet point(s).

2. Calculate the off-site tributary area and the corresponding peak runoff rate from the 100-year, critical duration design storm event.

3. Determine if regulatory floodplain or floodway exists on the development site.

4. Calculate the existing release rate from the site, accounting for any depressional storage.

5. From the hydrologically disturbed area, determine the percent impervious area and calculate the approximate detention volume required using Figure 7.

6. Determine the location(s) of stormwater storage facilities and the existing outlets, including invert/overland flow elevations.

7. Calculate the required retention volume following the procedure outline in § T203(g).

8. Determine the allowable fluctuation in water depth (bounce) due to site topography and the outlet elevation. Subtract 1 to 2 feet from the bounce for controlling the existing conditions pre-development peak runoff rate from the 100-year, critical duration rainfall event that will be conveyed should the primary restrictor in the detention facility become blocked. Depending on the required volume and storage facility configuration, the 100-year existing conditions pre-development peak runoff rate could be controlled with less than 1 foot of fluctuation over the design high water elevation.

9. Use an event hydrograph routing method to iterate the size of the detention pond knowing the allowable release rate, an approximate storage volume, and allowable bounce elevation, and modeling the inflow hydrograph from the development area.

10. The storage facility slopes should be planted with vegetation that can withstand the designed water elevation fluctuation.

§ T203(i) Site Runoff Storage Facility Requirements Within the Regulatory Floodplain

The Ordinance does not prohibit the construction of site runoff storage facilities in the floodplain, but requires that their design consider carefully the function of the facility during flood flows. Detention volume sizing shall assume a free discharge, establishing a required volume. However, analysis of the operation of the facility must consider the requirement that existing conditions 100-year peak runoff rate not be exceeded where the restrictor is blocked. “Berming off” of existing floodplain storage and uncontrolled site discharge (on-line storage) is highly discouraged. Excavating “new” storage in the floodplain and controlling the discharge while allowing overflow into basins of the stream system for infrequent floods can be beneficial to the watershed.

If it can be shown using detailed hydrologic and hydraulic analysis that the design of a storage facility within the regulatory floodplain provides a watershed benefit, the Administrator may approve the design. To show a watershed benefit, the applicant must demonstrate that there is a decrease in flood elevations for the 100-year, critical design storm event, either upstream and/or downstream of the development site. The decrease in elevation should be greater than 0.1 feet and in no locations, upstream or downstream of the development site should water surface elevations increase.

§ T203(j) Requirements Within the Regulatory Floodway

A hydrologic and hydraulic analysis must be performed to demonstrate no adverse impact upstream or downstream of the development site, as well as demonstrating that the required site storage volume will actually be available under all stream conditions. The storage facility shall provide a net watershed benefit.

§ T203(l) Off-Site Facilities

It is assumed that the site runoff storage will normally be located on the development site. If this is not the case, then the runoff storage site will itself constitute a development site and be subject to all of the requirements for development under the Ordinance.

The storage volume in the offsite facility, therefore, must be at least equal to the sum of the storage volume required for the original development, plus the volume required for development of the storage facility. If any other areas drain to the storage facility, additional storage volume must be provided as indicated under “Off-Site Flows”, above. Further, the developer must demonstrate that the required storage volume is intentionally and

operationally available under the full range of hydrologic and hydraulic conditions from dry weather to base flood conditions.

Runoff from the development site must be conveyed to the storage site. It precludes the option of oversizing an offsite storage volume and undersizing the outlet to compensate for allowing a larger discharge rate on the original development site. Conveyance from the development site to the storage site must be sized to convey the base flood peak flows considering both tailwater and headwater hydraulic conditions.

§ T203(m) Structures Built Across a Channel for Site Runoff Storage Facilities

Where a stream traverses a development site, special considerations for the location of detention facilities are warranted. The practice of building an impounding structure or dam across the stream to meet detention requirements is often problematic when a longer term view of the stream system is taken. In perennial streams, which in general are streams that exhibit a constant flow, a number of other processes are at work which the cross stream structure interrupts. These are (1) the movement of sediments downstream and (2) distribution of nutrients to aquatic organisms. In general the impact of this interruption is much more severe on perennial than intermittent streams where these processes are more likely to be in evidence. Therefore, structures built across a channel to impound water to obtain the required site runoff storage requirements are prohibited on any perennial stream unless it is part of a public flood control project with a net watershed benefit.

A stream's bed and bank configuration at any given time is related to a number of factors, but generally it is a product of the base flow, energy gradient, total sediment load, and size of the sediment particles. A change in any one of these four factors causes the stream to experience a long period of instability that tends back towards stability in a new configuration. A dam can effect the base flow of the stream and interrupts the sediment load that the stream is carrying. Sediment starved discharges from the impoundment pick up a new sediment load downstream. Increases in the base flow velocity can cause stream banks to widen in response to seeking equilibrium.

An ephemeral stream has no base flow by definition. The ephemeral portions of streams are located in the upland watershed where under certain circumstances cross stream structures can actually be beneficial to the watershed on a regional basis when considering peak discharges.

When no better information is available, USGS 7.5-minute quadrangle maps can be consulted for the location of a intermittent stream. Intermittent streams are shown as "broken blue" lines. Where a stream is shown as a "solid blue" line on these maps, they are assumed to be perennial unless

better information is submitted and accepted by the Administrator. Better information may include documented flow monitoring. The flow monitoring must be carried on for a minimum of one water year (October 1 through September 30) and documented by an individual who has had training in stream monitoring protocol and statistical analysis of stream flows.

Streams are shown as other than solid blue lines on a USGS Quadrangle Map may be assumed to be intermittent if they have a defined bed and banks and no flow is observed in them for some period of time. Where no bed and banks of a stream are observed, or above the discharge point of agricultural field tile systems, streams may be assumed ephemeral.

Stream stability calculations must document the streams current geomorphological classification for a significant reach downstream and upstream that would be influenced by the proposed dam. This length can vary based on the particular conditions but should be assumed to be no less than one thousand feet upstream of the pool and downstream of the impounding structure. This distance may extend off site. The submittal must include documentation that the proposed dam will not substantially change the base flow of the stream system, nor exacerbate known stream instability problems within the influenced reach. This submittal also must document the likelihood that other aquatic resources are present and what impact the cross stream structure would be on these resources. Where the impacts can not be adequately mitigated then the cross stream structure should be considered prohibited.

These requirements are in addition to any requirements imposed by the U.S. Army Corps of Engineers (COE) in their permitting process or other requirements imposed by this ordinance. Also, any impounding structure must also satisfy Illinois Department of Natural Resources – Office of Water Resources Dam Safety permitting requirements.

ARTICLE 3 – EROSION AND SEDIMENT CONTROL

Erosion and sedimentation are naturally occurring geological phenomena. Land development activities have initiated more drastic, undesirable and damaging alterations in the natural cycle by accelerating the erosion – sedimentation process. The original natural vegetative cover of prairie grasses, trees and shrubs allowed only a minimal amount of soil to be eroded. But as soon as cover was disturbed, first by the plow, and more recently by development activities, the exposed ground surface has become subject to accelerated stormwater runoff and resultant soil erosion. The primary cause of soil erosion is the energy impact of the falling rain on the exposed soil.

Stream beds tend to build-up with sediment during the construction phase of development and then erode dramatically as the area stabilizes and runoff increases. As such, erosion interferes with water uses, degrades water quality, destroys natural plant growth and buries substrates important for fish feeding and spawning.

§ T300(a) Site Planning

The primary goal of any erosion and sediment control site plan should be to prevent soil erosion by minimizing the amount of bare soil exposed at any one time during construction. On-site sediment control is a secondary mechanism to prevent eroded soil from leaving the development site. Soil erodibility factors have been calculated for all soil types in the County and are shown in Table 5. The potential erodibility of surface soil becomes greater with an increase in the erodibility co-efficient (k) used. Soil type information will provide assistance to the designer in selection of appropriate management practices for both temporary and permanent stabilization.

TABLE 5
Soil Erodibility

Soil Map Unit	Soil	Surface Erosion Factor (k)	Subsoil Erosion Factor (k)
24	Dodge	.37	.37, 9”-24”/.24 below 37”
27	Miami	.37	.37
59	Lisbon	.28	.43
60	LaRose	.32	.32
62	Herbert	.32	.43
67	Harpster	.28	.28
69	Milford	.28	.43
76	Otter	.28	.43
82	Millington	.28	.28
93	Rodman	.20	.10
103	Houghton	---	---
104	Virgil	.32	.43, 9”-48”/.28 below 48”
105	Batavia	.32	.43
125	Selma	.28	.28

Soil Map Unit	Soil	Surface Erosion Factor (k)	Subsoil Erosion Factor (k)
134	Camden	.37	.37/.32 below 34”
145	Saybrook	.32	.43, 18”-26”/.37
146	Elliott	.28	.43
148	Proctor	.32	.43, 13”-37”/.32
149	Brenton	.28	.28
152	Drummer	.28	.28
154	Flanagan	.28	.37
171	Catlin	.32	.43
194	Morley	.37	.32
198	Elburn	.28	.37
199	Plano	.32	.43
206	Thorp	.37	.37
210	Lena	---	---
219	Millbrook	.32	.32
223	Varna	.28	.37
233	Birkbeck	.37	.37
236	Sabina	.37	.37
243	St. Charles	.37	.32
290	Warsaw	.28	.10
298	Beecher	.37	.37
318	Lorenzo	.28	.10
323	Casco	.32	.10
325	Dresden	.28	.10
327	Fox	.37	.10
329	Will	.28	.28, 15”-31”/.10
330	Peotone	.28	.28
343	Kane	.28	.10
344	Harvard	.32	.43
347	Cannisteo	.32	.32
361	Kidder	..37	.24
369	Waupecan	.32	.43, 13”-38”/.10
442	Mundelein	.28	.43
531	Markham	.37	.32, 7”-31”/.43
570	Martinsville	.37	.37, 14”-42”/.24
656	Octagon	.28	.28
696	Zurich	.37	.37
697	Wauconda	.32	.32
791	Rush	.37	.10
792	Bowes	.32	.10
921	Faxon	.28	---
	Ripon	.32	.32
938	Miami	.37	.37
1103	Houghton	---	---

From current Field Office Technical Guide

Risk	K
Low	< .25
Mod	.25 - .30
High	.30 - .35
Very High	> .35

Consult NRCS for any changes.

§ T300(a)(1) Phased Construction

When site vegetation is inadequate to stabilize areas not currently being constructed in a phased development, several options are available for vegetative stabilization.

1) If construction will occur within one-year the site may be planted with a temporary cover of annual grasses included in Table 6.

2) If construction of the phase will be greater than 1 year, stabilization may be accomplished with a cover that uses a mix of annual and perennial grasses shown in Table 7.

TABLE 6
Seed Mixtures For Temporary Stabilization
Remaining Less Than One Year

Seed	**Rate**	**Soil Drainage**				**Planting Period**
	Lbs./ac.	ED	WD	SP	PD	
Timothy	5		X	X	X	Spring
Kentucky Blue Grass	5		X	X		Spring/Fall
With one of the following:						
Oats	90					Early Spring-July 1
Cereal Rye	90					Early Spring-Oct 15
Spring or Winter Wheat	90					Early Spring-Oct 15
Spring Planting – Early Spring to June 15 **Fall Planting – August 1 to October 15**						

*ED = Excessively Drained; WD = Well Drained; SP = Somewhat Poorly Drained; PD = Poorly Drained

TABLE 7
Seed Mixtures For Temporary or Permanent Stabilization
Remaining For More Than One Year

Mix/Seed	Rate Lbs./ac.	Soil Drainage ED	WD	SP	PD	Planting Period
1. Tall Fescue	24.0	X	X	X		Spring/Fall/Dormant
2. Smooth Brome	24.0	X	X			Spring/Fall/Dormant
3. Tall Fescue or Smooth Brome and Alfalfa	24.0 8.0	X	X			Spring/Dormant
4. Tall Fescue and Timothy or Red Top	14.5 3.0, 3.0	X	X	X	X	Spring/Fall/Dormant
5. Tall Fescue	14.5		X	X		
Red Top	3.0					
Alsike Clover	9.5					
6. Orchard Grass	7.0		X			Spring
Alsike or Ladino Clover	3.5					
7. Timothy and Alsike or Ladino Clover	4.0 8.0		X	X	X	Spring
Hayland Mixtures						
8. Alfalfa	12.0		X			Spring/Dormant
9. Alfalfa and	8.0		X			Spring/Dormant
10. Orchard Grass	4.0					Spring/Dormant
11. Alfalfa and Timothy	8.0 4.0		X	X	X	Spring/Dormant
12. Alfalfa and Tall Fescue or Smooth Brome	8.0 6.0		X	X		Spring/Dormant
With one of the following:						
A. Oats	30					Early Spring-July 1
B. Cereal Rye	30					Early Spring-Oct 15
C. Spring or Winter Wheat	20					Early Spring-Oct 15

*ED = Excessively Drained; WD = Well Drained; SP = Somewhat Poorly Drained; PD = Poorly Drained

Erosion control methods should be appropriate for the size of site, the duration of construction and the slope, length and grade. Soil stabilization with vegetative cover is generally the most effective stabilization. Hydroseeding with mulch application or periodic hydromulching may be used for soil stabilization alone on slopes flatter than 3:1. When hydroseeding does not produce dense vegetation, areas should be re-seeded periodically until growth occurs or if short duration summer stabilization is required and hydroseeding should be supplemented with heavy hydromulching. For steep slopes and drainage ways, erosion control blankets or gypsum-plaster may be more appropriate.

§ T300(b) Standards and Specifications

The "Illinois Urban Manual: A Technical Manual Designated for Urban Ecosystem Protection and Enhancement" is the primary resource for design detail for effective erosion and sediment control.

The "Illinois Urban Manual" may be obtained from the following sources:

Kane-DuPage Soil and Water Conservation District
545 N. Randall Road
St. Charles, IL 60174
(630) 545-7861
or
USDA NRCS
603 E. Diehl Road
Naperville, IL 60563
(630) 505-7808

The "Procedures and Standards for Urban Soil Erosion and Sedimentation Control for Illinois" (revised July, 1988) (The "Green Book") is also available from the Kane-DuPage Soil and Water Conservation District or Public Libraries throughout the Country. Additional information on erosion and sediment control practices including product source guides is available from:

International Erosion Control Association
P.O. Box 774904
1355 S. Lincoln Ave.
Steamboat Springs, CO 80477-4904
(970) 879-3010
ecinfo@ieca.org

§ T300(c) General Requirements

Sediment control facilities are utilized to prevent sediment from leaving the site or entering buffers or special management areas within a development site. Sediment control structures commonly used include, sediment basins, sediment traps and silt fences. Sediment control facilities will be in place for all drainage leaving the site prior to mass grading. Plans for sediment control facilities should include grading or installation plan, sizing information, and maintenance procedures. Straw bale dikes are not preferred sediment control structures and should be used only where other alternatives are impractical.

§ T300(d) Extended Construction Shutdown Periods

The condition of the site for extended construction shut down periods should be one of maximum stabilization and sediment trapping. All of the site that will not be constructed prior to the fall planting season should be stabilized with appropriate vegetative cover. The fall planting season ends on approximately October 15. Temporary seeding should be completed by this date. From October 1st until October 15, heavy mulch should be applied with the seed to prevent seedling losses to early frost. Prior to October 1st standard mulching rates apply. In years with prolonged summer droughts, heavy mulching should be applied with all seeding. The use of erosion control blankets with seeding is preferred on slopes 3:1 or greater and that are more than 100 feet in length.

Areas that are to be worked after October 15th shall be stabilized with tacified heavy mulch or erosion control blankets.

§ T300(e) Hydraulic and Hydrologic Design Requirements

Construction of sediment control structures is economically most practical when combined with stormwater management facilities. Because the site must have sediment control prior to mass grading, construction of the permanent detention facility as a sediment stilling basin is preferred. The ordinance sets a minimum design standard for sediment basins and traps that is commensurate with the duration of the rainfall event and the size of the drainage area.

For all areas greater than 3-acres, the minimum storm frequency to the detained for sediment removal is as follows:

Project Length	Design Event	Probability of Occurrence
< 6 months	2 year	50%
6 months – 1 year	5 year	20%
> 1 year	10 year	10%

Sufficient volume shall be created to retain all sediment from these design storm events. The facility shall be sized to hold the required volume for a period not less than 10-hours. This is the minimum settling time necessary to remove a substantial volume of the sediment from the runoff. To achieve a minimum 10-hour detention time from a 10-year, 24-hour storm event, the maximum design outflow would be limited to 0.065 cfs per acre-inch of runoff. The actual size of the facility may need to be larger where a site has one or more of the following conditions:

- The area of disturbance is greater than 75% of the maximum.
- Long or steep unvegetated slopes are present and will remain unstabilized for periods in excess of 7 days.
- The site drains into an adjacent wetland or special aquatic resource.
- The site drains into a previously developed parcel.
- The site drains across public highway or off-site private road.

§ T300(f) "As Needed" Practices on the Plans

"As needed practices" provide the permitee and the Administrator with a means to correct a deficiency in the management of erosion or in sediment control. Measures should be divided into temporary stabilization and sedimentation control measures. For each of these measures a typical detail should be provided. The project budget and contract should include each as well on a per unit basis.

Sediment Control (Figure 14)

a) Sediment Basins
b) Sediment Traps
c) Silt Fences

Stabilization (Figure 15)

a) Temporary Seeding
b) Mulching
c) Erosion Control Blankets
d) Sod

FIGURE 14A
Sediment Control Practices

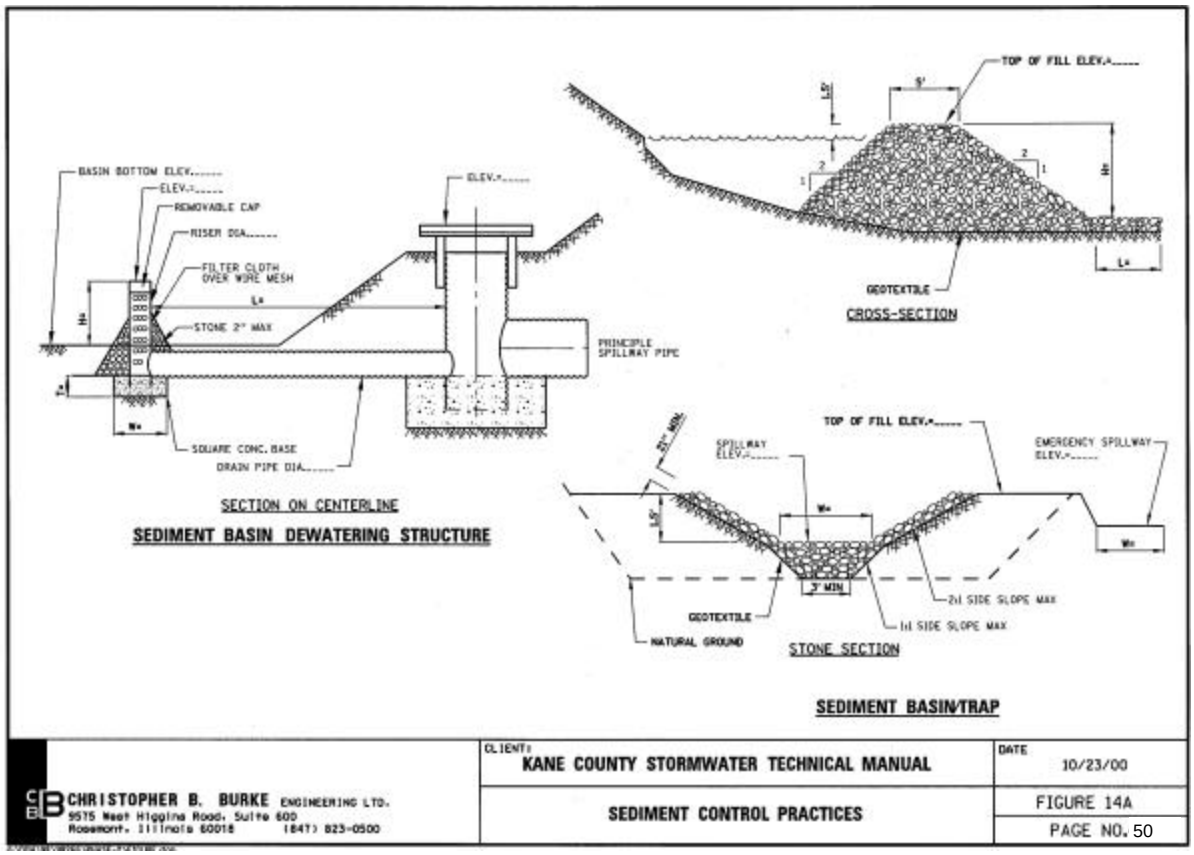
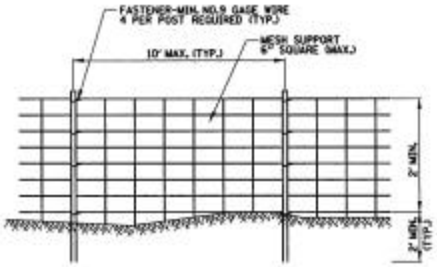
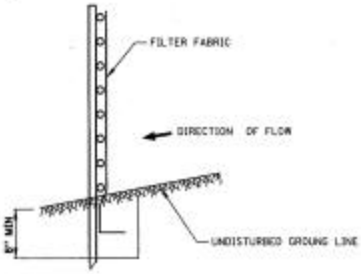


FIGURE 14B
Sediment Control Practices

TEMPORARY SWALE
(Feet)
CODE 980



ELEVATION



SILT FENCE

CHANNEL CROSS-SECTION REQUIRMENTS

	A	B
DRAINAGE AREA	<5 ACRES	5-10 ACRES
BOTTOM WIDTH FLOW CHANNEL	4 FEET	6 FEET
DEPTH OF FLOW CHANNEL	1 FOOT	1 FOOT
SIDE SLOPES	2:1 OR FLATTER	2:1 OR FLATTER
GRADE	0.5% MIN.	0.5% MIN.

CHANNEL STABILIZATION REQUIRMENTS

TYPE OF TREATMENT	CHANNEL GRADE	A <5 ACRES	B 5-10 ACRES
1	0.5-3.0%	SEED & STRAW MULCH	SEED & STRAW MULCH
2	3.1-5.0%	SEED & COVER W/ JUTE	SEED & COVER W/ JUTE OR EXCELSIOR; SOD; OR, LINE W/ IDOT CA-2 OR CA-3 COARSE AGGREGATE
3	5.1-8.0%	SEED & COVER W/ JUTE OR EXCELSIOR; SOD; LINE W/ IDOT CA-2 OR CA-3 COARSE AGGREGATE	LINE W/ IDOT RR-3 ROCK
4	8.1-20.0%	LINE W/ IDOT RR-3 ROCK	ENGINEERING DESIGN

CHRISTOPHER B. BURKE ENGINEERING LTD.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018 (847) 823-0500

CLIENT: KANE COUNTY STORMWATER TECHNICAL MANUAL

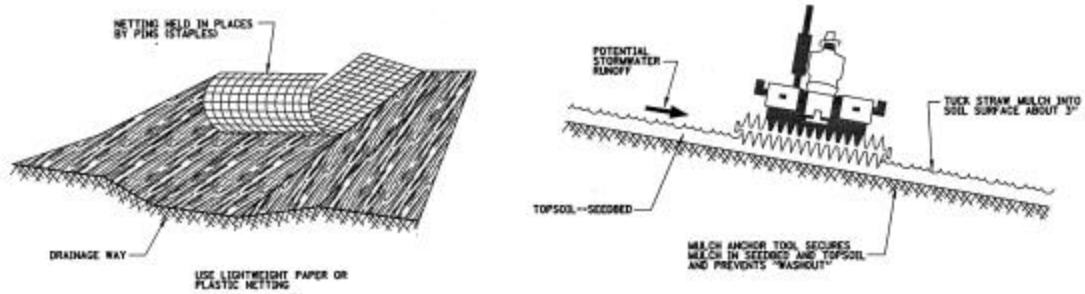
SEDIMENT CONTROL PRACTICES

DATE 10/23/00

FIGURE 14B

PAGE NO.: 51

Figure 15A
Soil Stabilization Practices



MULCH TYPE	EROSION CONTROL	SEED ESTABLISHMENT	REMARKS
STRAW	MEDIUM	MEDIUM	LEVEL, NON-WINDY APPLICATIONS ONLY
PUNCHED STRAW	MEDIUM	HIGH	GENTLE SLOPES
NET ANCHORED STRAW	HIGH	HIGH	SLOPE TO 3:1
TACIFIED STRAW	HIGH	MEDIUM	SOME SEED ESTABLISHMENT PROBLEMS
WOODCHIPS	MEDIUM	LOW	LEVEL GROUND ONLY
WOOD FIBER	MEDIUM	HIGH	HYDRO-APPLY, COMMONLY W/ TACIFIER
MULCH BLANKET	MEDIUM	MEDIUM	
EXCELSIOR BLANKET	HIGH	HIGH	ALL SLOPES; ALL CONDITIONS EXCEPT SHADE
STRAW COCONUT MAT	HIGH	HIGH	ALL SLOPES; ALL CONDITIONS EXCEPT SHADE

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CLIENT: KANE COUNTY STORMWATER TECHNICAL MANUAL

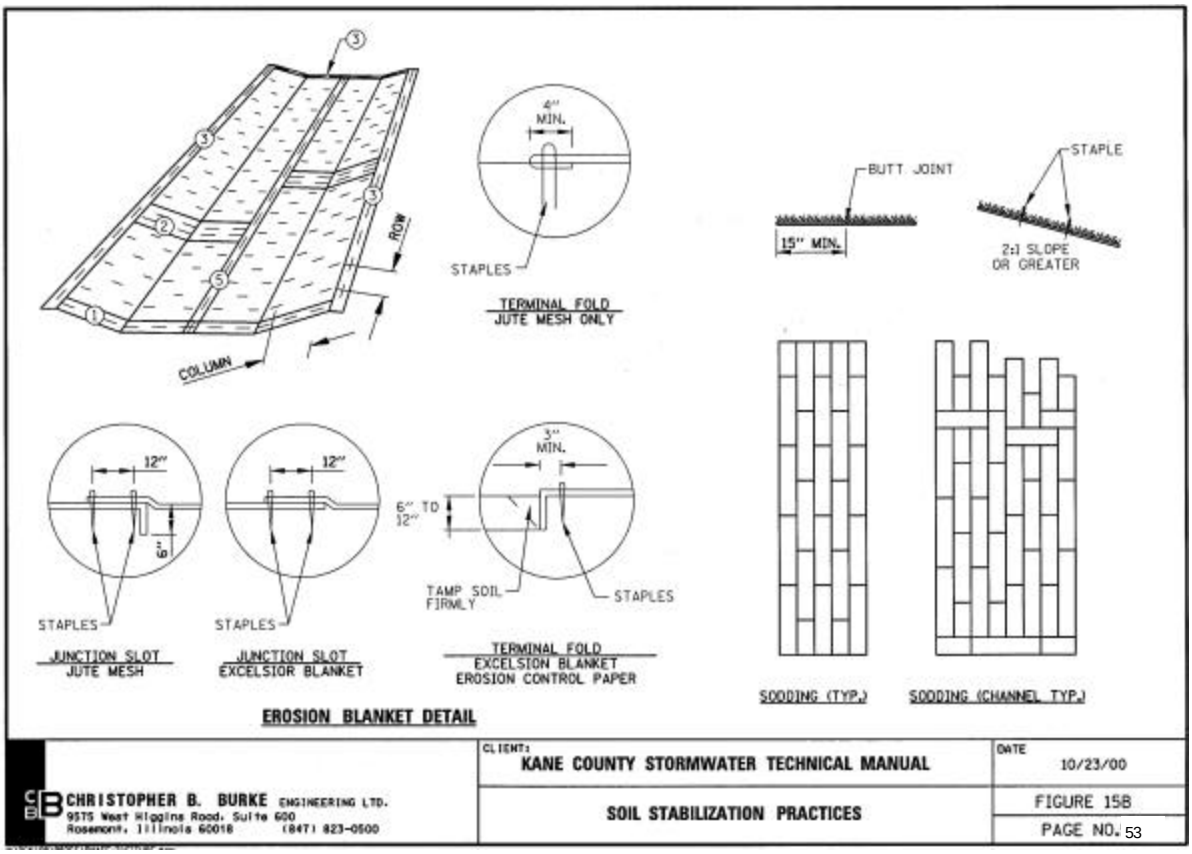
SOIL STABILIZATION PRACTICES

DATE 11/14/00

FIGURE 15A

PAGE NO. 52

Figure 15B
Soil Stabilization Practices



§ T300(g) Limitation on Site Disturbance

The limitation on site disturbance is in recognition of the need to prevent erosion in preference to controlling sediment. Site disturbances shall not exceed 20 acres at any one time unless it is to balance cut and fill, for which a maximum of 40 acres may be disturbed at any one time. The Administrator has considerable flexibility to vary the maximum area of disturbance based on site or project specific conditions, or in recognition of a particularly effective plan with aggressive and effective implementation. The amount of area open to erosion at any one time poses a risk for delivery of sediment downstream and the risk needs to be minimized consistent with the requirements of getting the project constructed.

The plan for limiting disturbance should be fully developed with both the applicant and the contractor and may not be finalized until a permit is issued but before construction. It should also be flexible to meet the challenges of Kane County weather patterns in the prime construction season.

Certain areas will be disturbed repeatedly, such as utility corridors and haul roads. These areas are not exempt from sediment and erosion control, but when defined on a plan or in the field, do not become subject to the limitation on disturbed area.

Areas such as sedimentation basins and detention/retention facilities are also exempt from the area limitations.

Outside the normal spring and fall planting seasons, temporary stabilization may be accomplished by hydroseeding with heavy mulch. Multiple treatments may be necessary to adequately stabilize the site. The use of erosion control blankets with or without seed also meet the requirements.

Permanent stabilization requires the placement of seed or sod. In the case of dormant season seeding the use of erosion control blankets or heavy mulching with permanent seeding satisfies the requirement. The use of heavy mulch may require multiple treatments depending on weather conditions and dislodgment protection.

§ T300(h) Erosion and Sediment Control Plan Requirements

Figure 16 illustrates the minimum components necessary for an erosion and sediment control plan sheet. The plan should clearly detail all phases of site construction and the erosion and sediment control practices to be installed. All permanent stabilization is to be shown on a separate plan sheet using practices shown in Table 8.

FIGURE 16
Sediment and Erosion Control Plan

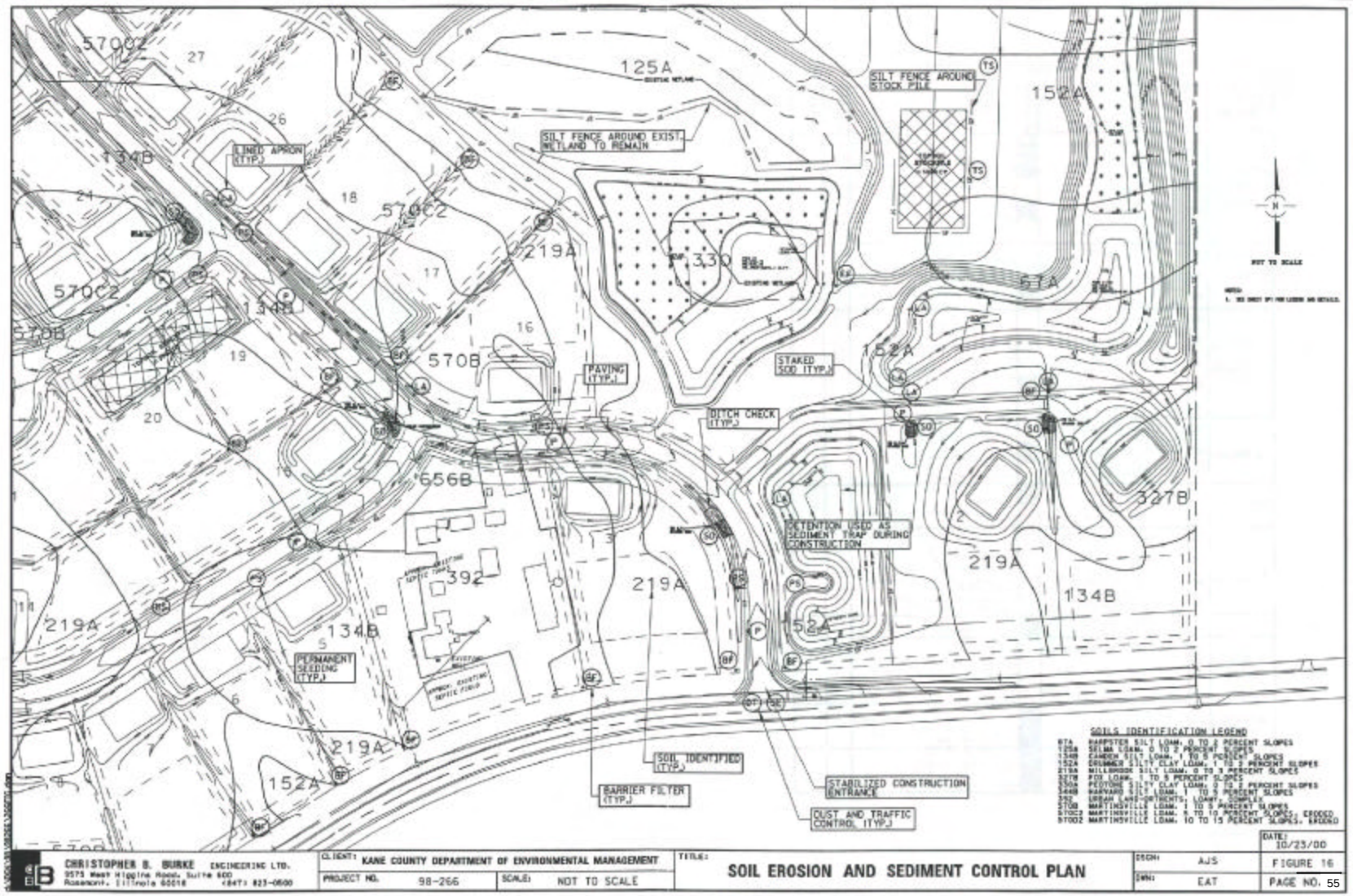


TABLE 8
Permanent Stabilization Practices

Permanent Stabilization Strategy	Urban Manual Code	Sheet & Rill Erosion	Rill & Gully Erosion	Stream-bank Erosion	Stream Channel Erosion	Nutrients, Heavy Metals & Salt	Flooding	Increased Peak Discharge	Sediment Damage
Urban Stormwater Wetlands	880				Excellent	Excellent	Excellent	Excellent	Excellent
Erosion Blanket	830	Good	Fair	Fair	Fair				Fair
Filter Strip (Buffer)	835	Good		Excellent	Excellent	Good			Excellent
Vegetated Channels (Swales)	840			Good	Good	Fair	Fair		Fair
Infiltration Trench	847	Fair	Fair			Fair		Fair	
Level Spreader	870	Fair	Fair	Fair		Fair			Fair
Mulching	875	Good	Good	Fair		Fair		Fair	
Permanent Seeding	880	Excellent	Excellent	Good		Good			Good
Permeable Pavement	890	Fair	Fair	Fair		Fair	Fair	Fair	Fair
Pool & Riffle System				Fair	Good				Good
Rock Check Dam	905		Good						Fair
Rock Outlet Protection	910	Good	Good	Good					Good
Sedimentation Forebay						Good			Good
Sodding	925	Excellent	Excellent	Good		Good			Good
Structural Streambank Stabilization	940			Excellent					Excellent
Vegetative Streambank Stabilization	995			Excellent					Excellent

At a minimum the 2-year and 10-year runoff rates for all off-site flows need to be shown along with an appropriate method for conveying the flows without increased velocities or erosion from within the construction site.

A maintenance schedule and weekly inspection worksheet should also be included. The maintenance schedule should be placed on the erosion and sediment control plan sheet. Form 12 shows an inspection worksheet. The inspection shall evaluate stabilization as well as sediment control. Inspections shall be scheduled weekly and after 0.5 inch of rainfall or greater until permanent stabilization has been completely established. Weekly inspections may be reduced upon installation of permanent stabilization.

§ T300(i) Conveyance of Off-Site Flow

Ditches and waterways that convey off-site flow through the site shall be permanently stabilized upon construction. The permanent stabilization should replace temporary measures but it may be necessary to leave some temporary measures in place while the permanent stabilization establishes. Stabilization of off-site conveyance must protect the downstream land from erosion and sedimentation. Permanent stabilization must therefore include velocity reduction features at the property boundary. Use of level spreaders, lined aprons, and drop inlet pipe spillways are preferred.

§ T300(j) Stockpiles

Stockpiles are not to be placed in any special management areas or buffers. When stockpiles remain for more than 3 days they require temporary stabilization. An adequate distance should be kept between the stockpile and special management areas such that maintenance of stabilization can be performed without entry into the special management area.

§ T300(l) Construction Dewatering

Discharge from site dewatering activities must be maintained in a manner that does not increase on-site erosion, convey sediment off-site or cause off-site flood damages. Dewatering discharge may not be outletted into wetlands on or off-site where practicable, discharge from on-site dewatering shall be routed into the site sediment basin. Thus, sediment basin volume of storage should include site dewatering.

§ T300(m) Protection of Public/Private Roadways

Public and private roadways must be kept free of nuisance soil. Access to the site must be large enough to provide a stabilized construction entrance (Figure 17) of sufficient width and length, on-site parking, and vehicle washdown facility where appropriate. Soil tracked onto public right-of-way

must be cleaned before the end of each workday. Street sweeping provides a mechanism for removal of loose soil materials, but may not be sufficient to remove materials compacted onto the roadway surfaces. Removal of such compacted materials during each workday and when required by the Administrator is also required. Removal of adhered soil materials will be done in a manner that does not damage the roadway or other right-of-way appurtenances.

§ T300(n) Temporary Stream Crossings

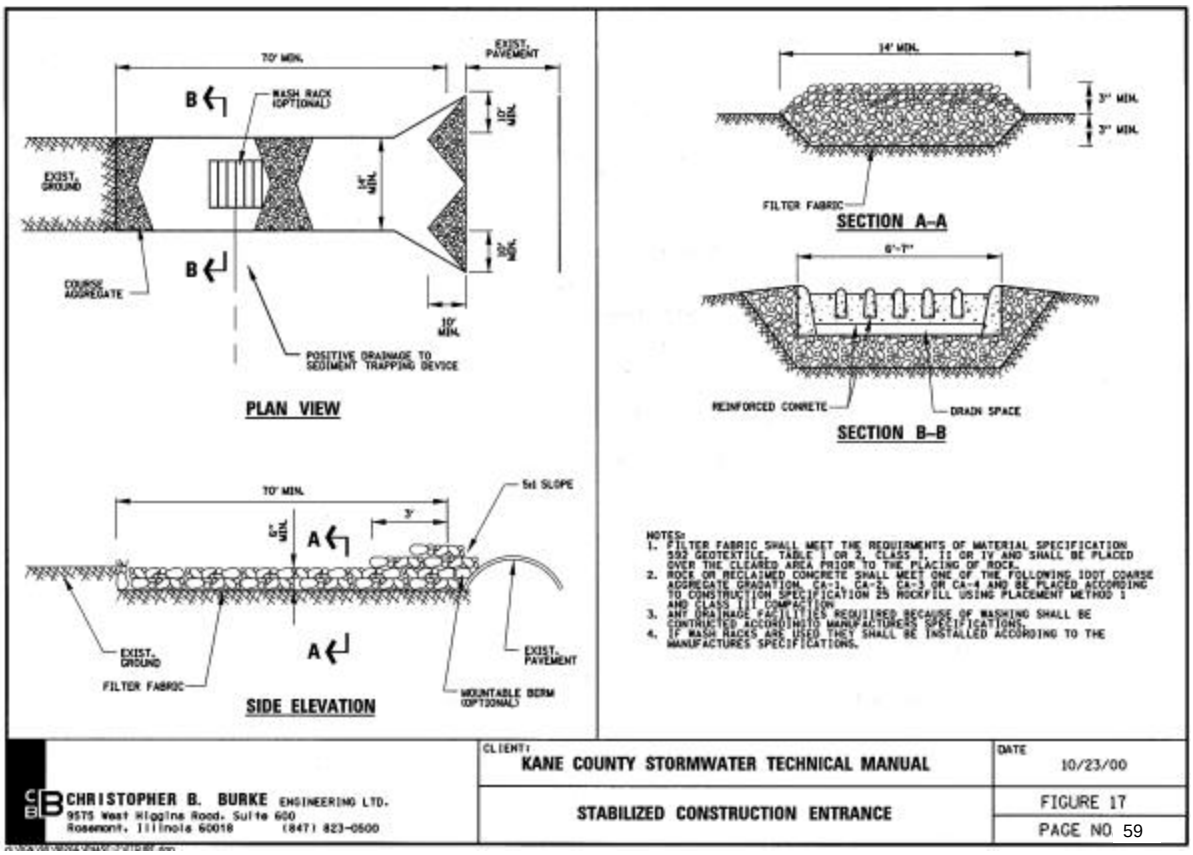
Temporary stream crossings (bridges, fords, and culvert crossings) should be designed for short-term use periods not to exceed 1 year. Temporary stream crossings are to be used only where there is no practicable alternative for moving heavy equipment from one side of a stream channel to another or where light duty equipment must cross a stream frequently for a very short period (<3 months).

Temporary stream crossings are applicable where the upstream drainage area does not exceed one square mile. For areas greater than one square mile, engineered structures should be designed. The following criteria should be addressed when designing temporary stream crossings:

- Erosion and sediment control
- Structural stability
- Safety
- Utility

At a minimum, the structure must be designed to pass the 2-year, 24-hour event and withstand erosion force of the 100-year (BFE) event. The outlet design velocity of the stream crossing structure should be non-erosive for the receiving stream. A swale or other water diversion shall be constructed (across the roadway) on both approaches a maximum of 50 feet on either side of the crossing to prevent direct runoff to the stream.

FIGURE 17
Stabilized Construction Entrance



ARTICLE 4 – PROTECTION OF SPECIAL MANAGEMENT AREAS

A Special Management Area is defined as a floodplain, regulatory floodplains, and waters of the United States including: wetlands, streams, rivers, linear water bodies, and other water bodies.

The Ordinance includes basic objectives for development, which are directly related to special management areas and are summarized below:

1. Prevent damages, including loss of life and inconveniences to the public, due to periodic flooding, to the greatest extent possible.

2. Assure the new development does not increase flood hazards to others.

3. Minimize new financial burdens for taxpayers for operations related to flooding.

4. Promote the orderly development of land and water resources and conserve the natural functions of floodplains.

5. Maintain and enhance the special aquatic resources of the County.

§ T401 Disclaimer

This Section notes that the Ordinance does not abrogate the permitting requirements or Authority of the State as administered by IDNR-OWR for floodplains. The Ordinance also does not require that approvals or other letters of exemption be obtained from IDNR-OWR in situations covered by Statewide floodplain construction permitting program. There are requirements in the Ordinance that are more strict than the 3700 and 3708 rules administered by IDNR-OWR, and those more strict rules must be observed when applicable.

§ T402 Statewide and Regional Permits

The Ordinance recognizes the general and specific conditions of the Statewide Permits and Regional Permits. For projects which meet the tests for applicability, and can meet the requirements of these permits, no additional requirements of the Ordinance with respect to floodplains apply. The applicant must send the Administrator documentation that the project complies with a Statewide or Regional permits.

§ T403 Floodplain Management

The applicant must identify floodplain limits using the best available information, or the applicant, Director, or Administrator may choose to develop a project-specific floodplain delineation.

The best available information may include reports and studies published by the U.S. Army Corps of Engineers (COE), the U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS), the U.S. Geological Survey (USGS), the Illinois State Water Survey (ISWS), the Illinois Department of Transportation, Illinois Department of Natural Resources-Office of Water Resources (IDNR-OWR) or the Northeastern Illinois Planning Commission (NIPC). The Administrator will need to approve the use of any floodplain study not previously designated as a regulatory study prior to the use of the BFEs, flood profiles or delineations. Applicants should check for the best available information with ISWS Floodplain Repository for BFE data associated with "A Zone" delineations on FEMA maps. Project specific floodplain delineation requires detailed and sophisticated studies. Determining the relationship between the project site and the floodplain is the responsibility of the applicant.

Table 403 of the Ordinance contains a summary of the requirements for developments in the floodplain. The left column of the Table refers to the type of floodplain on-site. References in the Table to "all" refer to projects of the type noted or with the designation of floodplain noted, and they must meet the applicable requirements of the referenced section. The difference between the floodplain and the regulatory floodplain is the jurisdiction of IDNR-OWR. The floodplain is a more general area with elevations at or below the base flood elevation that does not necessarily have one square mile of drainage area. A site without any type of stream or creek flowing through or near it could have floodplain on site if there is a depressional area that contains runoff at or below the base flood elevation determined from a hydrologic model of the tributary watershed area.

§ T404 Floodplain, Regulatory Floodplain, Base Flood Elevation (BFE) and Regulatory Floodway Locations

Developers must identify all floodplains (regulatory and non-regulatory) on the property proposed for development. Developers also must identify Regulatory Floodway affected by the development. Developers should check with the community official or Administrator to determine if any LOMRs have been published for the development area. Kane County also maintains a listing of applicable regulatory maps within the County or its website. If Regulatory Floodway is shown on a Flood Boundary and Floodway Map (FBFM) or Flood Insurance Rate Map (FIRM) for the project area, it shall also be clearly depicted on site topographic plans.

For projects where no Regulatory Floodplain is shown on the FEMA FIRM, the applicant is responsible for determining the project site BFE. If there is 640 acres (one square mile) or more of upstream tributary drainage area at the outlet point of the site this analysis must be accepted for permitting by IDNR-OWR. The BFE can be determined using a hydrologic and hydraulic (H&H) analysis if the upstream tributary drainage area. Any project-specific floodplain analysis for areas greater than 640 acres may also identify a floodway consistent with IDNR-OWR requirements.

For project sites with less than 640 acres of upstream tributary drainage area and no riverine Regulatory Floodplain, the Administrator or Director may require a project-specific floodplain analysis. If the Hydrologic Atlas, published by the United States Geologic Survey (USGS), shows a historic flood area (colored in blue) on the project site, an alternative to a project-specific floodplain analysis may be interpolating the elevation of the inundation area to determine the BFE. For these sites, 3 feet shall be added to the BFE to determine the Flood Protection Elevation (FPE).

It should be noted that BFEs which appear on FEMA FIRMs are rounded to the nearest whole foot. It is necessary to consult the FIS flood profiles, which can be read to the nearest 0.1 foot. The flood profile, used in conjunction with site-specific topography, is the definitive floodplain for permitting purposes, but the FEMA mapping is considered definitive for flood insurance and floodway boundaries. If there are inconsistencies, map revisions will be required.

The location of the Regulatory Floodway shall be delineated from the IDNR-OWR designated Regulatory Floodway maps. To locate the floodway boundary, the Regulatory floodway limits should be scaled from the Regulatory Floodway map and transferred to the project site plan using reference marks common to both maps. Typical reference marks are: street intersections, corporate limits, and section lines. It is important that the accurate floodway width be maintained during the data transfer process from the regulatory floodway maps to the applicant's site plan. As with the regulatory floodplain maps, an accurate delineation of the floodway boundary is important to determine the applicable floodway requirements of the Ordinance. The applicant should then check the floodway location in relation to the stream and the site topography. If it appears that the floodway location is unreasonable, the applicant may wish to pursue a Letter of Map Revision (LOMR) based on improved site topography. The LOMR request is made to FEMA through the IDNR-OWR or its designee and the Director.

An applicant may apply to the Administrator for conditional approval of a site plan with respect to the floodway boundaries prior to finalizing project design. This will provide 1) the Administrator an opportunity to verify the accuracy of the applicant's floodway boundary delineation on the site plan, and 2) the

applicant with a level of assurance from the Administrator prior to spending additional time and money on plan and site design.

In the case of property with an elevation higher than the BFE, but located within the regulatory floodway, the property is subject to the regulations of the Ordinance until such time as the LOMR is received from FEMA.

§ T407 Building Protection Standards

The Ordinance states explicitly that any new construction or changes to existing structures must meet its requirements. However, the Ordinance does not require that all existing structures located in the regulatory floodplain prior to adoption of the Ordinance be brought into compliance with the current regulations. In the special case of substantial improvement of a structure in the floodplain, the Ordinance requires that the entire structure, both the improvement and the pre-existing portions, be brought into full compliance with the Ordinance. A structure is considered to be improved substantially whenever the improvement exceeds 50 percent of the fair market value of the structure.

Residential Buildings

The Ordinance stipulates that the lowest floor, including basement, of new or substantially improved residential buildings (altered buildings that increase the first floor area by more than 20%; or manufactured homes), must be elevated above the Flood Protection Elevation (FPE), which is two feet above the BFE. This exceeds the NFIP regulations which require the lowest floor, including basement, to be only at or above the BFE. Two feet above the BFE accounts for a factor of safety and the impact of wave action during the base flood event. For sites that are located in the floodplain and backwater of the Fox River, the factor of safety is increased to 3 feet above the BFE. The requirement for a minimum elevation in new or substantially improved residential buildings reflects the fact that other floodproofing methods have a poor performance record and may become quite costly. The reduction of the threat of loss of life is one of the primary purposes of the Ordinance and this stringent requirement in use of the FPE assists in the achievement of that purpose. Dry floodproofing may not be considered in lieu of elevation for residential buildings.

Substantial Improvement is defined as any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either, a) before the improvements or repair is started, or b) if the structure has been damaged, and is being restored, the market value before the damage occurred. For the purpose of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration, affects the external dimensions of the structure. The term does not, however, include either 1) any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions or 2) any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

For purposes of determining substantial improvement, market value pertains only to the structure in question. It does not pertain to the land, landscaping or detached accessory structures on the property. For determining substantial improvement, the value of the land must always be subtracted.

Acceptable estimates of market value can be obtained from the following sources:

1. Independent appraisals by a professional appraiser.

2. Detailed estimates of the structure's Actual Cash Value (used as a substitute for market value based on the preference of the community).

3. Property appraisals used for tax assessment purposes (Adjusted Assessed Value: used as a screening tool).

4. The value of buildings taken from NFIP claims data (used as a screening tool).

5. "Qualified estimates" based on sound professional judgement made by staff of the local building department or local or State tax assessor's office.

As indicated above, some market value estimates should only be used as screening tools to identify those structures where the substantial improvement ratios are obviously less than or greater than 50% (e.g., less than 40% or greater than 60%). For structures that fall between the 40% and 60% range, more precise market value estimates should be used.

The use of assessed value has some limitations that, if not considered and accounted for, can produce erroneous estimates of market value. These limitations are:

1. Appraisal Cycle: How often are the appraisals done and when was the date of the last appraisal? Market value estimated can be grossly outdated if the cycle is long and the community happens to be in the latter stage of its cycle and has not been appraised for many years.

2. Land Values: In most cases, land values and the value of improvements (structures) thereon will be assessed separately and listed as such on the tax roles. In cases where they are not distinguished, a determination of the value of the land will have to be made and subtracted from the total assessed value.

3. Assessment Level: In Kane County the established statutory ratio between the assessor's estimate of the value and the true fair market value is 33.3%.

In cases where the assessment level is unacceptably low or where the projected ratio of cost of repair to market value is close to 50%, adjustments for assessment level must be made. If the use of assessed value is questioned, an appeal is warranted, but the burden of proof can be placed on the permit applicant who can be required to submit an independent appraisal by a qualified appraiser.

If a structure is rebuilt in violation of the County's floodplain management regulations and not elevated to or above FPE (or floodproofed if

nonresidential), the flood insurance rates and premiums will be significantly higher. In addition, the Certified Community can pursue legal action. For substantially damaged structures which have their lowest floors, including basements, several feet or more below the BFE, the annual premium cost increase to thousands of dollars. The guidance provided here on substantial improvement ~~in~~ is contained in *Answers to Questions About Substantially Damaged Buildings* (Federal Emergency Management Agency, FEMA – 213, May 1991).

Fill Placed to Elevate a Residential Structure must have the top of the fill and lowest floor, including basement, at or above the FPE. A buffer of fill above the FPE is required for a continuous distance of ten feet out from the building to reduce the potential damages associated with hydrostatic forces on the building. The top of the fill for an attached garage must be 0.5 foot above the BFE. The fill shall not settle below the BFE for a residential structure and not below 0.5 foot above the BFE for an attached garage.

The applicant will need to provide the Administrator with evidence that fill placed to elevate a residential building is protected against erosion and settlement below the FPE. It is strongly recommended that fill be placed in accordance with the FEMA criteria for development. § 65.6 (a)(6) of the NFIP regulations reads as follows:

(i) Fill must be compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test method used by the American Society for Testing and Materials (ASTM Standard D-698).

(ii) Fill slopes for granular materials are not steeper than one vertical on one-and-one-half horizontal unless substantiating data justifying steeper slopes is submitted.

(iii) Adequate protection is provided for fill slopes exposed to flood waters with expected velocities during the occurrence of the base flood of five feet per second or less by covering them with grass, vines, weeds, or similar vegetation undergrowth.

(iv) Adequate protection is provided for fill slopes exposed to flood waters with velocities during the occurrence of the base flood of greater than five feet per second by armoring them with stone or rock slope protection."

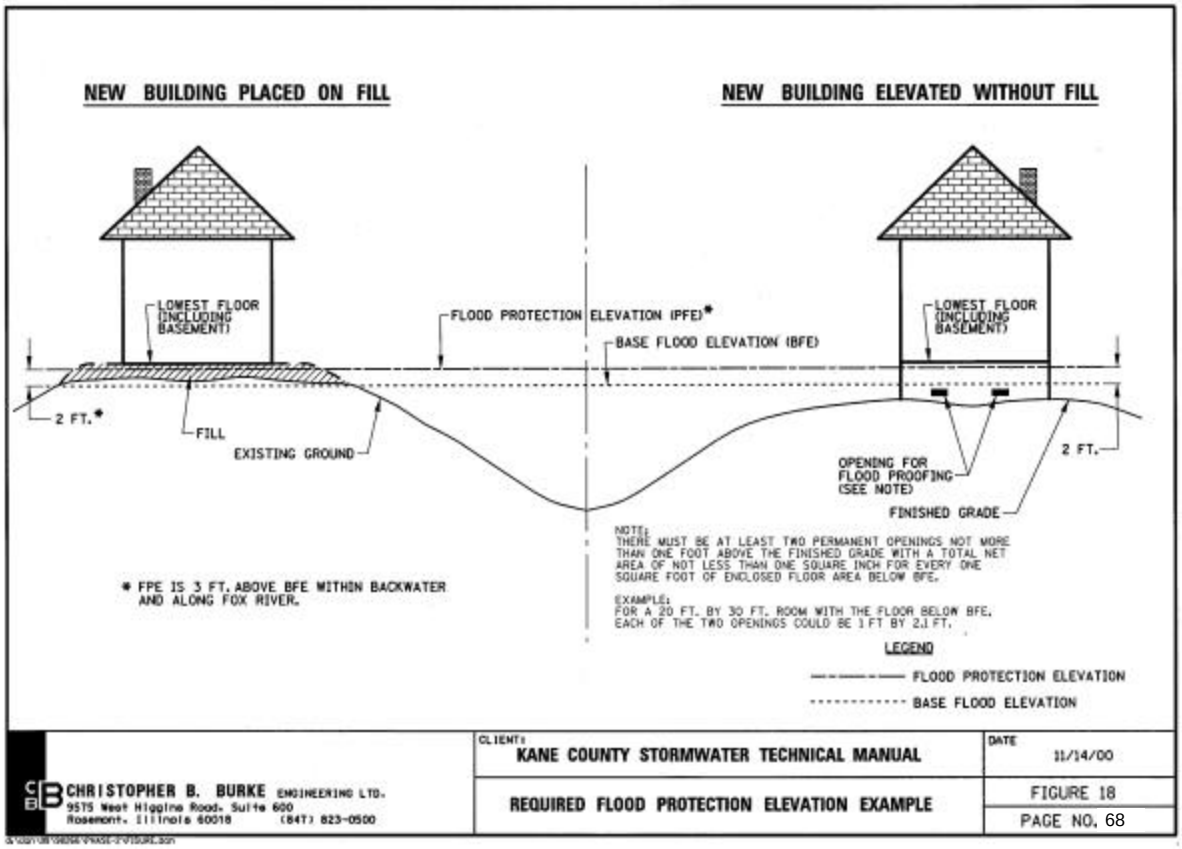
Because the flood carrying capacity of the regulatory floodplain must be maintained, fill placed in the regulatory floodplain must be shown to not singularly or cumulatively create a damaging increase in flood heights or velocities, or impair the natural hydrologic functions of the floodplain or

channel. Therefore, for any development involving fill placement, whether for a building pad or other reasons, the applicant must evaluate the impacts of the fill upon the existing floodplain storage and provide compensatory storage. The requirements for compensatory storage are defined in § T408.

When a residential building is elevated by a means other than filling in the floodplain, restrictions apply to how the structure can be elevated and how the space below the elevated structure may be used. New or substantially improved residential buildings that are elevated by crawl space, walls, pilings or stilts require that the support structure be permanently open below the lowest floor, including basement and not subject to hydrostatic pressures of the base flood. The openings must have a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding below the BFE. These criteria basically allow the area under the elevated structure to be used for storage and conveyance of flood waters. Using this space for flood storage may avoid the need for compensatory storage. The requirements are similar to those of the NFIP and should be familiar to the professional engineer or architect responsible for the design and certification of the permit submittal. The foundation and supporting members must be anchored and aligned in relation to flood flows and adjoining structures to minimize exposure to known hydrodynamic forces such as current, waves, ice, and floating debris. This reduces the risk of structural damage. These considerations are also required by the NFIP regulations. Storage of materials beneath the elevated structures is prohibited. The materials used to elevate the structure, and any other materials in the space below the elevated structure, must be able to withstand several days of inundation by flood waters without sustaining damage.

Figure 18 shows the required flood protection elevation for a structure being placed on fill and a structure elevated without fill.

FIGURE 18
Required Flood Protection Elevation



Nonresidential Buildings

The lowest floor, including basement of all new construction or substantial improvements for nonresidential buildings must either be elevated above the FPE or be structurally dry floodproofed. The dry floodproofing must be effective below the FPE and certified by an Illinois Professional Engineer or Registered Structural Engineer. The certification of the dry floodproofing performance should be stamped on the site plan and the overall building and site plans must be approved by the Administrator. Additionally, the attendant utilities must be watertight and capable of withstanding the base flood. The dry floodproofing must either make the building watertight or be automated with a backup power source requiring no human intervention. The NFIP regulations (§ 60.3(c)(4)) require the community NFIP official to maintain a record of approved buildings and the elevations to which they are floodproofed.

Manufactured Homes and Recreational Vehicles

The Ordinance contains additional criteria, mandated by NFIP regulations, related to placing manufactured homes or recreational vehicles in the floodplain. Under the Ordinance, this includes existing manufactured homes moved to a new site and new manufactured homes at a new or existing site. Protection from flood damage below the FPE is required if the manufactured home or recreational vehicle will be installed on a site for more than 180 days. The applicant should refer to the Illinois Manufactured Home Tie-Down code.

Auxiliary Structures

Auxiliary structures such as tool sheds and detached garages on an existing, single-family platted lot, may be constructed with the lowest floor below the FPE provided that requirements of Article 4, § 407(d) are met for restrictions on construction, use, structure size and value. Applicants should indicate on the site plan the number and location of buildings which are in this category. More than one such structure on a single-family lot may require a hydraulic analysis to properly assess the impact on the existing or proposed floodplain.

§ T408 Non-Conforming Structures

A structure that is non-conforming to the Ordinance contains a lowest floor, including basement, which is below the FPE. A non-conforming structure that is damaged by flood, fire, wind or other natural or man-made disaster may be restored on-site as long as the damage does not exceed 50% of its market value prior to being damaged. Damage in excess of 50% of the structure's market value places the restoration into the substantial improvement category and therefore, the building must conform to the requirements of Article 4, § 407.

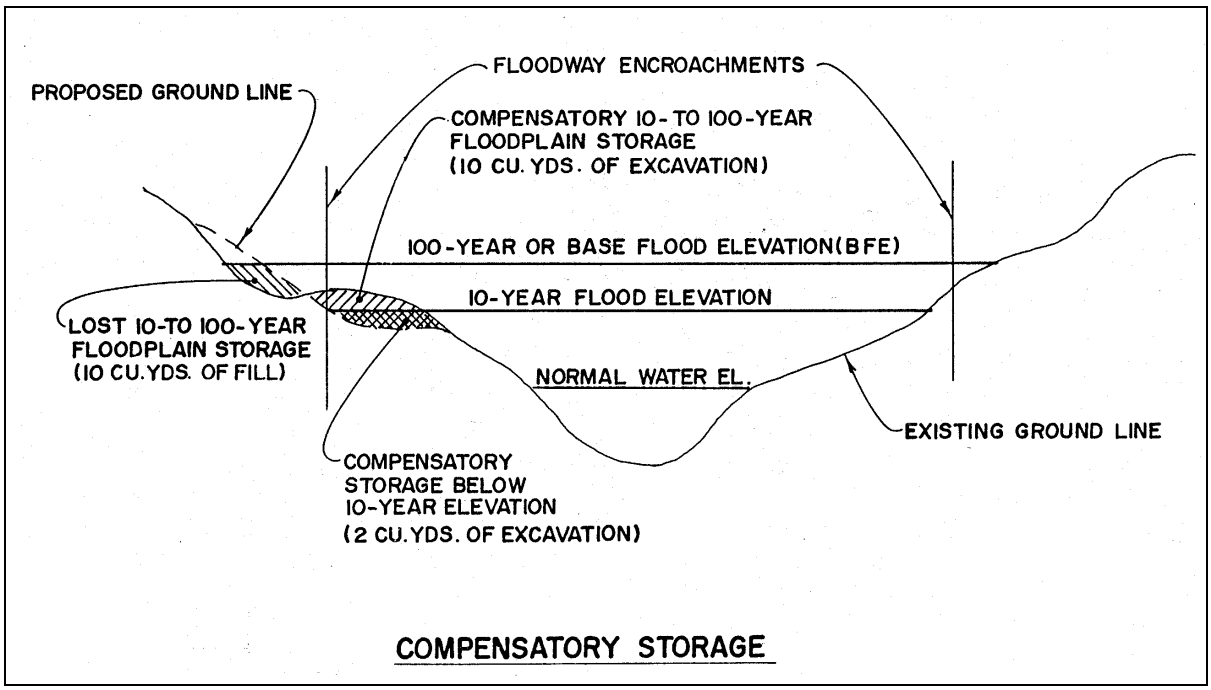
§ T409 Lowest Opening

Proposed structures outside the Regulatory Floodplain shall be built with the lowest opening above the FPE, or two feet above the BFE, unless the structure is within the floodplain or backwaters of the Fox River, which requires three feet above the BFE.

§ T410 Compensatory Storage Volume Standards

Compensatory storage is the replacement of the existing floodplain and, in rare exceptions, the floodway storage lost due to fill. Compensatory storage is required in both riverine and non-riverine floodplain systems. Compensatory storage is required when a portion of the floodplain is filled, occupied by a structure, or a change in the channel hydraulics reduces the existing available floodplain storage. An example is the placement of fill for the construction of a structure. It is important that the natural storage volume be preserved, since it functions like a flood control reservoir to reduce peak flood flows. Figure 19 provides an example of compensatory storage and its relationship with the 10-year and 100-year floods.

FIGURE 19
Compensatory Storage Example



Flood storage is measured between the normal water surface elevation and the BFE for a particular cross-section. The Ordinance defines hydraulically equivalent compensatory storage as storage placed between the proposed normal water surface elevation and the proposed BFE. All lost storage below the existing 10-year flood elevation is replaced below the proposed 10-year flood elevation and the storage lost above the existing 10-year flood elevation is replaced above the proposed 10-year flood elevation. It is important that the distinction between existing and proposed water surface elevations be maintained, since large scale regrading of the floodplain by excavation and fill will often result in a change in flood elevation for a given flood frequency. Isolated areas of minor fill in the floodplain will not normally change the flood profile of streams with larger drainage areas, so the existing and proposed flood profiles may be the same.

The Ordinance requires that the compensatory storage for fill or structures in a riverine floodplain equal 1.5 times the volume of floodplain storage lost. The increment of storage compensated over 100% may be at any elevation below BFE and above normal water surface elevation, as long as at least 100% of the lost storage increment between the existing normal water surface elevation and the existing 10-year flood elevation, and between the existing 10-year flood elevation and the existing BFE, is replaced within the respective proposed flood elevations.

Non-riverine floodplain storage need only be replaced with compensatory storage at the rate of one to one, between the normal water surface elevation and the BFE.

When developing a grading plan to provide compensatory storage, the Ordinance provisions concerning channel modifications, grading transitions, and buffers must also be followed. The compensatory storage should be located adjacent or opposite the site of the fill, but must also comply with the other Ordinance provisions. This requirement will often limit the extent to which a floodplain may be filled at a particular location.

Where regulatory floodways are mapped, the compensatory storage must be contained within the proposed floodway boundaries. Shifting of the floodway boundaries outside of the existing floodway may be permissible as a way of providing floodway compensatory storage, but all other provisions of the Ordinance regarding floodplains and flood easements must be met and both IDNR-OWR or its designee and FEMA must approve the floodway boundary change. Hydraulically equivalent compensatory storage for fill in the floodway associated with roadway crossings shall meet the same requirements stated above. Artificially created storage upstream of a restrictive bridge or culvert need not be replaced, provided that damages will not occur downstream. Normally, regulatory flows are not attenuated by restrictive stream crossings and are therefore unchanged upstream and downstream of the restrictive

crossing. The floodplain downstream of the crossing should be reviewed to determine whether structures are damaged. If it appears that there is a risk of additional damage, a detailed hydrologic investigation should be performed to establish the extent to which the artificial storage decreases flood flows and to determine what damages might be incurred.

For riverine floodplains, or any floodplain with a regulatory floodway, calculations for floodplain volume shall be submitted in tabular form showing calculations by cross-section. The volume of floodplain storage under the without-project conditions and the with-project conditions should be determined using the average end-area method with plotted cross-sections.

Floodplain storage cross-sections should be prepared as follows:

1. Cross-sections should be located parallel to each other and perpendicular to a stream reference line shown on the grading plan. The cross-sections used in the hydraulic analysis should be located perpendicular to flood flows, and may not be suitable for volumetric calculations.

2. All cross-sections should be plotted at the same standard engineering scale and should be at a horizontal:vertical ratio of between 5:1 and 10:1.

3. The scale chosen should be large enough to show the intent of the proposed grading.

4. Cross-sections should reflect both the existing and proposed conditions on the same plot.

5. All cross-sections should show the normal water level and the 100-year flood elevation. For riverine floodplains, the cross-sections should also include the 10-year flood frequency elevation and where there is a regulatory floodway, the regulatory floodway encroachments should be scaled onto the cross-sections.

6. Cross-section should span the full floodplain and should include all existing and proposed structures.

In non-riverine floodplains, where the grading plan utilizes a one-foot contour interval and the drawing is at a maximum scale of 1”=50’, floodplain storage may be calculated by measuring contour areas.

A grading plan of the project site should be provided to show existing and with-project conditions for the following details:

1. Planimetric Data for All Structures and Construction (Including Location and Dimensions);

2. All Property Lines:

3. Certified Elevation Data, Including Ground Contours at Intervals of 2 Feet or less;

4. Location of Drainage and Flood Control Easements; and

5. Location and Orientation of Cross-Sections.

§ T411 Floodway Standards

Development proposed within the regulatory floodway will require hydraulic calculations to analyze the impacts of the development upon the floodway and floodplain. Backwater models such as HEC-2, WSP-2, and WSPRO are acceptable models. For simple crossings such as culverts or clear-span bridges, hand calculations such as USGS regression equations or the equations found in the Federal Highway Administration (FHWA) manuals may be sufficient.

Appropriate Uses

Development in the floodway must be an appropriate use of the floodway as stated in the Ordinance (Article 4, § 409.(a)). Only development that is an appropriate use will be allowed in the floodway.

Modifications to an existing building that would not increase the enclosed floor area of the building below the BFE, and which will not obstruct flood flows are an appropriate use of the floodway and will require a permit from the Certified Community. Allowable modifications include fireplaces, bay windows, decks, patios, and second story additions.

If the proposed development within a regulatory floodway is not an appropriate use under the Ordinance, the development may only take place by revising the regulatory floodway designation on the site. It will be necessary to construct that portion of the project that revised the floodway on the property prior to the initiation of any building construction. In order to do this, the applicant must obtain local government concurrence of the revised floodway and an agreement from the unit local government to maintain it. The FEMA Community Acknowledgement form, to accompany the request for a proposed revision to the floodway is include as Form 11 in the next part of the manual. The maintenance agreement should be a statement from a community official that acknowledges the revised floodway and that the unit of local government will either assume responsibility to operate and maintain

any revised floodway or will agree, upon default of the party responsible for such operation and maintenance, to undertake such operation and maintenance. In addition, all the information required to obtain a CLOMR must be submitted to IDNR-OWR or its designee and then FEMA (depending on the source of the map). A stormwater permit may then be issued to proceed with the revision of the floodway. Upon completion of the construction necessary to revise the floodway, as-built plans must be submitted to the Administrator and FEMA to have a LOMR issued. Once a LOMR is issued revising the floodway map, and all necessary permits have been obtained, development may proceed in the former floodway area.

A minimum 20-foot buffer of open space is required on either side of the channel. Where floodway and buffer criteria apply to the same area, the more restrictive criteria shall be applied. The appropriate use definition applies to the floodway and any overlapping buffer area.

Engineering Criteria

Conveyance

Regulatory floodway conveyance must be maintained for all flood events up to and including the 100-year frequency flood except at bridges, culvert crossings, and dams. Conveyance is defined as:

$$K = [1.486/n] * A*[R^{(2/3)}], \text{ where}$$

n = Manning's roughness factor
A = effective area of the cross-section
R = hydraulic radius

The same Manning's n-value shall be used for both existing and proposed conditions unless a recorded maintenance agreement with a federal, state, or local unit of government can assure the proposed conditions will be maintained or the land cover is changing from a vegetative to a non-vegetative land cover. (For a discussion of conveyance, consult Open Channel Hydraulics by Ven Te Chow, 1959, McGraw-Hill, New York, New York.)

Transition Sections

Expansion and contraction of flow require transition sections to determine effective regulatory floodway conveyance and shall be located and determined as described in the Ordinance. Alternative transitions shall require review and approval by IDNR-OWR. Expansion is the hydraulic condition of water flowing from a narrower section to a wider section and shall be

assumed to occur no faster than at a rate of one foot horizontal for every four feet of the stream length. Contraction, the condition of water flowing from a wider section to a narrower section, shall be assumed to occur no faster than at a rate of one foot horizontal for every one foot of stream length. The floodplain area outside of the expansion and contraction flow area is considered to be ineffective flow area. Effective conveyance transition sections and expansion and contraction of flow are demonstrated in many hydraulic textbooks and manuals for hydraulic computer programs. When considering effective conveyance in a vertical direction, the expanding and contracting vertical transition shall be one foot vertical transition for every ten feet of stream length. The compensatory storage required by the ordinance may be placed within areas of ineffective conveyance within the floodway.

Average Channel Velocities

Channel velocities shall not be increased as a result of development. Minor increases may be permissible at some cross-sections along the project reach but the flow velocity of the change must remain below the scour velocity. Channel conditions vary, but channel scour must be considered if a velocity of above five feet per second is attained.

Flood Elevations

Flood elevations generated by the regulatory model must first be duplicated before updated data to reflect the existing conditions is input to the model. The flood profiles, flows and floodway data in the regulatory floodway study must be used for analysis of the regulatory conditions. If the study data appears to be in error or conditions have changed, IDNR-OWR or its designee shall be contacted for approval and concurrence on the appropriate existing conditions data. Once the output of the regulatory model has been duplicated to within 0.1 foot of the regulatory profile, revisions should be input to reflect the existing conditions.

If existing conditions in the watershed outside of the applicant's project site will be affected by the development, the applicant shall obtain the best available information of the proposed off-site changes to anticipate the impacts of the proposed change. The existing and with-project conditions shall be modeled based on this data.

On-stream structures built for the purpose of retaining water must be approved by the Dam Safety Section of IDNR-OWR by way of a permit or a letter stating that a permit is not required. The address for the Dam Safety Section is:

Illinois Department of Natural Resources
Office of Water Resources
2300 South Dirksen Parkway
Springfield, Illinois 62764-9484

Attn: Dam Safety Section

Floodway Permit Applications Involving Hydraulic Analysis

There are two different conditions for development within a regulatory floodway. Either the applicant is trying to maintain the existing regulatory profile and floodway boundaries or a LOMR is requested.

The discharges from the regulatory model shall be used except where the Administrator requires new discharges. The necessity for new discharges will depend on the correlation between the existing conditions profile, the regulatory profile, and the magnitude of the impacts on the profile due to the project. If the existing conditions profile is calculated to be lower than the regulatory profile, the effects of lost storage must be analyzed and the new hydrologic analysis must reflect the future land use. The Administrator or the applicant may contact the Director for an opinion on the suitability of the regulatory discharges. New discharges shall be developed based on stream gage analysis (if available), or shall follow the methodologies outlined in the "Hydrologic Techniques" section within the "Stormwater Runoff" portion of this manual.

The first step to determine if a revision of the regulatory floodway conditions is desired, is to duplicate the regulatory profile using the same hydraulic model (usually HEC-2 or WSP-2). Data input into the duplicate model should be identical to the data, which generated the regulatory profile. It is not necessary to duplicate the entire regulatory profile but the applicant should start the profile at least four cross-section downstream of the project site. Once the input from the regulatory model has been duplicated, the output of the duplicate model should be verified against the output of the regulatory model. A copy of the regulatory profile should be submitted along with the duplicate model run as part of the permit application package.

Where there is a designated floodway mapped, but there is no computer model available, the engineer should consult the Director about how to proceed with the specifics of modeling the existing conditions.

Once the duplicated model has been prepared and is operational, it must be updated to create an existing conditions model for a comparison against the with-project conditions. As discussed in "Floodplain Performance Standards", cross-sections should be added to the regulatory model where it is appropriate to add them for both the existing and with-project hydraulic

analyses. The existing conditions model should include all corrections to the regulatory profile and should be modeled with attention to areas of ineffective conveyance. The applicant is responsible for all existing field conditions within the watershed which may affect the existing conditions hydraulic model. These areas can be maintained in the model for storage volume and area calculations by imputing an artificially high n-value for these areas (such as 99). This will cause the computer model to treat these areas as ones of ineffective flow, but the cross-sectional area is still maintained for the area and volume calculations. Ineffective flow areas should be clearly annotated on the plans and cross-sections.

The existing conditions profile must tie-in to the regulatory profile to within 0.5 foot, based on FEMA requirements, upstream and downstream of the project reach. Where it is not possible to meet the regulatory profile, a new hydrology study is required.

If the applicant is trying to maintain the existing regulatory floodway boundaries, he should scale the floodway encroachments off the regulatory floodway map and input this data into the existing conditions model. This will create the existing conditions floodway model. The with-project model must demonstrate that the proposed development has no incremental impact if the with-project condition maintains the conveyance, storage, and travel time of the existing conditions model and the flood stages are not increased.

If the applicant is trying to establish or revise a regulatory floodway, one of the standard floodway encroachment methodologies from the computer models shall be utilized. The floodway must meet the floodway definition of this Ordinance.

The floodway is considered to meet the surcharge criteria of no more than a 0.1 foot increase if the floodway meets the requirements of the Ordinance. It will be necessary for the applicant to check that the 10% velocity rule is met and these calculations should be part of the submittal to the Administrator.

The preferred approach for developing floodway encroachments involves the use of an equal amount of flood conveyance on each side of the stream centerline. Modifications to the floodway encroachment, which reduce conveyance on one side of the stream, shall first consider an increase of conveyance on the streamside directly opposite the modified encroachment. When proposed floodway modifications form the affected property owners. Floodway encroachment methodologies generally create floodways by removing conveyance from the ends of the cross-sections and will typically create floodways with a considerably narrower floodway than necessary to meet the velocity criteria. The routines are a useful tool in developing a floodway that centers its conveyance about the centerline of the stream. The

applicant will have to manually adjust the encroachments to develop a floodway which meets all the criteria of the Ordinance floodway definition.

When manually adjusting the floodway encroachments at every cross-section, the applicant should start at the most downstream cross-section and work upstream. In using a backwater model floodway encroachment methodology, the upstream cross-sections should generally not have any effect on the generated encroachments form the downstream section.

The with-project conditions model will use the same regulatory discharges and cross-section locations as the regulatory conditions model to reflect the development on the site. The applicant should first run the model using the with-project topography with the fixed encroachments set at the existing condition. If the conveyance, storage, and travel time are maintained and the flood stages are not increased, the with-project floodway will be allowed if it does not differ from the existing conditions floodway. If the rules are not yet met, there are two options: to revise the design to meet the criteria of the Ordinance or to develop a new floodway that meets the Ordinance definition and obtain a LOMR from FEMA, revising the regulatory floodway. Table 9 identifies the data requirements and reviewing agencies for the various types of revisions.

TABLE 9
Data Requirements for Revisions to Mapped Areas

Type of Revision	Data or Hydraulic Model (H.M.) Utilized	Reviewing/Approving Agency
LOMA	Elevation	Administrator, FEMA
LOMR Based on Fill	Elevation, Certification of Fill Compaction	Administrator, FEMA
Revision to Regulatory BFEs Based on Existing Conditions	Regulatory Conditions H.M. Existing Conditions H.M.	Administrator, IDNR-OWR, FEMA
Revision to Regulatory BFEs Based on Proposed Project	Regulatory conditions H.M. Existing Conditions H.M. With-Project H.M.	Administrator, IDNR-OWR, FEMA
Revision to Regulatory Floodplain Boundaries	Elevation	Administrator, IDNR-OWR, FEMA
Revision to Regulatory Floodway Based on Existing Conditions	*Regulatory Conditions Floodway H.M. *Existing Conditions Floodway H.M.	Administrator, IDNR-OWR, FEMA
Revision to Regulatory Floodway Based on a Proposed Project	Regulatory Conditions H.M. Existing Conditions H.M. With-Project Conditions Floodway H.M.	Administrator, IDNR-OWR, FEMA

* Where applicable, otherwise use the regulatory profile with scaled and encoded floodway encroachments.

Note: Forward copies of all submittals to the Director.

Public Flood Control Project

Public flood control project will be considered compliant with the Ordinance if the applicant can demonstrate to the Administrator and IDNR-OWR through a detailed hydrologic and hydraulic analysis that the proposed project will not singularly or cumulatively result in increased flood heights outside the project right-of-way or easements. This must be valid for all flood events up to and including the 100-year flood. A public control project shall have a public agency as either the applicant or co-applicant.

§ T412 Riverine Floodplain

Within all regulatory riverine floodplains where the regulatory floodway has not been determined by the IDNR-OWR or FEMA, the applicant must provide a detailed hydrologic and hydraulic analysis which demonstrates a stormwater runoff conveyance path for the proposed development. The detailed analysis must conform to the hydrologic and hydraulic modeling requirements described in the "Basic Stormwater Management Requirement" section of the manual and this section, respectively. For mapped regulatory floodplains with certified 100-year flood discharges, the applicant may request from the Administrator permission to use the existing 100-year flood discharge. However, if the study conditions have changed, the Administrator may require a new hydrologic analysis. By definition, the stormwater conveyance path determination is slightly less detailed than a floodway determination under IDNR-OWR regulations. The stormwater conveyance path is essentially a conveyance floodway only and will not require an analysis of the floodway storage component.

The stormwater conveyance path must demonstrate that the proposed development will have no singular or cumulative impact on flood heights or velocities. A detailed analysis must be submitted and approved by the Administrator prior to the issuance of a watershed development permit. For riverine floodplains with a drainage area greater than 1.0 square mile, the applicant must also request and receive IDNR-OWR approval. In cases where the analysis of the flood conveyance path yields a revision to the FEMA mapped floodplain boundaries, the applicant will also need to request a LOMR from FEMA.

Upon acceptance of the stormwater conveyance path by the Administrator, the applicant has the option to locate all of the development outside the flood conveyance path or to meet the floodway performance standards. The hydraulic analysis of the relocated stormwater conveyance path cannot impact adjacent properties by more than 0.1 foot.

The applicant may limit the study to a floodplain determination and apply the performance standards of Article 4, § 401 to the entire floodplain, with the

exception of the appropriate use requirements of Section 401.8.9. Therefore, compensatory storage for the displacement of floodplain storage due to fill or structures, will be required at a rate of 1.5 times the volume of floodplain storage lost.

§ T413 Bridge and Culvert Standards

Permits involving new stream crossings or any significant modifications to existing structures will require a hydraulic model if the stream has a regulatory floodway. Both the existing and with-project conditions should contain the same cross-section locations so that each case can be compared at all locations along the reach.

For modification or replacement of existing structures, a determination must be made whether or not the existing structure is a source of flood damage. This is done by comparing the profile of the natural channel (as if the structure did not exist) against the profile of the channel with the existing structure in place. By delineating the floodplains of each of the two profiles upstream of the restrictive structure, the applicant can determine the area that is impacted by backwater created by the restrictive structure. If a building is located in the floodplain when analyzing a restrictive structure, but not in the floodplain when the structure is removed, the structure may be a source of flood damage. The applicant must then evaluate the feasibility of redesigning the structure to reduce the existing backwater, taking into consideration the effects on flood stages on upstream and downstream properties.

All excavations for new construction or modifications to existing structures at crossings must be designed in accordance with Article 4, § 403 of the Ordinance for limitations on average channel or regulatory floodway velocities.

Lost floodway storage must be compensated for as required in the “General Performance Standards” of the Ordinance except that artificially created storage lost due to a reduction in head loss behind a bridge shall not be required to be replaced, provided no damage will be incurred downstream.

Application submittal material should be submitted to IDNR-OWR for stream crossings over public bodies of water so that IDNR-OWR may issue a public notice. Also, where hydraulic analyses are required for road crossings, the application submittal material should also be submitted to IDNR-OWR for concurrence that a conditional LOMR is not required.

The detailed hydraulic analysis of upstream flood stages must be based on the Administrator approved regulatory discharges and corresponding flood elevations for tailwater conditions. Culverts must be analyzed using the U.S. DOT, FHWA Hydraulic Chart for the Selection of Highway Culverts. Bridges

must be analyzed using the FHWA Hydraulics of Bridge Waterways calculation procedures, or an appropriate hydraulic computer model approved for use by the Administrator.

§ T414(a-c) Requirements for Wetland Delineation

Wetland delineations are required for all developments which have on-site waters of the U.S. or are adjacent to wetlands, isolated wetlands, or farmed wetlands. The wetland delineation report shall identify the boundaries, location, limits and area of all on-site wetlands as well as their quality as measured by the Floristic Quality Index (FQI).

This wetland delineation will follow the current federal guidance, which is the 1987 Corp of Engineers Wetland Delineation Manual. Farmed wetlands shall be determined by the NRCS through their application of the methodology referenced in the Food Security Act program. The presence of wetland areas to be developed in agricultural areas requires that the NRCS certified delineation or determination be completed prior to submission of the wetland delineation report. Coordination of wetland delineation tasks with the NRCS is encouraged to minimize disagreements in identifying the boundary of such wetlands. Kane County lies within the boundaries of the Chicago District, Corps of Engineers. Specific information on the current delineation of wetlands may be obtained from the District.

U.S. Army Corps of Engineers
Chicago District
Regulatory Functions Branch
111 N. Canal Street
Suite 600
Chicago, IL 60606-7206
312-353-6400
312-353-4110 (fax)

A list of firms providing wetland related services is maintained by and available upon request from the Chicago District. This list may be downloaded from the internet at http://www.lrc.usace.army.mil/co-r/consult.pdf

The use of the FQI as an indicator of wetland quality requires that a thorough evaluation of all vegetation in the potential wetland site be conducted. It is paramount that the delineator be able to identify not only the dominant plant species but also all of the hydrophytic species found within the suspected wetland area. Because the mitigation of wetlands within the county is based upon their quality, a thorough evaluation of the vegetation is necessary. This may require the evaluator to sample the wetland in more than one season, making sure to obtain both the spring and late summer flora, and will require that any delineation for permitting be conducted in the growing season.

For all on-site wetlands with buffers less than fifty feet, FQI must be calculated. The procedure can be found in "plants of the Chicago Region", 4th ED. by Floyd Swink and Gerald Wilhelm or by using the Floristic Quality Assessment and Computer Applications V.1.O. The FQI program is available from:

Conservation Design Forum
324 N. York Rd.
Elmhurst, IL 60126
(630) 758-0355

The FQI is an indicator of natural area plant biodiversity used widely in the Chicago Region. Each plant in the flora has been assigned a "*C*-value" or coefficient of conservatism. To calculate the FQI of a wetland, a *complete* flora inventory must be taken or a statistically valid sample using multiple quadrants. The computer-based program provides a basic for plot sampling. After the inventory has been compiled the native mean *C* can be calculated by summing the *C* values for native plants and_dividing by total number of native plants in the inventory (N). The FQI is then calculated by the formula:

$$\text{FQI} = \text{native } \overline{C} \cdot \sqrt{N} \text{ or } \overline{C} * N^{1/2}$$

Native Community Quality

Quality	FQI
Low	<7.0
Medium	7.0 – 16.0
High	>16.0

The FQI is influenced by plant rating, size of the area sampled, completeness of the floristic inventory, and hence, the total number of native species (Table 10). Since the FQI does not take into account adventive, or non-native species, the "weediness" of an area cannot be determined by the FQI alone. Adventive data is presented along with native data in the computer program. These data should be submitted to the Administrator in the format shown in the example below, even if the FQI is hand-calculated (Figure 20).

FQI Calculation Example:

Data correspond to inventory presented in Figure 20. Floristic Quality Index Format

Sum of the Native C	=	98
Native Species	=	36
Mean Native *C*	=	98/36 = 2.72 = 2.7
FQI	=	$(2.72) / (36)^{1/2} = 16.3$

Calculate data to the nearest 0.01. Report data to the nearest 0.1.

TABLE 10
Factoring Influencing FQI

Constant Increasing			**Increasing Constant**		
C	N*	FQI	*C*	N	FQI
2.5	5	5.59	0.8	10	2.53
2.5	15	9.68	1.0	10	3.16
2.5	20	11.18	2.5	10	7.91
2.5	40	15.81	3.0	10	9.49
2.5	70	20.91	5.0	10	15.81
2.5	100	25.00	6.0	10	18.97

*Increasing area of sample will generally increase the number of species present. Though the FQI formula accounts for some of the species increase by taking the square root of N, transects with quadrats must be utilized to reduce sample area effects when the area being sampled exceeds 1 acre in size.

FIGURE 20
Floristic Quality Assessment Example

```
Site:  Kane County Stormwater Example
Locale: St. Charles, Illinois
By:     CBBEL
File:   C:\KaneCounty

   FLORISTIC QUALITY DATA        Native       36    85.7%      Adventive     6    14.3%
     36 NATIVE SPECIES           Tree          2     4.8%      Tree          0     0.0%
     42  Total Species           Shrub         4     9.5%      Shrub         2     4.8%
    2.7 NATIVE MEAN C            W-Vine        1     2.4%      W-Vine        0     0.0%
    2.3  W/Adventives            H-Vine        0     0.0%      H-Vine        0     0.0%
   16.3 NATIVE FQI               P-Forb       19    45.2%      P-Forb        1     2.4%
   15.1  W/Adventives            B-Forb        0     0.0%      B-Forb        2     4.8%
   -3.3 NATIVE MEAN W            A-Forb        3     7.1%      A-Forb        0     0.0%
   -2.6  W/Adventives            P-Grass       2     4.8%      P-Grass       1     2.4%
   AVG: Fac. Wetland             A-Grass       1     2.4%      A-Grass       0     0.0%
                                 P-Sedge       4     9.5%      P-Sedge       0     0.0%
                                 A-Sedge       0     0.0%      A-Sedge       0     0.0%
                                 Cryptogam     0     0.0%

ACRONYM    C SCIENTIFIC NAME                          W WETNESS  PHYSIOGNOMY COMMON NAME
ACENEG     0 Acer negundo                            -2 FACW-     Nt Tree      BOX ELDER
ALISUB     4 Alisma subcordatum                     -5 OBL      Nt P-Forb   COMMON WATER PLANTAIN
ALLPET     0 ALLIARIA PETIOLATA                       0 FAC       Ad B-Forb   GARLIC MUSTARD
AMBTRI     0 Ambrosia trifida                        -1 FAC+      Nt A-Forb   GIANT RAGWEED
ANGATR     7 Angelica atropurpurea                   -5 OBL       Nt P-Forb   GREAT ANGELICA
APOSIB     2 Apocynum sibiricum                      -1 FAC+     Nt P-Forb   PRAIRIE INDIAN HEMP
ASCINC     4 Asclepias incarnata                     -5 OBL       Nt P-Forb   SWAMP MILKWEED
ASTSIS     3 Aster simplex                           -5 OBL       Nt P-Forb   PANICLED ASTER
BOECYC     2 Boehmeria cylindrica                    -5 OBL       Nt P-Forb   FALSE NETTLE
CXSTRI     5 Carex stricta                          -5 OBL      Nt P-Sedge  COMMON TUSSOCK SEDGE
CXVULP     2 Carex vulpinoidea                       -5 OBL       Nt P-Sedge  BROWN FOX SEDGE
CORRAC     1 Cornus racemosa                         -2 FACW-     Nt Shrub     GRAY DOGWOOD
CYPESC     0 Cyperus esculentus                      -1 [FAC+]    Nt P-Sedge  FIELD NUT SEDGE
DAUCAR     0 DAUCUS CAROTA                            5 UPL       Ad B-Forb   QUEEN ANNE'S LACE
ECHCRU     0 Echinochloa crusgalli                   -3 FACW      Nt A-Grass  BARNYARD GRASS
EUPMAM     4 Eupatorium maculatum                   -5 OBL      Nt P-Forb   SPOTTED JOE PYE WEED
GEULAT     2 Geum laciniatum trichocarpum            -3 FACW      Nt P-Forb   ROUGH AVENS
HELGRO     2 Helianthus grosseserratus               -2 FACW-    Nt P-Forb   SAWTOOTH SUNFLOWER
IMPCAP     3 Impatiens capensis                      -3 FACW      Nt A-Forb   ORANGE JEWELWEED
LEEORY     4 Leersia oryzoides                       -5 OBL       Nt P-Grass  RICE CUT GRASS
LOBSIP     6 Lobelia siphilitica                     -4 FACW+    Nt P-Forb   GREAT BLUE LOBELIA
LONTAT     0 LONICERA TATARICA                     5 [UPL]    Ad Shrub    TARTARIAN HONEYSUCKLE
PHAARU     0 PHALARIS ARUNDINACEA                    -4 FACW+     Ad P-Grass  REED CANARY GRASS
POLAMS     4 Polygonum amphibium stipulaceum         -5 OBL       Nt P-Forb   WATER KNOTWEED
POLPEN     0 Polygonum pensylvanicum                 -4 FACW+     Nt A-Forb   PINKWEED
PYCVIR     5 Pycnanthemum virginianum               -4 FACW+    Nt P-Forb   COMMON MOUNTAIN MINT
RHACAT     0 RHAMNUS CATHARTICA                     3 FACU      Ad Shrub    COMMON BUCKTHORN
RUBOCC     2 Rubus occidentalis                       5 UPL       Nt Shrub     BLACK RASPBERRY
SAGLAT     4 Sagittaria latifolia                    -5 OBL       Nt P-Forb   COMMON ARROWHEAD
SALINT     1 Salix interior                          -5 OBL       Nt Shrub     SANDBAR WILLOW
SALNIG     4 Salix nigra                             -5 OBL       Nt Tree      BLACK WILLOW
SAMCAN     1 Sambucus canadensis                     -2 FACW-     Nt Shrub     ELDERBERRY
SCIATR     4 Scirpus atrovirens                      -5 OBL       Nt P-Sedge  DARK GREEN RUSH
SILPER     5 Silphium perfoliatum                    -2 FACW-     Nt P-Forb    CUP PLANT
SOLCAN     1 Solidago canadensis                      3 FACU      Nt P-Forb   CANADA GOLDENROD
SOLGIG     4 Solidago gigantea                       -3 FACW      Nt P-Forb    LATE GOLDENROD
SPAPEC     4 Spartina pectinata                      -4 FACW+    Nt P-Grass  PRAIRIE CORD GRASS
TYPANG     1 Typha angustifolia                     -5 OBL      Nt P-Forb   NARROW-LEAVED CATTAIL
TYPLAT     1 Typha latifolia                        -5 OBL      Nt P-Forb   BROAD-LEAVED CATTAIL
URTDIO     0 URTICA DIOICA                           -1 FAC+      Ad P-Forb   STINGING NETTLE
VERHAS     4 Verbena hastata                         -4 FACW+     Nt P-Forb    BLUE VERVAIN
VITRIP     2 Vitis riparia                           -2 FACW-     Nt W-Vine   RIVERBANK GRAPE
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§ T414(d) Delineation Hierarchy

In addition to identifying the location, extent, area and quality of on-site wetlands, off-site wetlands must be evaluated to a distance at least 50 feet beyond the edge of the site to verify buffer requirements. This should be included in the wetland delineation report and show on the wetland delineation exhibit. The location and extent of off-site wetlands shall be determined by using the first of the following documents or procedures at the time of development.

1. Site specific delineation, if one has been performed
2. Wetlands that are identified in ADID studies or watershed plans
3. Wetlands identified in interim watershed plans
4. Wetlands identified in NRCS wetland inventory maps.

The purpose in including off-site wetland delineation is to determine the overall value of the wetland complexes that occur on more than one property, and to determine whether or not there is a buffer required on a development site due to the existing off-site wetland.

Information concerning delineation by the NRCS method can be obtained from:

District Conservationist
USDA-NRCS
545 N. Randall Road
St. Charles, IL 60174
(630) 584-7961
www.il.nrcs.usda.gov

§ T415 Mitigation to be Local

All wetland mitigation required under a Corps of Engineers §404 permit for wetland impacts must occur in Kane County. Every effort should be made to mitigate in the same watershed where the impacts occur.

§ T416 Threatened and Endangered Species Consultation

Before a stormwater management permit is issued, the applicant must consult with the Illinois Department of Natural Resources (IDNR) Threatened and Endangered Species Consultation Program and the U.S. Fish and Wildlife Service Program with respect to presence of threatened or endangered species in or near the subject property. Such consultation shall reach a positive conclusion prior to the issuance of a stormwater permit. The IDNR Threatened and Endangered Species Consultation may be started by completing a Agency Action Report which may be obtained on the Internet from idnr.state.il.us/orep/nrrc/brief.htm or by contacting the Division of Resource Review in coordination of the

Illinois Department of Natural Resources
524 S. Second Street
Springfield, IL 62701

The U.S. Fish and Wildlife Services may be contacted at the:
Chicago Metro Office
1250 South Grove Suite 103
Barrington, IL 60010
(847) 381-2253

§ T417 Wetland Preservation During Development

During the development process, it is important to protect all on-site wetlands that are not to be impacted by the development process and therefore not included for mitigation. In order to assure the health and survival of these resources, the FQI of the wetland vegetation calculated two years after development begins will not be more than 2 points lower then the original FQI calculated for the delineation. In an event that the FQI does fall more than 2 points below the original or baseline FQI, the developer shall mitigate for those wetland losses at the ratio that is required for the originally calculated FQI as described in § 1502. It is important that a thorough vegetative assessment be performed for each evaluation of a wetland area and particularly during the delineation process to establish a representative baseline FQI.

§ T418 Buffer Requirements

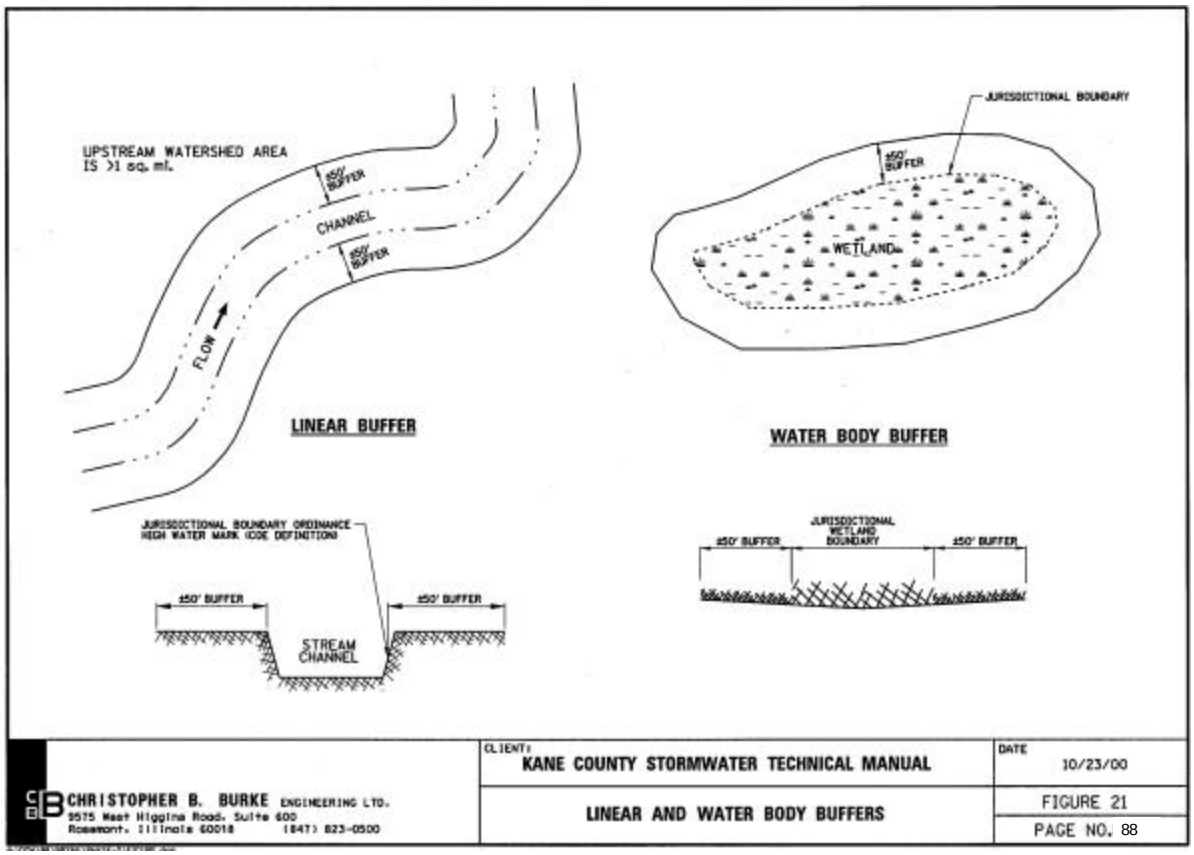
Buffers are defined in the Kane County Stormwater Ordinance as vegetated upland that serves a variety of functions including shoreline stabilization, sediment filtration, habitat, promotion of infiltration, and nutrient sequestration.

Buffers shall be vegetated using appropriate, deep rooted native vegetation. Soil disturbance in buffer areas shall be minimized. Every attempt should be made to reduce or eliminate cut and fill activities, topsoil respread and soil compaction. Development of buffer areas in naturally occurring soils is preferred. Where necessary, invasive species removal may be required prior to establishment of native vegetation. No buffers are required for wetlands less than 0.25 acres in size.

§ T418(a) Buffer Width Requirements

Two types of buffers are recognized: linear buffers and water body buffers (Figure 21).

FIGURE 21
Linear and Water Body Buffers



Buffer areas including the "Waters of the U.S." they protect shall be shown as easements on all newly platted lots and maintenance requirements for the buffer shall be recorded as a note against the deed. Buffer widths required as part of a Corps of Engineers 404 permit shall supercede widths described in the ordinance unless the width under the ordinance is greater. Jurisdictional "Waters of the U.S.", including regulated wetlands, may not be considered buffer and shall not be encroached upon to create buffer.

Buffer widths are to be a minimum of 50 feet wide unless they are determined using § 418(a)(3)(a) or 418(a)(3)(b).

§ T418(a)(3)(a) Linear and Water Body Buffers

Linear buffers shall be designated along "Waters of the U.S." including associated wetlands. This includes:

- Intermittent water courses
- Creeks
- Streams
- Rivers

Floodplain wetlands associated with streams are covered by § 418.1(d) and include:

- Floodplain wetland
- Backwater slough
- Oxbow
- Bordering wetland complex

Linear buffer widths are 50 feet, if the drainage area is greater than 640 acre or the FQI is >16.0. For drainage areas less than 640 acre and an FQI $\leq$ 16.0, the buffer width may be reduced by using the formula

$$X = (A*0.0547)+15$$

Where X = buffer area
A = drainage area

The buffer width calculated will be rounded up to the nearest five feet. Alternatively, buffer width may be estimated from Figure 1 in the Ordinance. Table 11 illustrates several scenarios for buffer width calculation.

TABLE 11
Linear Buffer Width Calculation Scenarios

Scenario	Drainage Area (AC)	FQI	Calc. Buffer	Est. Buffer	Req. Buffer
1	645	10	--	--	50
2	580	10	46.72	46	50
3	127	10	21.95	21	25
4	12	10	15.65	16	20
5	5	18	--	--	50
6	350	18	--	--	50
7	580	18	--	--	50

The use and extended maintenance of protective measures along linear buffers allows for a reduction in width up to 15%. The reduction is excluded if buffer width averaging has been used and the resultant buffer would be more than 20% less than the original buffer. Protective measures include effective stabilization measures included in the 'Illinois Urban Manual' or those approved by the Administrator. Commonly used protective measures include but are not limited to:

MEASURE	IL URBAN STANDARD	USE
• Erosion Blanket	Std. 830	Temp
• Silt Fence	Std. 920	Temp
• Sodding (as temp measure)	Std. 925	Temp
• Deep-rooted grasses – Sod or Seed		Perm
• Sediment Trap	Std. 960	Temp
• Sediment Basin	Std. 841 & 842	Temp/Perm

If lineal "Waters of the U.S." are partially or completely relocated, the channel design must accommodate naturalized revegetation and utilize best management practices including:

- Vegetatively Stabilized Banks
- Pool and Riffle Design for Low Flow Conditions
- Channel Meanders
- Other Biological Stream Enhancements Approved by the Administrator.

Water body buffers shall encompass all non-linear "Waters of the U.S." including, but not limited to lakes, ponds, and wetlands. All "waters" greater than 5 acres shall have a minimum buffer width of 50 feet.

The use of protective measures along water body buffers allows for a reduction in width up to 15%. The reduction is excluded if buffer width averaging has been used <u>and</u> the resultant buffer would be more than 20% less than the original buffer. Protective measures include effective

stabilization measures included in the 'Illinois Urban Manual' or those approved by the Administrator.

Table 12 details the relationship between FQI, and ADID wetlands and buffer widths.

TABLE 12
Water Body Buffer Widths

FQI	ADID	Water Body Buffer Width Table
> 16	Y	2
> 16	N	2
7 – 16	Y	2
7 – 16	N	3
< 7	Y	2
< 7	N	4

In both linear and water body buffers, buffer width averaging may be utilized. A conceptual buffer is illustrated in Figure 22 to show the ways in which buffer averaging may be applied. One special, but common occurrence is when a 404 permitted fill occurs. No buffer is required by the ordinance. However, it should be noted that buffer may be required by the 404 permit.

§ T418(b) Plantings in Buffers

Native vegetation, particularly deep-rooted warm season grasses and prairie forbs, are required for seeding, re-seeding, or inter-planting buffers. Appropriate native plants may be selected from "Wild Plants of Kane County" by Richard Young. The latest edition of the book is available from the Kane County Forest Preserve District or local book stores. A list of current plant nurseries selling native materials is included in Table 13. This list will be updated periodically and made available by the Administrator. Only plants with local (Upper Midwest) provenance may be used. Genetically modified warm season grasses are not allowed as some cultivars spread aggressively when utilized in mixes with local native materials. Plant material selection information may also be found in the Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois prepared by USDA-NRCS.

FIGURE 22
Buffer Width Scenarios

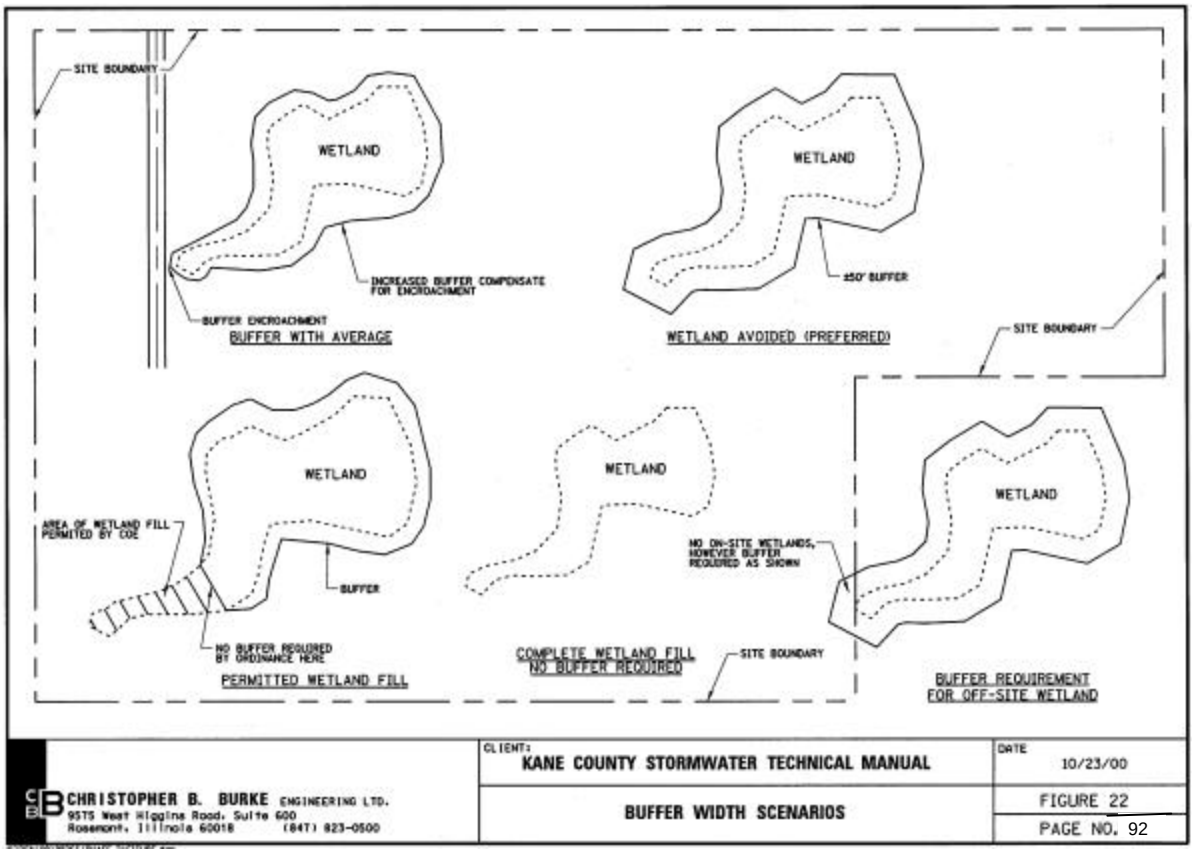


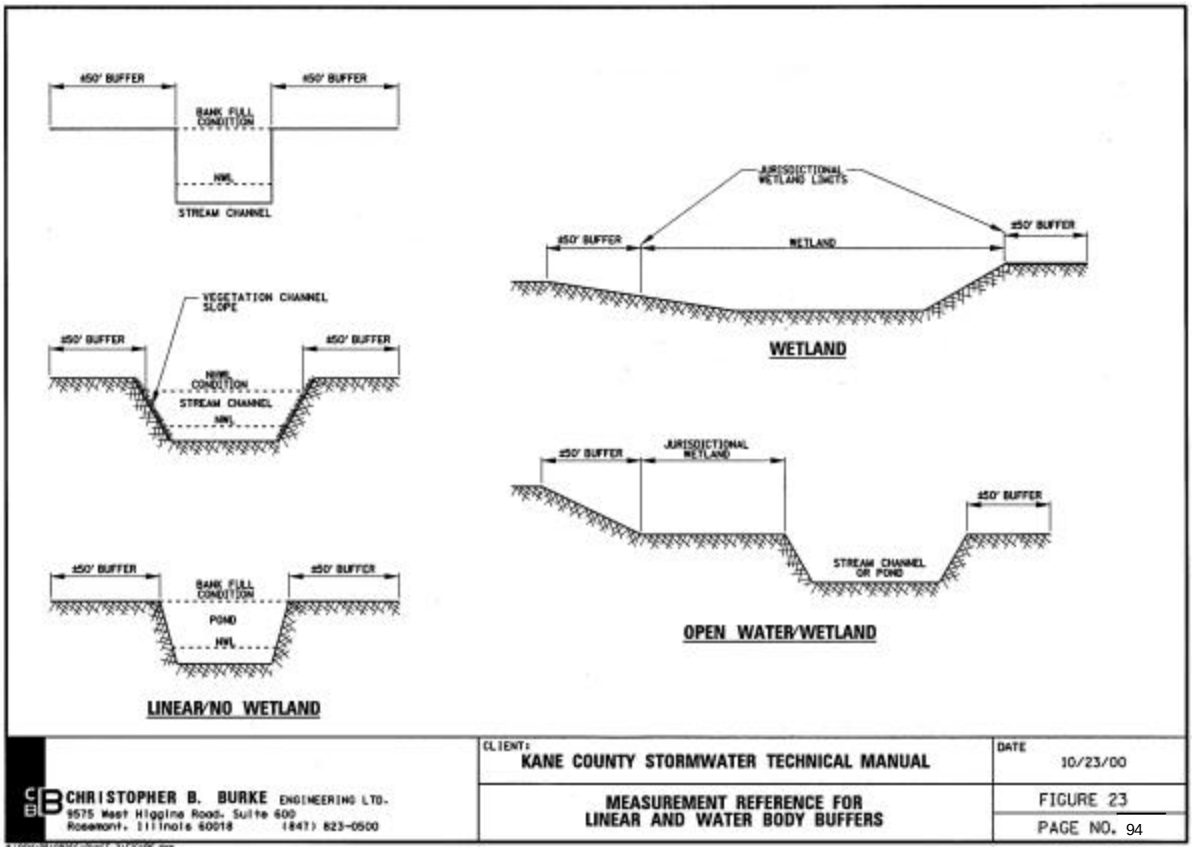
TABLE 13
Sources of Buffer Plant Materials

Applied Ecological Services Route 1, Box 130 Juda, WI 53550 Steve Apfelbaum (608)897-8547 info@appliedeco.com	Marshland Transplant Post Office Box 1 Berlin, WI 54923 Beth Miller (920)361-4200
Country Wetlands Nursery W181 S8684 Cottage Circle W Muskego, WI 53150 Jo Ann Gillespie (414)679-8003/(414)679-6866	Taylor Creek Restoration Nurseries P.O. Box 256 Brodhead, WI 53520 (608)897-8641/(608)897-8486 info@appliedeco.com
LaFayette Home Nursery, Inc. 1 Nursery Lane LaFayette, IL 61449 Dave Lahr (309)995-3311/(309)995-3909 tonyclhn@netins.net	The Natural Garden 38W443 Highway 64 St. Charles, IL 60175 Vallari Talapatra (630)584-9422/(630)584-0185 jagwet@aol.com

§ T418(c) Measurement Reference

For the purpose of measuring the width of the buffer, the interior edge of the buffer shall begin at the jurisdictional edge for wetlands and at the normal high water mark for other waters. Typically, this will be the edge of bank for ponds and lakes and the top of bank for linear water courses (Figure 23).

FIGURE 23
Measurement Reference for Linear and Water Body Buffers



§ T418(d) Disturbance During Construction

Construction disturbance of buffers is discouraged but allowed provided it meets the requirements of § 300 of the ordinance. Exceptions to this disturbance include:

- Topsoil stockpiles
- Material stockpiles
- On-site equipment maintenance
- On-site equipment storage

§ T418(e) Access

Access by equipment into buffer areas is allowed to the extent necessary to provide maintenance to the buffer and/or maintenance and monitoring activities associated with wetlands within buffers.

Buffer areas shall typically remain private property and thus, not accessible to the general public.

§ T418(f) Exemptions from Buffer Requirements

Buffers are not required for stormwater management systems provided they do not meet the requirements of "Waters of the U.S.". This includes:

- Roadside Ditches
- Channels
- Conveyance Systems
- Channels
- Excavated Detention Facilities
- Roadway Crossings of Wetlands
- Down Spouts and Sump Discharges
- Constructed Stormwater Management Facilities
- Site runoff storage facility

ARTICLE 5 – STORMWATER MANAGEMENT PERMIT SUBMITTAL REQUIREMENTS

§ T500 Stormwater Management and Other Permits Required

To determine if a Stormwater Management Permit is required for a particular development, the developer should follow the flowchart provided as Form 1, in Part 2 of this Manual. The developer must show the project location on the Flood Insurance Rate Map (FIRM), published by the Federal Emergency Management Agency (FEMA). Many of the FIRMs published by FEMA are from the early 1980's and have been restudied and revised. Therefore the developer shall request from the community or county the latest FIRM for the project area. Each community is responsible for maintaining the latest set of FIRMs for their jurisdictional area.

Section 500(a)(4) of the Ordinance includes exclusions from the necessity of obtaining a Stormwater Management Permit for developments that disturb more than 5,000 square feet of ground cover. The installation of storm sewers are not included as an exclusion because the storm sewers would be considered an improvement to the hydraulic conveyance of runoff that would otherwise have to flow overland or be absorbed into the ground.

Developments that do not require a Stormwater Management Permit are not excluded from obtaining all other appropriate stormwater management related approvals from federal, state and regional authorities.

§ T500(d) Professional Seals and Certification Required

A professional engineer shall certify a Stormwater Management Permit application by signing and sealing the front cover and Tab 1 of a bound application. By certifying the front cover and Tab 2 of the application, the professional engineer is attesting to the contents of the entire bound application. If the professional engineer does not attest to a sheet or part of the application, it must be noted. Otherwise, it will be assumed that the contents of entire bound document is being attested to by the signature and seal of the professional engineer. For applications with separate plan sheets from the bound application, the professional engineer shall sign and seal the front cover of the bound plan set. When the total project site is over 20 acres, the survey must also be tied into the Kane County Survey Control Network. New Plats, for parcels greater than 20-acres in size, must also be submitted in an electronic format designated by the County. These files will not be used to define or record property holdings.

§ T501(a) Permit Expiration

Permits are valid for a minimum of three years. Permits expire on December 31 of the third year following the date of their issuance. If a permit is issued on January 2, 2002, the permit shall expire on December 31, 2005. If a permit is issued December 1, 2002, the permit shall expire on December 31, 2005.

§ T501(b) Permit Extension

The permittee may request an extension of a permit to pursue the permitted activity before the expiration date if the permitted activity has been started. For permitted activities in special management areas, a permit extension may be applied for but the activity must be in compliance with the current requirements of the Ordinance on December 31st of the year in which the original permit expires.

§ T501(c) Permit Revision

In cases where a permit has been issued for a particular activity and after receiving the permit, the design for the proposed activity is changed, the permittee shall submit revised plans to be reviewed along with a written explanation of the changes and the reason for the changes. These changes cannot be started until a written permit revision is received from the Administrator.

§ T502 Required Submittals

A stormwater management permit application must be submitted to the appropriate authority listed in listed in Form 5 whenever a permit is required. For linear developments spanning several municipal jurisdictions, it will be acceptable for the jurisdictions to utilize the same qualified review specialist(s).

The applicant shall refer to Table 5 in §502 of the Ordinance and Form 1 in Part 2 of this manual to determine the required permit submittal sections. All Stormwater Management Permit applications shall include an application and project overview (Form 2), plan set submittal, performance security, and maintenance schedule and funding. All permitted activities shall provide record drawings at the completion of the project. Applicants shall review and complete all necessary parts of Form 3 – Kane County Stormwater Management Submittal Checklist and include the original forms with the required signatures in the bound application.

§ T502(a) Required Submittals

If the developer/applicant believes their project warrants special consideration for which a part of the submittal requirements are not required, the developer/applicant shall request in writing from the Administrator a modification in the requirements of the submittal. For example, if a developer was to redevelop a one square block in a downtown area that is nearly 100% impervious, they may request from the Administrator that no subsurface drainage investigation be performed because of the site's impervious area and location.

§ T503 Application and Project Overview

Form 2 in the latter part of this manual contains the information requested in §503 of the Ordinance. The applicant may obtain from the developer a letter authorizing the applicant to sign any documents related to the Stormwater Management Permit Applicant. In such cases the signed letter by the developer shall be attached to Form 2. In completing parts (7) through (9) of §503(a), the sheet(s) addressing each part shall be attached to Form 2.

§ T504 Plan Set Submittal

An example plan set submittal for a hypothetical development is attached at a reduced scale. The correct scale for the submittal should be 1 inch = 100 feet or larger. The Kane County benchmark used for the project shall be identified on the plan set. Where it is practical, two FEMA benchmarks should be tied-in to verify accuracy. All benchmarks shall be labeled on the plan set. A plan set submittal shall be include the following:

1. Site Topographic Map.
2. General Plan View Drawing.
3. Sediment/Erosion Control Plan.
4. Vicinity Topographic Map.

§ T505 Stormwater Submittal

A stormwater submittal shall document a plan hydrologic and hydraulic evaluation that is required when any land is subdivided or developed. The plan evaluates stormwater runoff conditions and determines the need for site runoff controls and stormwater drainage facilities consistent with watershed capacities.

It is important that each stormwater management project and permit application be handled in an equitable, fair and consistent manner. A stormwater submittal provides the technical basis for accomplishing this and is an accepted practice throughout the country. The Ordinance provides the

basis for determining capacities of existing facilities and thus for identifying the need to control potential problems associated with proposed changes. In addition, the relationship of a specific project to watershed concerns, such as off-site impacts or the use of a regional stormwater storage facility, also can be considered. Certification that the stormwater calculations and plans are prepared under the direct supervision of a professional engineer is required to encourage proper technical input.

Calculations should be submitted in the form of design reports, calculation sheets, and/or computer model documentation identifying and explaining the assumptions, data, and coefficients used in sizing the major and minor stormwater systems. The calculation of the hydraulic grade lines must be documented. Any time a computer model is used in the stormwater calculations the output should be included along with the input and output on diskette or other common media.

Form 3 in Part 2 of this manual consists of the Kane County Stormwater Management Submittal Checklist. This form should be included with each stormwater submittal. It is meant to assist the organization of the report into a standardized format that will help the reviewer find the necessary written report and calculations supporting the proposed activity. The applicant should identify those parts of the submittal appropriate for the specific submittal through the use of the checklist.

For the subsurface drainage investigations, all existing field tile systems, including the tiles entering and exiting the site, should be shown. The size, type, quality, and depth for each field tile should be noted, as well as the percentage of flow and silt found for each slit trench location. The percentage of the total depth of flow found is the percentage of tile diameter occupied by active flow. Any restrictions or surcharged conditions should be noted. Similarly, for percentage of silt, the percentage of tile diameter that is restricted by silt should be identified. If possible, field tile lines should be identified as mainline tile, sub-main tile or lateral tile.

An example of a narrative description is as follows:

Example:

"The Main project proposes a development of a 50 acre parcel located in St. Charles, Illinois. The existing site conditions consist of farmed row crops. The Main project will consist of 40 acres of ¼-acre residential lots and 10-acres of open space. The general drainage pattern or the site is from the northwest to the southeast. There is 20-acres of off-site area that is tributary to the site and enters the site at the northwest corner. The off-site tributary area is conveyed through a detention pond prior to entering the Main project site. A storm sewer has been sized to collect and convey the 10-year off-site flow through the site. Flows greater than the 10-year design storm event will be conveyed via swale to the southeast corner of the site. The Main project will have two stormwater storage facilities on the east side of the site. The outflows from both facilities will be directed into an existing storm sewer which has been demonstrated to have existing capacity to accept this additional volume without surcharging."

The applicant will have to address each of the statements with technical support, calculations and models where necessary. All stormwater storage facilities should be functional and in working order prior to development of the remainder of the site. In projects with tributary site flow, a stormwater system shall also be in place to safely convey off-site flow prior to development of the site.

§ T506 Floodplain Submittal

A floodplain submittal is required whenever a hydrologic disturbance is proposed within a floodplain. The submittal is required if any part of the hydrologic disturbance will be in the floodplain, even if the majority of the development lies outside the floodplain. All floodplain modifications shall be the minimum required to accomplish the development.

The applicant shall provide a copy of the permit obtained from IDNR-OWR and approval from FEMA for all new base flood and floodway determinations when their permitting authority applies. It will be the decision of the Administrator whether or not the review of the stormwater permit application will begin prior to written receipt of IDNR-OWR and FEMA approval in such cases as permits are required. Hydraulic disturbance of the base flood and floodway shall not occur until all necessary permits are issued and received by the Administrator.

The floodplain submittal must include sufficient information for the qualified review specialist to ascertain compliance or noncompliance of the proposed development with the criteria of the Ordinance.

At a minimum, the floodplain submittal must contain:

1. Floodplain delineation.
2. Floodway delineation.
3. Floodplain calculations.
4. Topographic survey with Kane County benchmark used.
5. IDNR-OWR permits and FEMA approval, if required.

The applicant must provide the delineation by a professional engineer of floodplain boundaries on or adjacent to the proposed development site. The floodplain must be delineated for pre-development and post-development conditions. The floodplain delineations should be shown on maps at the same scale as these required for the site stormwater submittals (floodplain boundaries on the development site should be shown on the site topographic map and nearby off-site floodplain boundaries should be shown on a vicinity topographic map).

The applicant must provide calculations and drawings sufficient for the certified review specialist to determine compliance of the proposed development set forth in Article 4 of the Ordinance. In addition, the calculations and drawings must be sufficient to meet the requirements of the NFIP regulations.

§ T507 Wetland Submittal

For all activities which do not encroach into on-site wetlands or water but still have direct impacts, the following information must be submitted to the Administrator along with a written opinion from a firm which provides wetland related services. The firm, which provides the written opinion, will review and discuss the applicability of current Federal permits.

At a minimum, the wetland submittal shall include the following:

a) Wetland Delineation Report.

The wetland delineation report will be based upon the current federal methodology in place at the time of submittal. The report will clearly detail the wetland flora, hydric soils, wetland hydrology, and surrounding upland data. The delineation report shall also include representative, current growing season photographs of each wetland plant community. All field data and inventories shall be provided on current Federal forms or approved equivalent

b) Buffer Requirements.

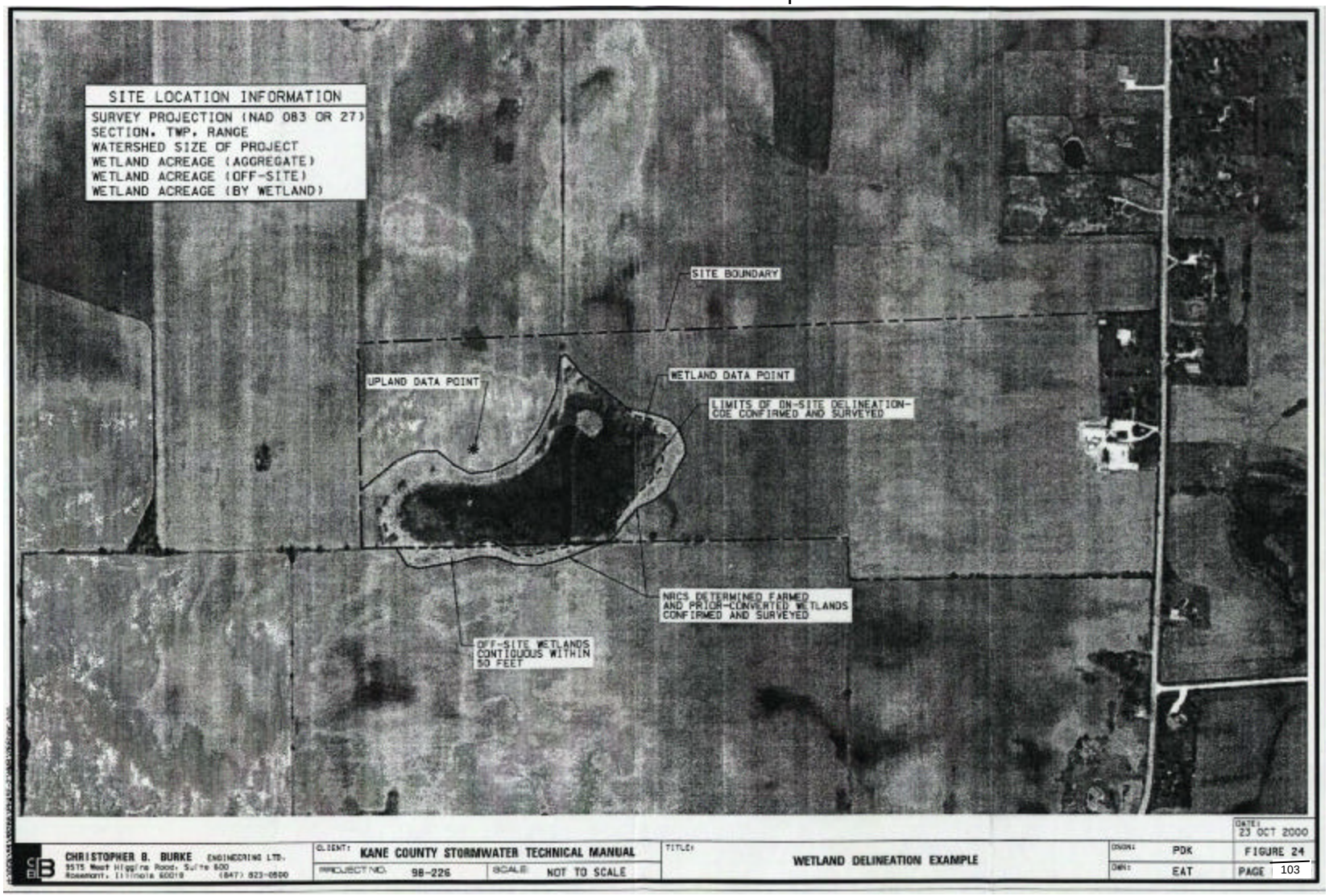
The buffer requirements for the wetland or waters shall be shown on the wetland delineation plan. The calculation of buffer size and the vegetative quality of the buffer areas shall be included in the delineation report and referenced on the plan sheet.

c) Wetland Delineation Plan.
The wetland delineation plan will at a minimum identify the following (Figure 24).

- All existing wetlands or waters on-site
- All existing off-site wetlands that lie all or in part within 50 ft. of the site boundary.
- Proposed impacts to wetlands and waters including size, shape and type of impact
- An indication of direct and indirect impacts
- Any on-site wetland mitigation plan.
- Planting plan for buffers including planting specifications, species lists, and appropriate stabilization measures.
- Wetland maintenance and monitoring activities and schedules.

Requirements for maintaining site conditions, including vegetation, soils and hydrology are set by the U.S. Army Corps of Engineers.

FIGURE 24
Wetland Delineation Example



ARTICLE 6 – LONG-TERM MAINTENANCE

The scheduled maintenance program must include at least:

1. A list of the planned maintenance tasks to be performed for each drainage facility and the frequency of each task; and

2. All supporting infrastructure (storm sewer, swales, etc.)

3. Identification of the party responsible for performing the maintenance of the drainage facility.

It is expected that naturally vegetated detention storage facilities, preserved wetlands, and preserved woodlands within private lots of a development meet a set of minimum performance standards. The performance standards have been developed in order for the Certified community to conclude if the plantings were "successful" enough to warrant a finding of compliance, and that the preserved areas are not degrading. If compliance is not met, corrective measures and subsequent monitoring is required to meet the terms and conditions of the Certified Community. The corrective measures will be funded by the SSA or backup SSA.

The success of naturalized detention ponds, preserved wetlands and woodlands, and buffers in achieving the desired effect is very dependent upon periodic management with a set of goals. The following is an example management and monitoring plan that includes a schedule describing minimum management requirements for success of the naturalized detention ponds and preserved wetlands and woodlands contained within a project site. A set of goals has been developed to assist the entity/person responsible for the maintenance with defining what is acceptable under the Ordinance.

§ T600 Long-Term Maintenance

- Protection of preserved areas from impacts directly associated with development activities.

- Provide a native vegetated buffer around detention ponds and preserve wetland areas to assist with filtering detrimental contaminants in the runoff.

- Enhance the preserved wetland areas by elimination of invasive, non-native species to increase the quality of the site.

A qualified consultant shall periodically visit the site during the first five years after planting to monitor the progress and health of the plantings and the preserved areas. These visits are to determine if remedial measures are required and to recommend procedures to correct any deficiencies. In most cases, these

deficiencies are related to the maintenance of the wetlands (i.e. eroded side slopes, clogged outlets, trash, debris dumping). The following minimum maintenance activities shall be completed every other month unless otherwise indicated during the growing season (March 1-October 31):

1. Debris Management: All trash, brush, grass clippings, debris, etc. shall be removed from the created detention ponds, preserved wetlands, and buffer areas.

2. Stormwater Management Structures: All stormwater control structures and silt basins, etc. shall be cleaned out and/or repaired every two weeks to prevent clogging. This is especially important in early spring and late fall. Dammed water can drown certain wetland plants if not rectified quickly.

3. Soil Erosion Control Management: All soil erosion control devices, structures and features, etc. are to be installed as required by the soil erosion control plan, and function properly at all times. Any deficiencies shall be corrected immediately.

The following management activities should be completed annually unless otherwise specified in the management plan:

1. Prescribed Burn Management: The detention ponds and preserved wetlands shall undergo periodic prescribed burns after the second growing season or as fuel allows. These burns help to reduce undesirable weedy species and encourage native species. These burns should only be performed by a qualified burn contractor.

2. Invasive Non-native Weeds: Purple loosestrife, reed canary grass, common reed, willow, thistle and other invasive weeds shall be controlled by the following: mechanically, through the use of mowing no sooner than the 3rd week of July, fire (as fuels allow), application of herbicide, or a combination of these methods.

3. Protection of Preserved Woodlands on Private Lots: Preserved woodlands shall have construction fencing placed around the limits of no construction zone. No equipment or materials shall be stored within the no construction zone and no equipment shall be driven within it.

An example of performance standards for the detention ponds and preserved wetlands is as follows:

A. A temporary cover crop shall be planted on all slopes immediately upon completion of detention pond grading. Within 3 months, at least

90% of the slopes, as measured by aerial cover, shall be vegetated. If the long-term slope vegetation is not planted with the temporary crop, then it should be planted in the first available growing season appropriate for each species. Prior to replanting, rill erosion shall be repaired, any gully erosion shall require drainage improvements to eliminate them from reoccurring. All cover crop species must be nonpersistent or native and not allelopathic. If a temporary cover crop is not planted immediately upon completion of grading, erosion blanket or heavy mulch must be installed to prevent erosion.

B. By the end of the fifth year, no individual area over the entire detention pond buffer area greater than 0.25 square meter shall be devoid of vegetation, as measured by aerial coverage.

C. By the end of the fifth year, none of the three most dominant plant species in any of the mitigated or preserved wetland community zones may be non-native or weedy species including by not limited to: cattails, reed canary grass, giant reed, blue grass, purple loosestrife, sandbar willow, thistle or barnyard grass, unless otherwise indicated on the approved mitigation plan.

Vegetation sampling is conducted to assist with determining if the performance standards have been met.

The sampling must occur prior to early June and again in August/September following the planting and be completed twice in Years 3, 4, and 5 during the monitoring period. Sampling will consist of a time meander search to record species presence. A visual estimate of species dominance and cover will be made. A Floristic Quality Assessment shall be performed (see § T412(c)). The number of native species present should increase over the 5 year monitoring period. Representative photographs will be taken at the time of sampling. An annual monitoring report will contain the following information:

A. Vegetation Map – This information shall be descriptive and shall define the limits of all vegetation areas by general community type, based on field observations. Dominant species within each zone shall be identified. Representative photographs of each vegetation area by general community zone shall be submitted to the entity responsible for maintenance and the certified community.

B. Cover shall be determined by visual estimate to ensure no bare earth is exposed leaving the area open to erosion.

C. Plant Community Quality – Calculate the native mean *C* values, FQI and native mean wetness coefficient for all of the areas. The native mean *C* value and FQI for the area should increase each year for a 5-

year period. If the native mean *C* value or the FQI decreases, then corrective measures should be taken in these areas.

An annual monitoring report based on the above sampling and soil erosion control inspection reports shall be submitted to the Administrator by the end of February of the year following the completion of monitoring and management tasks. The report will include a review of progress toward meeting goals and performance standards. If any of the performance criteria are not met for any year, the responsible entity must provide a detailed explanation and propose corrective measures. Particular attention should be given at the end of the second year to areas initially planted with native vegetation.

It is the applicant's responsibility to rectify any deficiencies in the detention ponds, mitigation areas and preserved areas through replanting and management including but not limited to burning and selective herbicide use.

ARTICLE 7 – ENFORCEMENT AND PENALITIES

§ T701 Required Inspections

The Administrator shall inspect or have inspected projects which are permitted under this ordinance from time to time. Inspection should be performed during construction to insure compliance with the permitted plans, but should also be performed occasionally after the permitted project is completed so that such things as required maintenance can be monitored and so that no changes to facilities are made without a permit. The Administrator has the authority to develop his own inspection program and shall be guided by the requirement for long term maintenance of permitted projects as well as by the requirements contained in this ordinance for obtaining a permit prior to development. Changes to facilities on permitted projects made after the final inspection shall be considered as new development requiring new permits. As an aid to Administrators, Forms 8 and 9 are provided in Part 2 of this Manual and may be used in lieu of developing an inspection program.

ARTICLE 13 – FEE-IN-LIEU OF SITE RUNOFF STORAGE AND WETLAND MITIGATION

§ T1300 Fee-in-Lieu of Site Storage Runoff

The Director or Administrator may in some limited circumstances pay a fee-in-lieu of site runoff storage to fulfill part or all of the site runoff storage requirement. The fee will be determined to be the lesser of

a fee per acre foot or part thereof computed from a schedule adopted by the permitting authority.

OR

the verifiable cost of providing the required storage

§ T1301 Procedures; Use of Funds

The Administrator shall grant or deny the fee-in-lieu request within 45 days of written request. The funds shall be collected and used in the same watershed for which they were paid. The fees may be used to plan, design, construct or improve stormwater management facilities in the watershed for which they were collected.

§ T1302 Fee-in-Lieu of Wetland Mitigation

If a wetland mitigation is required under this ordinance, the applicant may choose to satisfy the mitigation requirement by paying a fee-in-lieu of mitigation. To satisfy the requirements of § 1302 the applicant shall:

Prepare a statement of the estimated probable cost to acquire the land, install, monitor and maintain a wetland mitigation facility for five years as if the applicant had chosen to satisfy the mitigation requirement by mitigating within a wetland mitigation facility;

and

If mitigation credits are available from any wetland mitigation bank, the applicant shall also prepare a statement of the estimated probable cost of satisfying the mitigation requirement through the purchase of credits from a wetland mitigation bank as if the applicant had chosen to satisfy the mitigation requirement in such manner. Each estimate shall require the approval of the Director and the fee-in-lieu of wetland mitigation shall be the lesser of the two estimates.

ARTICLE 15 – WETLAND IMPACTS AND MITIGATIONS

§ T1500 General

A permit for any wetland impact not regulated by the COE and not an activity undertaken for agricultural purposes allowed under NRCS administrated programs as a result of development shall be obtained from the Director.

§ T1501 Unmitigable Wetlands – Exception

Wetlands identified in §414 as having an FQI greater than or equal to 25 are very rare and impact must be avoided to the maximum extent practicable, unless strict application makes the site completely unbuildable. The FQI should be based solely upon the wetland vegetation; buffers and adjacent plant communities should not be included in this calculation. Unmitigable wetlands include those that have high plant biodiversity, and cannot be replaced by creation of wetlands mitigation. Within Kane County, wetlands that score FQI's greater than 25 are those having high biodiversity or being in specialized habitats such as fens and calcareous seeps. The purpose for including only wetland vegetation in the FQI evaluation is so that the FQI value is not falsely increased by including more conservative plants from upland prairie or other specialty habitats.

§ T1502 Mitigation Required

All wetland impacts must be mitigated with several exceptions. The first exception is wetland impacts created by dredging a wetland that has a FQI less then seven. These wetlands typically have low quality vegetation and do not currently provide significant wetland functions. The only time mitigation is not required for these wetlands is when they are dredged. Dredging is considered to be any excavation of material. Dredging need not be a total removal of the wetland. A portion of the wetland may be excavated provided that the entire wetland has an FQI less then 7.0.

Wetland impacts to manmade wetlands that were created by excavation or as a result of development that was not completed need not be mitigated. These include partially excavated ponds and incompletely graded sites that develop wetland vegetation. Wetlands that have been created as a result of the use of irrigation, whether directly or indirectly, but that would revert to non-wetland conditions if irrigation ceased, also need not be mitigated. Evidence must be shown that the wetland is in fact created by the additional irrigation water provided to the area of hydrophytic vegetation. It is on the developer's responsibility to establish that no other hydrology exists that would support the wetland vegetation.

Wetland mitigation is not required when a manmade stormwater management facility is constructed in a previously non-wetland area. The developer will need to provide verification for the purpose and use of the manmade stormwater management facility. This may be done through a number of routes including a valid stormwater permit, construction plans, as-built plans or other documentation including dedication on plats.

Agricultural activities in wetlands occurring on agricultural land in any program under the Food Security Act for the previous three years will not have to be mitigated, provided that these wetlands are determined to be "farmed wetlands". This also includes "prior converted wetlands", which will not need to be mitigated. Applicants are encouraged to review with a qualified wetland review specialist or the Director whether these exemptions apply to the property in question, prior to application for a stormwater permit. Final decision on these questions rests with the Director.

§ T1503 Mitigation Requirements

When wetland mitigation is required, the following approaches may be used to meet the mitigation requirement.

1. Mitigation may occur in a facility designed for wetland mitigation and constructed by the applicant.
2. Mitigation may be satisfied by purchase of credits from a wetland mitigation bank. This bank must be an approved mitigation bank by the Corp of Engineers or the Director and must be a mitigation bank occurring within the boundaries of Kane County.
3. Mitigation requirements may also be satisfied by paying an outright fee in lieu of mitigation as described in Article 13, §1302.

When mitigation is required, the ratio of mitigation necessary to meet the ordinance is outlined in Table 14.

TABLE 14
Mitigation Requirements

FQI	Activity	Mitigation Location	Mitigation Ratio	Mitigation Options	Comments
<7	Dredging			Mitigation not required	
<7	Fill	Mitigation Facility Retention Area Compensatory Storage Facility Mitigation Bank	1:1	Wetland Mitigation Facility Approved Wetland Bank Fee in lieu of Mitigation	.25 wetland credit per acre for enhancement of wetlands w/ FQI less than 5.0
7-16	All	Mitigation Facility Comp. Storage Facility w/o controlled outlet Mitigation Bank	2:1	Wetland Mitigation Facility Approved Wetland Bank Fee in lieu of Mitigation	
16-25	All	Mitigation Facility Mitigation Bank	3:1	Wetland Mitigation Facility Approved Wetland Bank Fee in lieu of Mitigation	
>25				Not Mitigable	

The ratios increase with increasing floristic quality as a "safety factor" because the loss of biodiversity is difficult to replace. It should be noted that if mitigation is required for multiple wetlands on a site, the standards of the highest quality wetland impacted shall be applied. Again, the purpose of this requirement is to insure that higher quality wetlands receive greater protection or are replaced at higher mitigation ratios. Applicants are encouraged to avoid and minimize impacts to wetlands. The enhanced mitigation ratios are set up to reflect the difficulty in replacing diverse wetlands and should cause the applicant to carefully consider avoiding and minimizing impacts to these resources.

§ T1504 Wetland Mitigation Plan

In addition to the wetland delineation requirements in Article 5, if mitigation is required, mitigation plan must be submitted as part of the stormwater permit submittal. The plan must contain the following: a narrative description of the proposed plan that includes the description of the wetland hydrology to be created, the soils that will be utilized and local geomorphologic conditions that impact the construction of the wetland. This should include a description of both surface and groundwater conditions, relating to the construction and maintenance of the wetland mitigation. Each wetland mitigation plan must have a drawing that depicts the limits of the wetland mitigation facility as well

as wetlands that are impacted on the on-site wetlands. The summary table on this drawing should include the acreage to be disturbed, the acreage to be mitigated, the mitigation ratio and the total mitigation acreage.

Specifications for construction, monitoring and maintenance shall be included with the mitigation plan and should include specifications for rough and final grading, types of soils to be used for creation of the wetland mitigation, plant materials to be used, how they will be procured, and from what sources. Specifications should also include water control structures, specifications related to the planting plan including scientific and common names, rates of seeding or spacing, as appropriate, and any special planting provisions necessary for a successful wetland mitigation.

Wetland mitigations shall contain a minimum of two wetland plant communities. These plant communities must be appropriate for the site on which they are contained and be a naturally occurring wetland type within Kane County. This includes, but is not limited to wet prairie, emergent marsh, floating vascular, shrub-scrub, wooded, forested floodplain, sedge, meadow wet meadow, fen or calcareous seep, submerged aquatic, and mudflat annual. It should be noted that certain plant communities including, fens, submerged aquatic environments, hemi-marsh, and mudflat annuals will be more difficult to establish or measure their performance. Thus, to attain the goal FQI, performance standards may be more difficult to meet than for other plant communities.

The maintenance and monitoring provisions of the wetland mitigation plan are included in technical guidance for §1506. Maintenance and monitoring plan shall at a minimum include an annual work schedule describing each task in detail and its expected effect, the time of year it will be performed, and any measure of success of the technique as employed. Changes to the mitigation and monitoring plan shall be approved by the Director as necessary.

All wetland mitigation plans shall be designed to contain a minimum of two wetland plant communities as described previously and open water shall not constitute greater than 20% of the entire wetland mitigation facility. As noted previously, detention storage can only be used for wetlands being mitigated with and FQI less than seven. In compensatory storage areas, the limits remain described as in §1502 and §1503.

§ T1505 Buffer Requirements for Wetland Mitigation Facilities

Buffers are required around the edges of wetland mitigation facilities and these will be in accordance with the Tables described in §416 for the various wetland communities. No buffer is required between a wetland mitigation facility and an adjacent wetland that is preserved on site. A buffer is required

between wetland mitigation facilities and adjacent compensatory storage or stormwater detention areas.

§ T1506 Wetland Mitigation Performance Standards

The following mitigation performance standards are minimum requirements for the establishment and maintenance of wetland mitigation facilities under this ordinance.

1. The entire wetland mitigation facility, excluding the buffer, shall meet the definition of a wetland as defined in this ordinance. Buffers shall not count as mitigated area, nor will areas that were intended to be developed as wetland but that do not meet either the vegetation, soils or hydrologic requirements of a wetland.
2. All wetland mitigation facilities shall achieve a minimum 85% vegetative cover prior to acceptance of the wetland mitigation facility as complete.
3. In wetland mitigations where emergent communities are part of the wetland mitigation, the emergent vegetation will cover a minimum of 60% aerial coverage of the designated area. Emergent areas should be designed so as not to expand into other plant communities designed within the wetland mitigation facility.
4. For wetland mitigations utilizing floating vascular communities, the aerial coverage shall be at least 25% at the end of the monitoring period.
5. Open water shall have a 0% vegetative cover; however, the use of submerged aquatics within the open water area is encouraged, particularly for small shallow bodies of water. Creation of open water wetland areas, mitigation plans should be designed to minimize to the extent practicable the development of algae blooms. Open water areas should also be designed to minimize the use of these areas by locally resident nuisance goose populations. In addition to these standards, the floristic quality improvements are required as part of the mitigation performance standards and they are detailed in the Table 15.

TABLE 15
Floristic Quality Mitigation Performance

Original FQI Impacted Wetland	**Required Wetland Mitigation Facility FQI**
<7	Original FQI + 3
7-25	Original FQI + 5
>25	Not mitigable

§ T1507 Mitigation Monitoring

All wetland mitigation facilities developed under this ordinance shall be monitored and managed for five years beginning on the day the wetland planting is complete. The procedures for monitoring wetland mitigation facilities will be those set by the current Chicago District Corp of Engineers Protocols. The monitoring and management plan shall be included with the wetland mitigation plan submittal. The monitoring plan should include sampling method 5. These sampling methods shall include a vegetation map based upon as-built drawings of the completed grading. This information must be descriptive and define the limits of all of the vegetative community types that are installed. Permanent transects for sampling vegetation must be shown on this map. The dominant species and the planting list should also be submitted with the monitoring plan. Additionally, representative photographs of each vegetative area should be submitted with the annual monitoring report. These photographs should be based upon each transect location and have an overall view of the transect area. An inventory of the vascular plant community must be taken according to the procedures identified by Masters (1996) in Monitoring Vegetation in the Tall Grass Restoration Handbook for Prairies, Savannas and Woodlands edited by Packard and Corat, Island Press, 1996. An inventory of the total number of exotic taxa shall be recorded for each quadrat. Then mean C value shall be calculated as well as the FQI for each quadrat. Additionally, the wetness coefficient shall be calculated for each quadrat.

An overall mean C value as well as the FQI for each vegetative community shall be established using the procedures identified in the FQI program. A relative frequency and relative coverage of each species shall be identified for each plant community. On an aerial base each plant community shall be delineated. The soil in each community will be evaluated for morphologic, physical and chemical characteristics to determine whether hydric soil conditions exist. This includes redoxomorphic features and manganese accumulations, oxidized rizospheres, depleted matrices and other mottle colors. Any special mitigation features developed, as part of the wetland mitigation facility shall be described and their function evaluated annually during the monitoring period. The annual report for the monitoring program shall cover the calendar year from January 1st to December 31st and shall be submitted to the director no later then February 15th of the following year.

§ T1508 Mitigation Required for Non-Performing Wetlands

Wetland mitigation facilities that fail to meet the performance standards established in the ordinance shall meet additional mitigation requirements as outlined in § 1303. An amount of money set aside for non-performance of the wetland mitigation shall be estimated by the applicant and approved by the Director as a probable cost of mitigating for the shortfall in performance. The

Director will reduce the wetland performance security to cash as required to make up the difference in shortfall for performance and the remainder shall be released.

§ T1509 Denial of Permit Appeal

Any permit denied under Article 15 may be appealed as described in § 511.

PART 2 – FORMS AND APPENDICES

FORMS

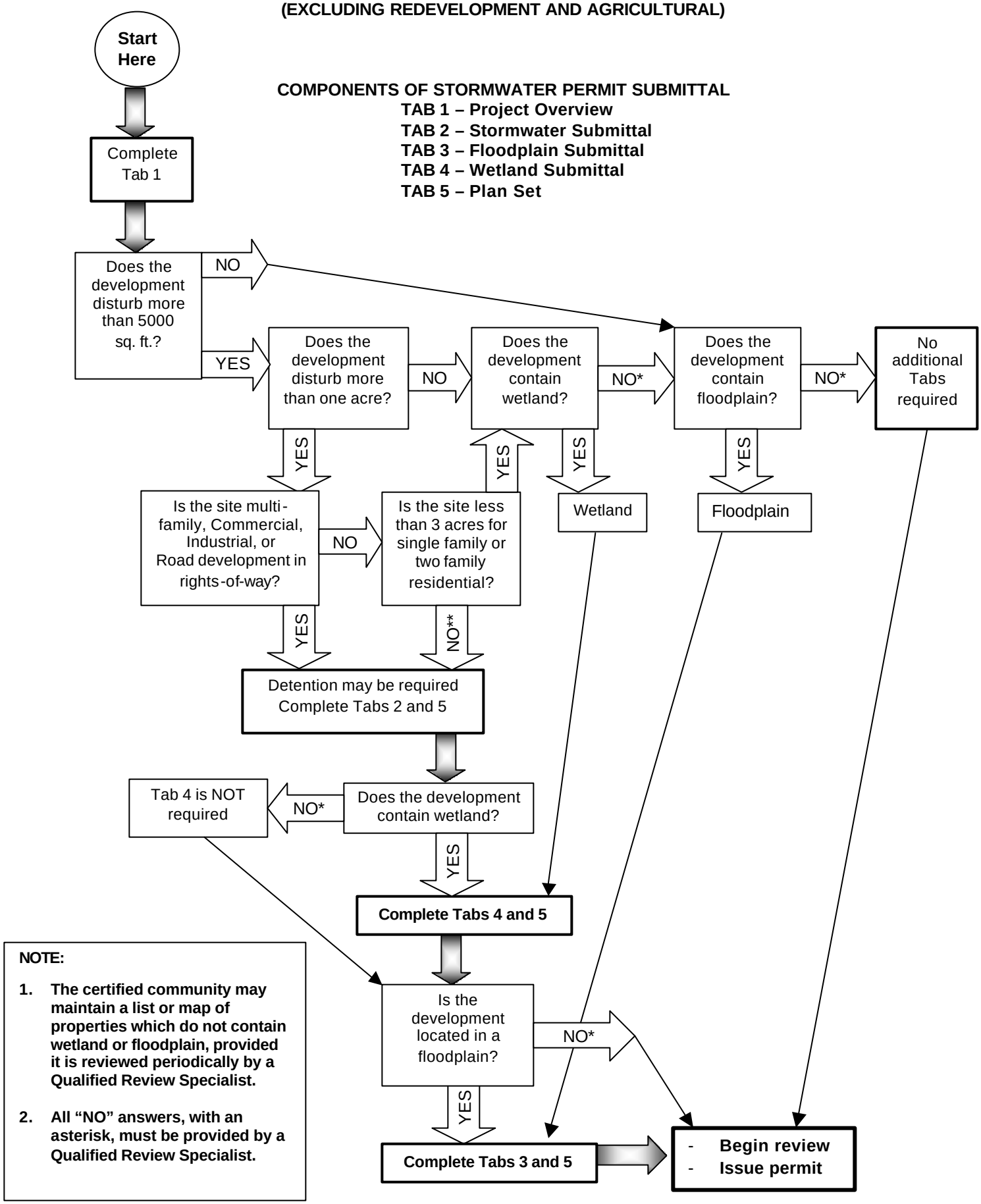
The following sheets contain forms that are meant to be copied and used by either the developer/applicant, community official or review engineer. The forms contained in this section are listed below.

FORM NO.

1. Kane County Stormwater Management Typical Permit Submittal Flowchart
2. Kane County Stormwater Management Permit Application
3. Kane County Stormwater Management Submittal Checklist
4. Community Certification Status Report
5. Community Contact For Stormwater Management Questions
6. Certified Community Form For Exempt Project
7. Certified Community Annual Form For Project Status
8. Inspection Checklist During Construction
9. Inspection Checklist After Construction
10. Developers Statements – Right to Draw on Securities
11. FEMA Community Acknowledgement Form
12. Erosion and Sediment Control Inspection Report

FORM 1

KANE COUNTY STORMWATER MANAGEMENT TYPICAL PERMIT SUBMITTAL FLOWCHART
(EXCLUDING REDEVELOPMENT AND AGRICULTURAL)



NOTE:

1. **The certified community may maintain a list or map of properties which do not contain wetland or floodplain, provided it is reviewed periodically by a Qualified Review Specialist.**

2. **All "NO" answers, with an asterisk, must be provided by a Qualified Review Specialist.**

REVISION DATE: 10/21/00

FORM 2

KANE COUNTY STORMWATER MANAGEMENT PERMIT APPLICATION

Date Application Received:	Date Permit Issued:

Name & Address of Applicant: Name & Address of Owner(s): Name & Address of Developer:

_____ _____ _____

_____ _____ _____

_____ _____ _____

Title:_____

Telephone no. during business hours: Telephone no. during business hours
A/C( )_____-_____ A/C( )_____-_____

Indicate which Submittals apply to application* (see flowchart):

? Stormwater Submittal

? Flood Plain Submittal

? Wetland Submittal

? No special management areas encroach the development

*Must be identified by qualified review specialist

Names, addresses and telephone numbers of all adjoining property owners within 250 feet of the development (use additional sheets if necessary):

Common Address of Development:

_____
Street address

_____
Community

_____
Name of local governing authority

_____
Watershed planning area and tributary

Legal Description (attach):

_____
¼, Section, Township, Range

_____
P.I.N.

Is any portion of this project now complete? _____ Yes _____ No, If "yes," explain in description portion.

I hereby certify that all information presented in this application is true and accurate to the best of my knowledge. I have read and understand the Kane County Stormwater Management Ordinance, and fully intend to comply with those provisions.

_____ _____
Signature of Developer Date

I have read and understand the Kane County Stormwater Management Ordinance, and fully intend to comply with those provisions.

_____ _____
Signature of Owner Date

Kane County Stormwater Management Submittal Checklist FORM 3

Applicant:	Reviewer:	Stormwater Permit No.:

The following tables contain a checklist of the requirements before a review for a Stormwater submittal will be accepted. The flow chart on the previous page shall be completed prior to completing the following tables. The flow chart identifies which Tab(s) need to be completed for a particular submittal. Not all requirements pertain to every stormwater submittal. For those requirements that you believe do not pertain to the this submittal, please give the reasons in the comment box.

TAB 1 – PROJECT OVERVIEW

Identifier	Requirement	Section	Comments
1A	Completed Stormwater Permit Application	503(b)	
1B	Copy of a completed Joint Application form with transmittal letters to the appropriate agencies (wetland or floodplain submittal).	503(b)	
1C	Copies of other relevant permits or approvals (include applications if permits have not been issued)	503(b)	
1D	Narrative description of development, existing and proposed conditions, and project planning principles considered, including BMPs utilized.	503(b)	
1E	Subsurface drainage investigation report	503(b)	

Name of Applicant: _____ Name of Reviewer: _____

Signature of Applicant: _____ Signature of Reviewer: _____

Date: _____ Date: _____

PROJECT INFORMATION:

Project Name: _____

Site Location: _____

Township, Range: _____

Site Area (acres): _____

Please check the following activities that apply (from the flow chart):

Type of development: ? Residential ? Commercial ? Industrial ? Agricultural ? Other

The site has the following constraints:

Floodplain	Floodway	Wetlands
? YES	? YES	? YES
? NO _____	? NO _____	? NO _____
Qualified Review Specialist Signature	Qualified Review Specialist Signature	Qualified Wetland Review Specialist
_____	_____	_____
Print Name	Print Name	Print Name

Note: Please attach a narrative project description to this Tab, if Applicant is not completing Tab 2.

Kane County Stormwater Management Submittal Checklist

TAB 2 – STORMWATER SUBMITTAL

Identifier	Requirement	Section	Comments
2A	Narrative description of the existing and proposed site conditions. Include description of off-site conditions.		
2B	Schedule for implementation of the site stormwater plan.		
	Site runoff calculations:		
2C	Documentation of the procedures/assumptions used to calculate hydrologic and hydraulic conditions for sizing major and minor systems.	202.3, 202.4, 202.8	
2D	Cross-section data for open channels.	203.14	
2E	Hydraulic grade line and water surface elevations under design conditions.		
2F	Hydraulic grade line and water surface elevations under base flood conditions		
	Site Runoff and Storage Calculations:		
2G	Calculation of hydraulically connected impervious area and corresponding retention volume.	203.7	
2H	Documentation of the procedures/assumptions used to calculate hydrologic and hydraulic conditions for determining the allowable release rate.	203.2, 203.4	
2I	Documentation of the procedures/assumptions used to calculate on-site depressional storage.	201.8	
2J	Documentation of the procedures/assumptions used to calculate hydrologic and hydraulic conditions for determining the storage volume.	203.7, 203.8	
2K	Elevation-area-storage data.		
2L	Elevation-discharge data.	203.5	

Kane County Stormwater Management Submittal Checklist

TAB 3 – FLOODPLAIN SUBMITTAL

Identifier	Requirement	Section	Comments
3A	Regulatory floodplain boundary determination:	400	
3B	Provide source of flood profile information.	401.1.a, 402.6	
3C	Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations, and floodplain map revisions.	203.9, 203.10, 401.1	
3D	Floodway hydrologic and hydraulic analyses for the following conditions:		
3E	Existing conditions (land use and stream system).		
3F	Proposed conditions (land use and stream system).		
3G	Tabular summary of 100-year flood elevations and discharges for existing and proposed conditions.		
3H	Calculations used for model development.		
3I	Floodplain fill and compensatory storage calculations for below and above 10-year flood elevation:	401.7	
3J	Tabular summary for below and above 10-year flood elevation of fill, compensatory storage, and compensatory storage ratios provided in proposed plan.		
3K	Floodproofing Measures:	401.4	
3L	Narrative discussion of flood proofing measures including material specifications, calculations, design details, operation summary, etc.		
3M	Flood Easements when required by the countywide ordinance or local jurisdiction.		

Kane County Stormwater Management Submittal Checklist

TAB 4 – WETLAND SUBMITTAL

Identifier	Requirement	Section	Comments
4A	Wetland Delineation Report (COE format)		
4B	Calculation of required buffer (including width, size and vegetation quality)		
4C	Wetland Delineation Plan View Drawing:		
4C-1	Location of existing and proposed impacted or undisturbed wetlands.		
4C-2	Location of buffers.		
4C-3	Planting plan for buffer area.		
4C-4	Identify all required wetland management activities.		
4C-5	Submittal to the USACOE for permit application.		

Kane County Stormwater Management Submittal Checklist

TAB 5 – PLAN SET SUBMITTAL

Identifier	Requirement	Section	Comments
5A	All drawings should be signed and sealed by a P.E.		
5B	Site Topographic Map:		
5B-1	Map scales at 1 inch = 100 feet (or less) and accurate to +/- 0.5 feet.		
5B-2	Existing and proposed contours on-site and within 100 feet of site.		
5B-3	Existing and proposed drainage patterns and watershed boundaries.		
5B-4	Delineation of pre-development regulatory floodplain/floodway limits.		
5B-5	Delineation of post-development regulatory floodplain/floodway limits.		
5B-6	Location of cross-sections and any other modeled features.		
5B-7	Location of drain tiles.		
5B-8	Location of all wetlands, lakes, ponds, etc. with normal water elevation noted.		
5B-9	Location of all buildings on the site.		
5B-10	Nearest base flood elevations.		
5B-11	FEMA and Kane County Survey Control Network benchmark.		
5C	General Plan View Drawing (may be more than one drawing for clarity)		
5C-1	Map scales at 1 inch = 100 feet (or less) and accurate to +/- 0.5 feet contour interval.		
5C-2	Existing major and minor stormwater systems.		
5C-3	Proposed major and minor stormwater systems.		
5C-4	Design details for stormwater facilities (i.e. structure and outlet work detail drawings, etc.).		
5C-6	Scheduled maintenance program for permanent stormwater facilities including BMP measures.		
5C-7	Planned maintenance tasks and schedule.		
5C-8	Identification of persons responsible for maintenance.		
5C-9	Permanent public access maintenance easements granted or dedicated to, and accepted by, a government entity.		
5D	Sediment/Erosion Control Plan:		
5D-1	Sediment/erosion control installation measures.		
5D-2	Existing and proposed roadways, structures, parking lots, driveways, sidewalks and other impervious surfaces.		

Kane County Stormwater Management Submittal Checklist

Identifier	Requirement	Section	Comments
5D-3	Limits of clearing and grading.		
5D-4	Wetland location(s).		
5D-5	Proposed buffer location.		
5D-6	Existing soil types, vegetation and land cover conditions.		
5D-7	List of maintenance tasks and schedule for sediment/erosion control measures.		
5E	Vicinity Topographic Map:		
5E-1	Vicinity topographic map covering entire area upstream of the development site and downstream to a suitable hydraulic boundary condition.		
5E-2	A 2' contour map is preferred at a scale readable by the reviewer.		
5E-3	Watershed boundaries for areas draining through or from the development.		
5E-4	Soil types, vegetation and land cover affecting runoff upstream of the site for any area draining through the site.		
5E-5	Location of development site within the major watersheds.		

Kane County Stormwater Management Submittal Checklist

TAB 6 – SECURITY SUBMITTAL

Identifier	Requirement	Section	Comments
	Estimate of Probable Cost to construct stormwater facilities.		
	Development security:		
	Schedule for the completion of stormwater facilities.		
	Irrevocable letter of credit for 110% of estimated probable cost to construct the stormwater facilities.		
	Right to draw on the security statement - signed by the holder of the security.		
	Right to enter the development site to complete required work that is not completed according to schedule.		
	Indemnification statement - signed by developer.		
	Sediment and erosion control security:		
	Irrevocable letter of credit for 110% of estimated probable cost to install sediment and erosion control facilities.		
	Right to draw on the security statement - signed by the holder of the security.		
	Right to enter the development site to complete required work that is not installed and maintained according to schedule.		
	Letter of Credit Requirements:		
	Statement that indicates that the lending institution capital resources at least $10,000,000, or as authorized.		
	Lending institution has an office location within the Chicago Metropolitan Area.		
	Lending institution is insured by the Federal Deposit Insurance Corporation.		
	Allows Administrator to withdraw without consent of developer.		
	Allows Administrator to withdraw within 45 days of expiration date.		

Kane County Stormwater Management Submittal Checklist

TAB 7 – VARIANCE SUBMITTAL

Identifier	Requirement	Section	Comments
	Completed Stormwater Permit Application and all required submittals.		
	Completed variance petition including all information identified in Section 15-236.7.a.-l.		
	Statement as to how the variance sought satisfies the standards in Section 15-236.10. Address each condition separately.		

FORM 4

COMMUNITY CERTIFICATION STATUS REPORT
AS OF JANUARY 14, 2001

COMMUNITY	***CERTIFIED***	***RECEIVED PETITION***	***IN PROGRESS***	***NON-CERTIFIED***
Aurora (C)				
Algonquin (V)				
Barrington Hills (V)				
Bartlett (V)				
Batavia (C)				
Burlington (V)				
Carpentersville (V)				
East Dundee (V)				
Elburn (V)				
Elgin (C)				
Geneva (C)				
Gilberts (V)				
Hampshire (V)				
Hoffman Estates (V)				
Huntley (V)				
Lily Lake (V)				
Maple Park (V)				
Montgomery (V)				
North Aurora (V)				
Pingree Grove (V)				
St. Charles (C)				
Sleepy Hollow (V)				
South Elgin (V)				
Sugar Grove (V)				
Virgil (V)				
Wayne (V)				
West Dundee (V)				
Unincorporated County				

FORM 5

COMMUNITY CONTACT FOR STORMWATER MANAGEMENT PERMIT APPLICATION QUESTIONS
AS OF JANUARY 14, 2001

COMMUNITY	VILLAGE ENGINEER OR CONSULTING ENGINEER	ADDRESS	PHONE (FAX)	E-MAIL ADDRESS
Aurora	Peter Haurykiewicz	44 E. Downer Place Aurora, IL 60507	(630) 844-3620 (630) 892-0322	N/A
Algonquin	Scheflow Engineers Frank Cuda	1814 Grandstand Place Elgin, IL 60120	(847) 697-7095 (847) 697-7099	scheflow@foxvalley.net
Barrington Hills	Gewalt Hamilton Assoc. Inc. Don Matthews	850 Forest Edge Dr. Vernon Hills, IL 60061	(847) 478-9700 (847) 478-9701	Dmatthews@gha-engineers.com
Bartlett	Pavia Marting & Co. Dale Marting, Sr.	910 W. Lake St. Roselle, IL 60172	(630) 529-8000 (630) 894-4910	N/A
Batavia	Ted Bergeson	100 N. Island Ave. Batavia, IL 60510	(630) 879-1424 (630) 879-1012	Tbergeson@cityofbatavia.net
Burlington	Engineering Enterprises, Inc. John Whitehouse	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	Jwhitehouse@eeiweb.com
Carpentersville	Bill Emmerich	1200 LW Besinger Dr. Carpentersville, IL 60110	(847) 551-3480 (847) 426-0864	villeng@yahoo.com
East Dundee	Gerald Heinz	206 N. River East Dundee, IL 60118	(847) 426-4535 (847) 426-4584	Glheinzinc@aol.com
Elburn	Rempe-Sharpe & Assoc. Bill Gain	324 W. State St. Geneva, IL 60134	(630) 232-0827 (630) 232-1629	billgain@inil.com
Elgin	Joe Evers	150 Dexter Ct. Elgin, IL 60120	(847) 931-5955 (847) 931-5965	evers_j@cityofelgin.org
Geneva	Dan Dinges	1800 South St. Geneva, IL 60134	(630) 232-1501 (630) 208-1503	ddinges@geneva.il.us
Gilberts	Robert Anderson & Assoc. Tony Malone	220 W. River Drive St. Charles, IL 60174	(630) 584-3530 (630) 584-3047	tmalone@haengr.com
Hampshire	Engineering Enterprises, Inc. Pete Wallers / Brad Sanderson	52 Wheeler Rd. Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	pwallers@eeiweb.com bsanderson@eeiweb.com
Hoffman Estates	Gary Salavitch	1900 Hassell Rd. Hoffman Estates, IL 60195	(847) 781-2636 (847) 781-2664	gary.salavitch@hoffmanesstates.org

COMMUNITY	VILLAGE ENGINEER OR CONSULTING ENGINEER	ADDRESS	PHONE (FAX)	E-MAIL ADDRESS
Huntley	Baxter & Woodman Bill Blecke	8678 Ridgefield Rd. Crystal Lake, IL 60012	(815) 459-1260 (815) 455-0450	bblecke@baxwood.com
Lily Lake	Engineering Resource Assoc. Rod Beadle	214 W. Willow Ave. Wheaton, IL 60187	(630) 668-5995 (630) 668-0693	era@eraconsultants.com
Maple Park	Engineering Enterprises, Inc. Dave Burroughs	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	Dburroughs@eeiweb.com
Montgomery	Engineering Enterprises, Inc. Pete Wallers	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	pwallers@eeiweb.com
North Aurora	Rempe-Sharpe & Assoc. Jim Bibby	324 W. State St. Geneva, IL 60134	(630) 232-0827 (630) 232-1629	billgain@inil.com
Pingree Grove	Scheflow Engineers Frank Cuda	1814 Grandstand Place Elgin, IL 60120	(847) 697-7095 (847) 697-7099	scheflow@foxvalley.net
St. Charles	Greg Chismark	2 E. Main St. St. Charles, IL 60174	(630) 377-4486 (630) 584-6520	gchismark@ci.st-charles.il.us
Sleepy Hollow	Gerald Hines & Associates Joe Hines	206 N. River East Dundee, IL 60118	(847) 426-4535 (847) 426-4584	glheinzinc@aol.com
South Elgin	Baxter & Woodman Steve Larson	4845 W. 167th Street Oak Forest, IL 60452	(708) 560-7070 (708) 560-7556	slarson@baxwood.com
Sugar Grove	Engineering Enterprises, Inc. Dave Burroughs	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	dburroughs@eeiweb.com
Virgil	Wendler Eng. & Surveying Inc. David Weber	444 E. Hillcrest Dekalb, IL 60115	(815) 756-7756 (815) 748-0961	davew@wendler.nu
Wayne	Christopher Burke Eng. Dan Lynch	9575 W. Higgins Rd. Suite 600 Rosemont, IL 60018	(847) 823-0500 (847) 823-0520	dlynch@cbbel.com
West Dundee	Christopher Burke Eng. Donald Dressel and Earth Tech Jay Kesson	9575 W. Higgins Rd. Suite 600 Rosemont, IL 60018 3121 Butterfield Rd. Oak Brook, IL 60521	(847) 823-0500 (847) 823-0520 (630) 574-2006 (630) 574-2007	ddressel@cbbel.com james_kessen@earthtech.com
Unincorporated County	Paul Schuch	719 Batavia Ave, Geneva, IL 60134	(630) 232-3497	schuchpaul@co.kane.il.us

FORM 6

CERTIFIED COMMUNITY FORM FOR EXEMPT PROJECT

Name of Community/Unincorporated Area applying for exemption _____

Name, Address, and Title of Submitter:

_____

_____

_____

Title: _____

Indicate reason for exemption:

? Substantial Development has commenced

? Stormwater Development Plan provides:

- minimum detention of 0.15 cfs/acre release rate
- designed conveyance system for flow rates up to base flood with no damage
- soil erosion and sediment control with Illinois Urban Manual

Description of Proposed Development (Describe in detail, including area of site, drainage area, project purpose and intended use, and estimated time until completion):

Location of Proposed Development:

_____
Name of waterway at development

_____
Street address or other descriptive location

Legal Description:

_____
¼, Section. Township, and Range

Review of this exemption is hereby made for authorization for the proposed development described herein. I certify that the information in this submission is true, complete, and accurate.

_____ _____
Signature of Submitter Date

Office Use Only

Municipal Approval	Date	Signature
Approved by Village/Council Board	_____	_____
Final Approval	Date	Signature
Director of Environmental Management	_____	_____
Special Conditions of Exemption:		

FORM 7

CERTIFIED COMMUNITY ANNUAL FORM FOR PROJECT STATUS

(This form shall be completed for each project)

Community _____ Date_____

Name, Address and Title of Submitter:
_____
_____
_____

Telephone no. during business hours:
A/C ( )_____ - _____
Fax no. (if applicable)
A/C ( )_____ - _____

PROJECT INFORMATION:
Project Name: _____
Site Location: _____
Section/Township/Range: _____

Check components that affect project:
? stormwater ? floodplain ? wetlands

Check Phase of Construction:
? pre-construction ? during construction ? post-construction

Please Describe Tasks completed during year:

Please Describe Tasks to be completed in the following year:

I hereby certify that all tasks completed during this year comply with the Kane County Stormwater Management Ordinance, and that all information presented in this submittal is true and accurate to the best of my knowledge.

_____ _____
Signature of Submitter Date

** A copy of every stormwater permit application (Form 2) shall be included with this form.*

FORM 8

INSPECTION CHECKLIST DURING CONSTRUCTION

1. Is the sediment an erosion control system as depicted on the plans installed?

2. Has the developer been maintaining the system after rain fall events?

3. Is there evidence of sediment being carried down stream from the development site at the project boundaries? If so, this is an indicator of an inadequate sediment erosion control plan and corrective action must be taken.

4. As construction progresses are there provisions for handling off site flows into the construction site without increasing upstream water surface elevations?

5. Is there adequate stormwater storage provided in sedimentation basins? Is there functional detention storage being provided for the development as it is being constructed? (In general some sort of detention basin must be in place prior to the construction of impervious surfaces).

6. Are existing wetlands to be preserved adequately protected during construction with fencing and other appropriate sediment and erosion control measures to limit both vehicle access and the impact of sediment from the construction site?

7. Is any required culvert or bridge being constructed in a manner to provide the least disturbance of the aquatic resource?

8. Are buffers delineated in the field and protected from intrusion by construction vehicles and other construction activities?

9. Are any required restrictor structures installed as soon as practicable on the conveyance system?

10. Are sediments being removed from basins and disposed of properly on site in a manner that does not promote their reintroduction into the stream system?

11. Are the limitations to the amount of area that can be worked being followed?

FORM 9

INSPECTION CHECKLIST AFTER CONSTRUCTION

1. Are required storm water detention/retention facilities in place and generally as they appear on the as-builts from the permitted plans?

2. Are any required restrictors in place and is the outlet control structure generally “clean”?

3. Are any required on site buffers around wetlands in place and free from prohibited activities?

4. Are there signs of failed construction?

    a. Settlement of berms.
    b. Slope instability.
    c. Accumulated sediment in detention/retention facilities.
    d. Questionable conditions at facilities related to retaining walls.
    e. Adequate stabilization of surfaces – i.e., stand of grass or other stabilizing means.

5. Have “record drawings” been submitted?

FORM 10

DEVELOPER'S STATEMENT

Right to Draw on Securities
Section 1201.1 (c & d) & 1202.1.b

I, _____, do hereby grant to the Administrator of _____
Developers Name County/Municipality
The right to draw on performance security posted in accordance with the Storm Water Permit _____ for the purpose of completing any and all
(Number/Description)
Stormwater Facilities and completing or maintaining Sediment and Erosion Control Measures included in the referenced permit. The decision to draw on the security shall be at the discretion of the Administrator. I further grant the right to enter the property for the purpose of performing the work to whoever the Administrator designates and agree to identify _____ against any increased costs
County/Community
attributable to concurrent activities or conflicts between the Administrators design's and any other contractors on site. I further warrant that I am a duly authorized representative of the developer with the authority to make this statement, and that this statement shall remain binding until final inspection and acceptance of all permitted Stormwater Facilities.

STATEMENT FOR: _____
Developer

BY: _____
Name and Signature

TITLE: _____

RELEASED BY FINAL ACCEPTANCE

FOR: _____
County/Community

BY: _____
Administrator

DATE: _____

FORM 12

EROSION AND SEDIMENT CONTROL INSPECTION REPORT

Project Name: _____ File No.: _____

Inspection Date: _____ Time: _____ Inspected By: _____

Stage of Construction

___ Pre-Construction Mtg. ___ Rough Grading ___ Finish Grading

___ Clearing & Grubbing ___ Building Construction ___ Final Stabilization

YES	NO	N/A	Inspection Checklist
__	___	__	1. Have all disturbed areas requiring temporary or permanent stabilization been stabilized? Seeded? Mulched? Graveled?
__	___	__	2. Are soil stockpiles adequately stabilized with seeding and/or sediment trapping measures?
__	___	__	3. Does permanent vegetation provide adequate stabilization?
__	___	__	4. Have sediment trapping facilities been constructed as a first step in disturbance activity?
__	___	__	5. For perimeter sediment trapping measures, are earthen structures stabilized?
__	___	__	6. Are sediment basins installed where needed?
__	___	__	7. Are finished cut and fill slopes adequately stabilized?
__	___	__	8. Are on-site channels and outlets adequately stabilized?
__	___	__	9. Do all operational storm sewer inlets have adequate inlet protection?
__	___	__	10. Are stormwater conveyance channels adequately stabilized with channel lining and/or outlet protection?
__	___	__	11. Is in-stream construction conducted using measures to minimize channel damage?
__	___	__	12. Are temporary stream crossings of non-erodible material installed where applicable?
__	___	__	13. Is necessary restabilization of in-stream construction complete?
__	___	__	14. Are utility trenches stabilized properly?
__	___	__	15. Are soil and mud kept off public roadways at intersections with site access roads?
__	___	__	16. Have all temporary control structures that are no longer needed been removed? Have all control structure repairs and sediment removal been performed?
__	___	__	17. Are properties and waterways downstream from development adequately protected from soil erosion and sediment deposition due to increases in peak stormwater runoff?

APPENDICES

APPENDIX A – MANNING'S ROUGHNESS COEFFICIENT

TABLE A1
Composite Runoff Coefficients for Unlined Channels
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)

Coefficients	Channel Conditions	Value
Material Type	Earth	0.020
n_o	Rock cut	0.025
	Fine Gravel	0.024
	Course Gravel	0.028
Degree of Irregularity	Smooth	0.000
n_1	Minor	0.005
	Moderate	0.010
	Severe	0.020
Variation of Channel	Gradual	0.000
Cross Section	Alternating Occasionally	0.005
n_2	Alternating Frequently	0.010-0.015
Relative Effect	Negligible	0.000
of Obstructions	Minor	0.010-0.015
n_3	Appreciable	0.020-0.030
	Severe	0.040-0.060
Vegetation	Low	0.005-0.010
n_4	Medium	0.010-0.025
	High	0.025-0.050
	Very High	0.050-0.100
Degree of Meandering	Minor	1.000
m_5	Appreciable	1.150
	Severe	1.3

TABLE A2
Typical Roughness Coefficients for Open Channels
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)

Type of Channel and Description			Minimum	Normal	Maximum
EXCAVATED OR DREDGED					
a.	Earth, straight and uniform				
	1.	Clean, recently constructed	0.016	0.018	0.020
	2.	Clean, after weathering	0.018	0.022	0.025
	3.	Gravel, uniform section, clean	0.022	0.025	0.030
	4.	With short grass, few weeds	0.022	0.027	0.033
b.	Earth, winding and sluggish				
	1.	No vegetation	0.023	0.025	0.030
	2.	Grass, some weeds	0.025	0.030	0.033
	3.	Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
	4.	Earth bottom and rubble sides	0.028	0.030	0.035
	5.	Stony bottom and weedy banks	0.025	0.035	0.040
	6.	Cobble bottom and clean sides	0.030	0.040	0.050
c.	Dragline-excavated or dredged				
	1.	No vegetation	0.025	0.028	0.033
	2.	Light brush on banks	0.035	0.050	0.060
d.	Rock cuts				
	1.	Smooth and uniform	0.025	0.035	0.040
	2.	Jagged and irregular	0.035	0.040	0.050
e.	Channels not maintained, weeds and brush uncut				
	1.	Dense weeds, high as flow depth	0.050	0.080	0.120
	2.	Clean bottom, brush on sides	0.040	0.050	0.080
	3.	Same, highest stage of flow	0.045	0.070	0.110
	4.	Dense brush, high stage	0.080	0.100	0.140

TABLE A2 (continued)
Typical Roughness Coefficients for Open Channels
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)

Type of Channel and Description			Minimum	Normal	Maximum
NATURAL STREAMS					
Minor streams (top width at flood stage < 100 feet)					
a.	Streams on plain				
	1.	Clean, straight, full stage, no rifts or deep pools	0.25	0.030	0.033
	2.	Same as above, but more stones and weeds	0.030	0.035	0.040
	3.	Clean, winding, some pools and shoals	0.033	0.040	0.045
	4.	Same as above, but more weeds and stones	0.0.35	0.045	0.050
	5.	Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
	6.	Same as 4, but more stones	0.045	0.050	0.060
	7.	Sluggish reaches, weedy deep pools 0.050	0.070	0.080	
	8.	Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush 0.075	0.100	0.150	
LINED OR BUILT-UP CHANNELS					
a.	Corrugated Metal		0.021	0.025	0.030
b.	Concrete				
	1.	Trowel finish	0.011	0.013	0.015
	2.	Float finish	0.013	0.015	0.016
	3.	Finished, with gravel on bottom	0.015	0.017	0.020
	4.	Unfinished 0.014	0.017	0.020	
	5.	Gunite, good section	0.016	0.019	0.023
	6.	Gunite, wavy section	0.018	0.022	0.025
	7.	On good excavated rock	0.017	0.020	
	8.	On irregular excavated rock	0.022	0.027	

TABLE A2 (continued)
Typical Roughness Coefficients for Open Channels
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)

Type of Channel and Description			Minimum	Normal	Maximum
c.	Concrete bottom, float finished with sides of				
	1.	Dressed stone in mortar	0.015	0.017	0.020
	2.	Random stone in mortar	0.017	0.020	0.024
	3.	Cement rubble masonry, plastered	0.016	0.020	0.024
	4.	Cement rubble masonry	0.020	0.025	0.030
	5.	Dry rubble or riprap	0.020	0.030	0.035
d.	Gravel bottom with sides of				
	1.	Formed concrete	0.017	0.020	0.025
	2.	Random stone in mortar	0.020	0.023	0.026
	3.	Dry rubble or riprap	0.023	0.033	0.036
e.	Asphalt				
	1.	Smooth	0.013	0.013	
	2.	Rough	0.016	0.016	
f.	Vegetal lining		0.030		0.500

TABLE A3
Manning's Roughness Coefficients for Straight Channels
Without Shrubbery or Trees

	Depth of Flow of 0.7 to 1.5 feet	Depth of Flow greater Than 3.0 feet
Bermuda grass, Buffalo grass, Kentucky Bluegrass		
a. Mowed to 2 inches	0.035	0.030
b. Length 4-6 inches	0.040	0.030
Good stand, any grass		
a. Length of 12 inches	0.070	0.035
b. Length of 24 inches	0.100	0.035
Fair stand, any grass		
a. Length of 12 inches	0.060	0.035
b. Length of 24 inches	0.070	0.035

ARTICLE 16 – Retention Best Management Practices

§ T1600 Introduction

This section provides guidance on a number of retention based stormwater BMP's that can be used to meet the Kane County 0.75-inch retention standard. The BMP's outlined in this Article include:

§ T1601 Permeable Interlocking Concrete Pavements

§ T1603 Rain Gardens

§ T1604 Infiltration Trenches

§ T1605 Level Spreader and Filter Strips

§ T1606 Naturalized Stormwater Basins

Guidance for each of these BMP's is provided in subsequent sections of this chapter. For each of the BMP's, the following are provided.

Design guidance: Describes site suitability, design parameters, hydrologic analysis, and sizing.

Example specification: Written specifications that can be used within construction documents.

Standard detail: A standard detail that may be used within construction drawings or inform the production of construction drawings.

The Technical Guidance Manual is not an exhaustive list of best management practices that can be used to provide a water quality and quantity benefits. Each practice will need to be evaluated on a case by case basis. Appropriate documentation shall be required to insure the proposed practice shall function as designed.

Before any BMP is proposed on a site it is important to determine what site conditions are present and will the proposed BMP have a negative impact to on and off site resources. An example would be if the proposed project is located in a ground water recharge area it would be critical to prevent any ground water contamination due to infiltration of deicing materials or similar that would contaminate the water supply.

The guidance in this manual does not relieve the designer of responsibility for meeting all federal, state, and local requirements.

§ T1600(a) Terminology

There are many terms used to describe the various stormwater management practices that are in use today. To avoid confusion caused by local variations in terminology, the following abbreviated glossary is provided. Because this glossary is

short, the terms are not arranged alphabetically. Rather the terms are arranged in a progression from the most commonly understood to the least.

§ T1600(a)(1) Detention:

The temporary storage of stormwater runoff with a slow, controlled release. Detention is typically provided in detention basins that use orifices, weirs, and other structures to control the discharge rate from the storage facility. The Kane County 0.10 cfs/acre 100-year allowable release rate is a detention standard. There are a number of types of detention basins.

Dry detention basins: Detention basins that remain dry between events. This is typically due to the outlet control structure being located at the bottom of the basin and the basin having adequate bottom slope to drain all runoff water.

Wet detention basins: Detention basins that include a permanent pool of water that is intended not to drain. The permanent pool is provided by locating the outlet control structure above the bottom of the excavation. In addition to providing detention of runoff water, wet detention basins are often constructed to provide aesthetic benefits, water quality benefits, and to reduce space requirements. (No storage is lost to the sloping bottom often necessary within dry detention basins.) Wet detention basins are sometimes, incorrectly referred to as retention basins (see "retention" below).

Wetland detention basins: Detention basins constructed with appropriate morphology (cross-sectional shape) and hydrology to provide habitat for wetland vegetation. Neither the Kane County stormwater management ordinance, nor the Corps of Engineers allow detention basins to be located within natural wetlands. Thus, wetland detention basins are created wetlands. Wetland detention basins can take on a variety of forms from a generally wet detention basin with a wetland shoreline to a shallow marsh with little or no permanent pool but sufficiently flat bottom and sufficiently wet conditions to support wetland plant species.

§ T1600(a)(2) Retention:

In relation to stormwater, retention is the opposite of surface discharge. With retention, runoff water does not leave the site and is instead infiltrated, evaporated, or reused within the site. Although there may be storage associated with retention facilities, the runoff water is not permanently stored on the site. In relation to stormwater, retention is the opposite of surface discharge. Retention strategies mimic the natural water cycle and release runoff back to the environment as groundwater recharge or evaporation or both but not as surface runoff. Reuse of collected rainwater for later irrigation or grey water reuse could also be considered a retention strategy. Although there may be storage associated with retention facilities, the runoff water is not permanently stored on the site. The Kane County requirement that 0.75- inches of runoff per impervious acre be retained is a retention standard. It is intended that this first 0.75-inches of runoff from impervious surfaces not leave the site as surface water.

Wet detention basins are often referred to as retention basins. However, because the permanent pool is ever-present, the only retention is the small amount of drawdown that may occur between events due to evaporation or mild infiltration.

The Best Management Practices outlined in this chapter are all at least partially retention practices. While many of these practices can be designed to retain most any volume of runoff, the design guidance provided here is specifically targeted to meeting the 0.75-inch retention standard.

Infiltration:

Infiltration refers to the introduction of runoff water into the underlying soil. Infiltration facilities typically provide temporary storage to allow slow infiltration of runoff water from a particular size event.

Bioretention:

Bioretention is a special class of retention BMP. Bioretention facilities temporarily store runoff water within soil or vegetation for later evaporation. With a bioretention facility, the stored water is used by the vegetation and evaporated or transpired but not infiltrated. Examples of bioretention include rain gardens located on impervious soils and green roofs.

Bioinfiltration:

Bioinfiltration is a special class of retention BMP. Bioinfiltration facilities temporarily store runoff water for infiltration.

		Retention		
BMP	Detention	Infiltration	Bioretention	Bioinfiltration
Detention basin	√			
Infiltration basin		√		
Infiltration trench		√		
Permeable pavement	√	√		
Green roof	√		√	
Rain garden		√	√	√
Bioswale		√	√	√
Filter strip			√	√

Table 1 – Classification of Typical Stormwater BMPs

Combination Facilities:

Many BMP's do not fall into only one category as evidenced in Table 1. For example, permeable pavement systems are both detention and infiltration. These systems temporarily store runoff water in the aggregate below the paving surface.

Some of that water infiltrates into the subgrade and some is slowly drained (and therefore detained) by an edge drain that discharges to the surface.

As can be seen in the table, there are many BMP's that fall into the categories of bioinfiltration and bioretention; in particular, rain gardens and bioswales. Rain gardens are shallow depressions lined with amended topsoil that are often underlain with a gravel storage/drainage layer. Bioswales are essentially the same as rain gardens except they tend to be long and linear and sometimes provide conveyance as well as storage. Because bioswales often provide both retention in the topsoil and infiltration through the bottom, the term bioswale is conveniently used rather than the more limiting terms of bioinfiltration swale and bioretention swale.

Although guidance for green roofs is not included in this document, a green roof is a bioretention BMP. A green roof (or vegetated roof) does not provide infiltration (for obvious reasons) but can retain significant runoff. Rain water that falls onto the engineered green roof soil hydrates the soil where the water is retained for later evaporation and transpiration by plants. Most green roofs are capable of retaining 0.75-inches and more runoff. Thus, with approval from the enforcement officer, green roofs can be assumed to meet the Kane County 0.75-inch retention standard.

§ T1600(b) BMP Systems

Although it is convenient to discuss individual BMP's, it is best to design stormwater management systems to provide necessary retention, conveyance, and detention. It is also best to distribute those systems throughout a site (decentralization of the stormwater treatment system) rather than using the more typical end-of-pipe approach to mitigating stormwater runoff. With a decentralized system, no one facility or one location of the site must manage all of the runoff and therefore greater volumes of retention are possible to better mimic natural hydrology. The Blackberry Creek Alternative Futures Analysis report

(http://www.co.kane.il.us/kcstorm/blackberry/FinalReport.pdf)

provides example BMP systems for various development types and densities and documents potential site and watershed scale benefits of implementing decentralized, retention based stormwater management systems.

§ T1600(c) Guidance Organization

Although a systems approach is recommended, this guidance is organized by BMP for purposes of providing design guidance and specifications. Each BMP section provides guidance on suitable applications, limitations to their use, site data requirements, hydrologic design criteria and sizing guidance, guidance on vegetation selection and establishment, construction considerations, and maintenance and operation requirements. Sample construction details and specifications are also provided for each BMP.

§ T1601 Permeable Interlocking Concrete Pavements

§ T1602 Definition and Examples

Permeable interlocking concrete pavement represents one type of porous pavement. These pavers are pre-cast units that have openings or large crevices (expanded joints) formed into them. The crevices (or expanded joints) are created through tabs or spacers that are cast onto the concrete unit block paver. The cast-on tabs or spacers lock into each other to create a flexible pavement system. Simple openings in the paver unit are provided by removing or adding a section from/to the cast.

The width and size of the crevices or opening in the interlocking pavers varies by the products and yields different ratios of openings per square foot. The crevices are filled with an open graded permeable material to allow water to infiltrate through the pavement. The gradation and permeability of this material will ultimately determine the rate at which water can be infiltrated through the porous paver surface.

Porous pavers can be combined with other BMP's in this guidance manual. Biofiltration measures, such as rain gardens (see Section § T1603) with or without infiltration trenches (see Section § T1604), can be used in parking lot islands to treat and convey runoff that may be discharged from the porous pavement surface during very intense rainfalls. Small rain gardens (see Section § T1603) can be used at the downstream end of porous pavements to treat and infiltrate surplus runoff that may be generated.

Other porous pavement options, although not addressed in this manual, are porous asphalt and porous cast-in-place concrete.

§ T1602(a) Suitable Applications

Porous pavers are an important structural BMP tool and valuable alternative to conventional pavements. Their application is ideal for small sites where surface detention is not feasible due to space constraints. Porous pavement systems may further be used on sites with high permeability soils where there is no drainage system to accept pavement runoff. They can be integrated into new developments and can be retrofitted into existing developments. Suitable areas or development types in which porous pavements can be incorporated are:

Paths, sidewalks, and walkways

Patios, terraces, and plazas

Driveways

Parking lots

Main and service drives

Emergency access areas

Small subdivision roads and alleyways

Non-commercial boat ramps and landings

§ T1602(b) Benefits

The purpose and concept behind porous unit block pavers is to offer a decentralized stormwater management tool. It provides retention and detention. The former allows for stormwater infiltration through the pavement wearing course, its base, and into the subgrade. It thus can be used to meet the Kane County 0.75-inch retention standard. Depending on the subgrade infiltration rates, use of permeable pavement can help to maintain the natural water cycle, recharging local aquifers and supporting groundwater driven base flows in streams and other water bodies. Permeable pavement systems can also improve water quality through filtration and a reduction in runoff temperatures[1].

Ancillary benefits:

Increased longevity when compared to conventional asphalt and concrete pavements[2]

Can reduce downstream detention needs

Efficient land use through combination of stormwater management and vehicular infrastructure

Can increase aesthetic value of the property

Can reduce the need for costly stormwater infrastructure

§ T1602(c) Limitations

It is recommended that the contributing watershed not exceed 20% of the area of the porous pavement installation[3].

The drain time for porous pavements should be limited to approximately 24-hours[4] to ensure the structural integrity of the pavement subgrade. Where soil permeability is insufficient and/or the volume of runoff is too great, a lateral subsurface drain must be installed to meet the 24-hour drainage requirement (see Section § T1602(e)(12)).

Porous pavement systems must provide adequate separation above the seasonal high ground water table (see also Section § T1602(e)(3)) and should be located at least 10-feet down slope and 100-feet up slope from building foundations unless adequate waterproofing is provided and direct drainage to footing drains can be prevented[5].

Soils on bed rock with very high infiltration rates may be unsuitable for porous pavement installations. Infiltration under such conditions may lead to sink holes and potential groundwater contamination.

Highly expansive clay soils are unsuitable for porous pavement installation[6] unless adequate drainage is provided to prevent saturation of the expansive subgrade soils. An appropriate drainage system is necessary to collect and dispose of excess stormwater in a controlled manner.

Unless the system is lined, use of porous pavers is not recommended over contaminated soils and in areas with land uses such as:

Gas stations, recycling facilities, salvaging yards, vehicle storage, service and cleaning facilities and other uses with risk of stormwater coming into contact with hazardous materials.

Land uses where there is storage of agricultural contaminants (e.g. pesticides, fertilizers, sediments) that could come into contact with stormwater.

Commercial marina services where there is a risk of fuel or other spills.

Outdoor loading and storage facilities where hazardous materials are being managed.

Well fields (see also Section § T1602(e)(4)).

Land uses within the recharge zone of sensitive wetlands, such as fens and other areas where the impact of potential increased volumes of groundwater recharge could be detrimental unless the amount of infiltration is controlled.

Locations where construction site runoff (that could clog the system) and other risks of sedimentation cannot be controlled.

Interlocking paver systems are not suitable for roadways that exceed the Average Daily Traffic (ADT) of 2000 and the speed limit of 30 miles/hour (i.e. collector roads, arterial roads, freeways).

§ T1602(d) Required Design Data

Infiltration capacity / suitability of subgrades:

The infiltration capacity of the subsoils under the porous pavement will determine the volume of runoff that can be exfiltrated from the pavement base/subbase into the ground over a given time. The infiltration capacity, along with the contributing watershed and subgrade strength will help to determine the drainage and structural design for the porous pavement.

The Kane County Soil Survey provides some guidance with regards to soil permeability and subgrade strength. It is, however, recommended to commission a soil report with density test reports and classification. The report should further include results of a hydraulic conductivity test performed at the location and elevation of the proposed bottom of the pavement to establish the site-specific permeability rate (double ring infiltrometer test per ASTM D3385, lab test per ASTM D2434 through a Shelby tube sample, or have a Certified Professional Soil Classifier

conduct an on-site soil investigation to determine soil suitability or a Falling Head Percolation Test (described in Appendix A).

Seasonal high water table:

If the site in question for the porous pavement is known to have a relatively high water table, data on the elevation of the seasonal high water table is needed. The bottom of the porous pavement should be at least three feet above the seasonal high water table[7] to reduce the potential for shallow ground water contamination.

Contributing drainage area:

Along with the infiltration capacity, the drainage area and level of imperviousness contributing to the porous pavement, if any, will determine the drainage design of the porous pavement. In generally, pervious areas should not be drained toward permeable pavement to minimize the risk of sediment clogging

§ T1602(e) Porous Unit Pavement Design

§ T1602(e)(1) Porous unit paver design principles:

Permeable interlocking concrete pavements behave as flexible pavements[8]. The surface is composed of tightly placed high-strength concrete pavers. The tight placement in combination with appropriate edge restraint, the laying pattern, and granular fill in the crevices allows the pavers to interact and function as a unified structure rather than individual units. This flexible pavement behavior mandates a flexible pavement design.

Permeable interlocking concrete pavements constitute a high strength, long-lived wearing course set into a setting bed. The purpose of the setting bed is to provide an accurate leveling course that allows the paver to be set at the specified elevations. The base and subbase course are the major load-carrying element. They distribute the loads to the level where it can be tolerated by the subgrade without failure. An additional function of the subbase in porous pavement systems is to laterally drain the water that is infiltrated through the pavement surface as well as store water temporarily to allow additional time for infiltration and/or to provide detention. It should also perform as a capillary barrier. This prevents water from moving upwards into the pavement base. It helps to secure the pavement's structural integrity and prevents ice lenses from forming in the pavement. The subbase may be followed by a layer of improved or stabilized subgrade if the structural properties of the soil prove insufficient.

Design for porous paving has to reconcile structural and drainage objectives. To assure structural integrity of the pavement and prevent frost heave damage, a properly designed subbase with the appropriate drainage characteristics is of critical

importance[9]. Good pavement design for porous unit pavers results in water infiltration and particle filtration combined with structural strength.

§ T1602(e)(2) Load bearing strength:

The subgrade strength is a dominant factor in flexible pavement design[10]. Soil, or subgrade strength, is sometimes expressed by the Modulus of Elasticity (E), but more typically by the California Bearing Ratio (CBR) as defined in the ASTM D 1883 specification. The CBR of soils, particularly those that are finer graded, varies with moisture content. This is important in porous pavement design, where the subgrade is expected to be wet. Soils with permeability lower than 0.8-inch/hour can be used for exfiltration as long as the subgrade remains stable while saturated. The saturated subgrade CBR in porous pavement must be at least 5% after a minimum of 96-hours of soaking if used for vehicular traffic[11]. Other empirical design specifications require a 6,550 psi Modulus of Elasticity in porous pavement design[12], which translates into 4.3% CBR for relatively soft, fine grained soils[13].

Most subgrades will require some compaction or other stabilization treatment to assure sufficient load bearing capacity. This may greatly reduce or eliminate the infiltration capacity on finer graded soils. In some instances, the use of a geotextile can help to balance structural with infiltration objectives. The use of a woven-monofilament geotextile will spread loads over a wider area and allows for bridging of weak spots in the subgrade. An increase in depth of the base or subbase is an alternative to the use of a geotextile. The increased depth of base or subbase spreads the load over a larger area. By using these methods, the need for compaction on finer graded soils can be reduced or eliminated to preserve infiltration rates. It is recommended to consult a geotechnical engineer to evaluate soils for their CBR and suitability under porous pavements.

§ T1602(e)(3) Seasonal high water table:

On installations where the main objective is to exfiltrate stormwater into the ground, the bottom of the pavement must be a minimum of three-feet[14] above the seasonal high groundwater table. This distance provides a filter to remove pollutants from the runoff and to prevent shallow ground water contamination.

Staying a minimum required distance above the seasonal high ground water table also has a structural rational. It prevents groundwater from entering into the pavement and allows for efficient subsurface drainage and exfiltration during storm events. Controlling the moisture content of the subgrade allows for improved load bearing capacity and reduces the potential for frost heave.

§ T1602(e)(4) Well field set back:

Porous pavement systems should not be used in the immediate proximity of a well or a well field. The State of Illinois requires a minimum setback of 200-feet for

potential primary or potential secondary sources of contamination to any existing or permitted community water supply wells.

§ T1602(e)(5) Freezing conditions and frost depth:

The depth of frost penetration is an important factor in porous pavement design on soils with high silt content. Footing and foundation design frost depth is typically specified by local code (generally 42-inches in Kane County). A porous pavement base does not need to extend to the design frost depth. Silty soils, however, should be adequately drained before frost penetrates through the pavement to minimize the potential for frost heave. Frost heave in porous pavement is, however, not necessarily a failure-causing factor. The unit block pavement system is able to withstand modest amounts of frost heave without damage because of its flexible nature.

§ T1602(e)(6) Edge restraint:

A rigid, stationary edge restraint is of critical importance to permeable interlocking concrete pavements due to the modular nature of the block system. The edge restraint prevents lateral creep, holds the pavers tightly together, and provides load transfer between blocks. Modular pavements without an edge restraint will move laterally, fail along the edges and cease to provide load transfer between blocks, which compromises the structural integrity of the pavement.

Methods of edge restraint include abutting existing structures, cast-in-place concrete curbs (see also Figure 4) or slabs, pre-cast concrete curbs, or soldier courses set into concrete (see also Figure 5). Recommended minimum dimensions for edge restraints are 6-inches wide and 12-inches deep[15]. The more structurally sound the edge (i.e. concrete products with stable footer and/or concrete haunch), the less the opportunity for pavement failure at the edges. No matter what edge restraint is used, it must remain stationary under stress or it is of no value to the porous block pavement system.

§ T1602(e)(7) Traffic categories:

General roadway classification as defined in the AASHTO 'A Policy on Geometric Design of Highways and Streets'; also know as the "Green Book", distinguishes between:

local roads, collector roads, arterial roads, and freeways.

For the purpose of these guidelines, categories are created that reflect additional uses and traffic types at lower traffic volumes, loads and repetitions than those of 'local roads', including:

Paths + patios (pedestrian and bicycle applications)

Driveways + small parking (personal automobiles)

Large parking (personal automobiles and some truck and bus traffic)

Local roads

Porous pavement applications are suitable for traffic volumes up to those defined in the 'local road' category (ADT 2000 or less) and where the posted speed limit does not exceed 30 miles/hour. Typical examples for the 'local road' category are alleyways and small subdivision roads. The foremost rational behind the 'local road' restriction is concerns over stormwater runoff quality and pollution. It also attempts to reduce the most common cause of pavement failure, which are heavy, repetitive loads. The occasional school bus, garbage truck, or fire engine represents an acceptable load at acceptable repetitions.

§ T1602(e)(8) Typical cross sections:

Table 2, Table 3, Table 4, and Table 5 show recommended cross section designs for different interlocking porous paver applications. Porous pavement installations on subgrades with an infiltration capacity less than 0.1-inch/hour should be designed and evaluated by a qualified civil engineer.

The indicated depths of the subbase in Table 2, Table 3, Table 4, and Table 5 may be increased if additional storage and detention of runoff is required, or if low subgrade strength requires additional subbase structure. The indicated infiltration rates must be based on the subgrade at the depth of the subbase-subgrade interface after compaction or soil treatment. It is highly recommended that a qualified civil engineer with porous paving experience be consulted if conditions vary from those represented below.

Some porous pavement design software is available by paver vendors to assist the design. An example is the software product Lockpave ® Pro.

Table 2 Cross section design for **PATHS** and **PATIOS** (pedestrian and bicycle applications)

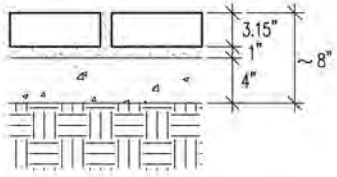
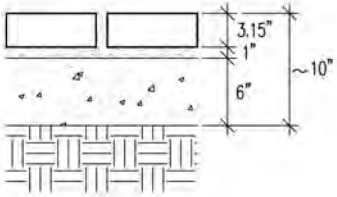
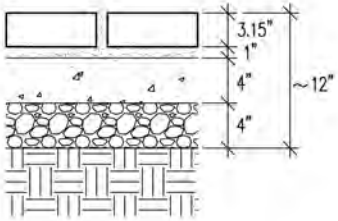
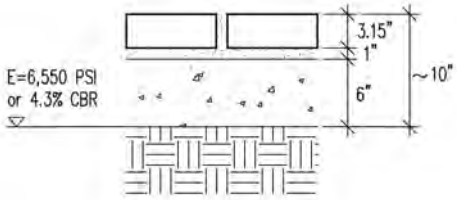
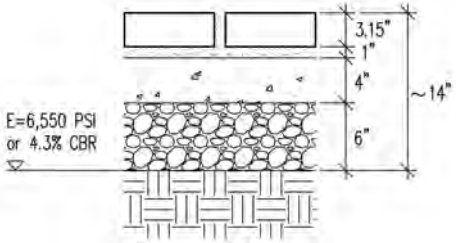
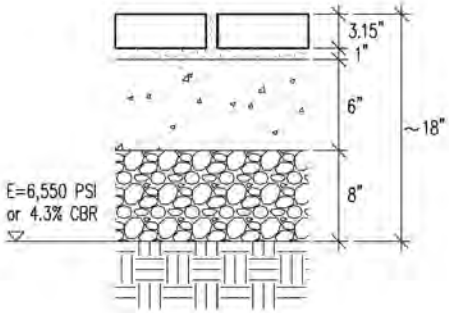
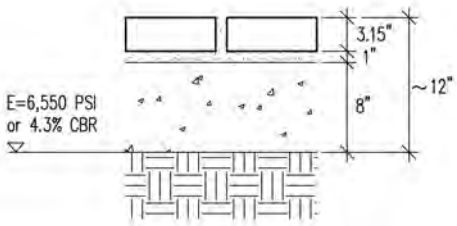
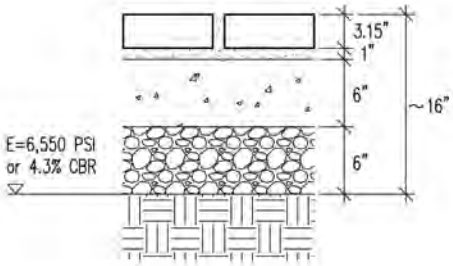
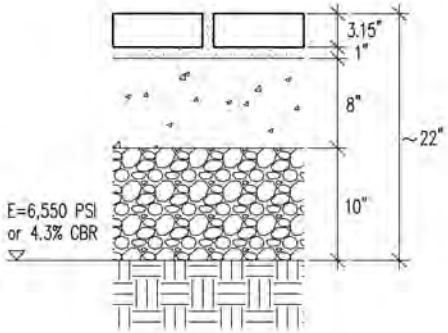
	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour
Block	3.15-inches	3.15-inches	3.15-inches
Setting	1-inch	1-inch	1-inch
Base	4-inches	6-inches	4-inches
Subbase	n/a	n/a	4-inches
Total	~ 8-inches	~ 10-inches	~ 12-inches
			
Drainage	No drainage required	No drainage required	Allow for pavement base to drain within 24-hours, may require drainage at pavement edge)

Table 3 Cross section design for **DRIVEWAYS** and **SMALL PARKING** (personal automobiles)

	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour
Block	3.15-inches	3.15-inches	3.15-inches
Setting	1-inch	1-inch	1-inch
Base	6-inches	4-inches	6-inches
Subbase	n/a	6-inches	8-inches
Total	~ 10-inches	~ 14-inches	~ 18-inches
			
Drainage	No drainage required	Allow for pavement base to drain within 24-hours, may require drainage at pavement edge	Allow for pavement base to drain within 24-hours, may require drainage at pavement edge

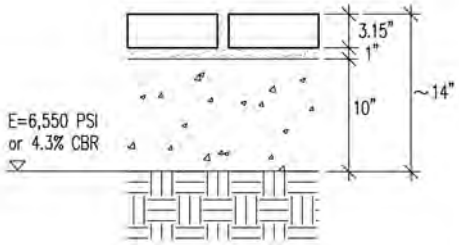
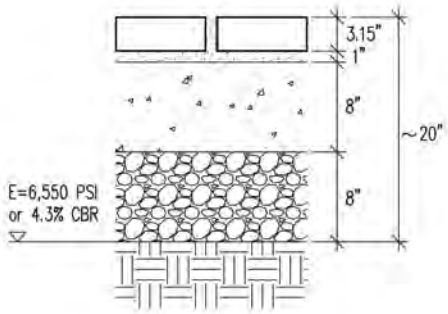
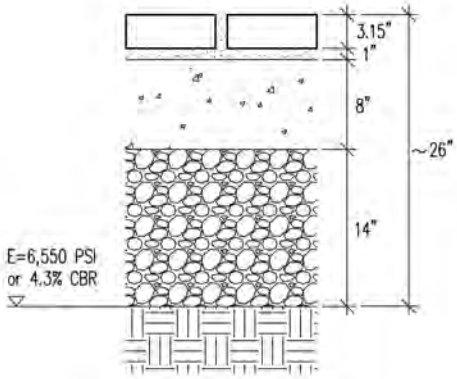
CBR = California Bearing Ratio in % (soaked)
E = Modulus of Elasticity (in psi) on soaked subgrade for relatively soft, fine grained soils

Table 4 Cross section design for **LARGE PARKING** (personal automobiles and some truck and bus traffic)

	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour
Block	3.15-inches	3.15-inches	3.15-inches
Setting	1-inch	1-inch	1-inch
Base	8-inches	6-inches	8-inches
Subbase	n/a	6-inches	10-inches
Total	~ 12-inches	~ 16-inches	~ 22-inches
			
Drainage	No drainage required	Allow for pavement base to drain within 24-hours, include drainage at pavement edge	Allow for pavement base to drain within 24-hours, include drainage at pavement edge

CBR = California Bearing Ratio in % (soaked)
E = Modulus of Elasticity (in psi) on soaked subgrade for relatively soft, fine grained soils

Table 5 Cross section design for **LOCAL ROADS**

	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour
Block	3.15-inches	3.15-inches	3.15-inches
Setting	1-inch	1-inch	1-inch
Base	10-inches	8-inches	8-inches
Subbase	n/a	8-inches	14-inches
Total	~ 14-inches	~ 20-inches	~ 26-inches
			
Drainage	No drainage required	Allow for pavement base to drain within 24-hours, include drainage at pavement edge	Allow for pavement base to drain within 24-hours, include drainage at pavement edge

CBR = California Bearing Ratio in % (soaked)
E = Modulus of Elasticity (in psi) on soaked subgrade for relatively soft, fine grained soils

§ T1602(e)(9) Material/aggregate selection, function and performance:

A porous unit block paver system must be designed and constructed with open graded materials in the paver crevices or openings, the bedding layer, the base, and subbase to ensure and sustain good drainage and infiltration characteristics.

Typical road construction aggregates (including sharp sands) are unsuitable due to their percentage of fines (Sieve No. 16 to 200). These aggregates have small voids and tend to trap fine dust particles that wash into the pavement. This will lead to clogging and formation of an impervious "pan" over time. Infiltrated runoff will accumulate on the pan, which compromises the stormwater objectives of the porous pavement. A reduction in permeability in the base or subbase will also compromise structural objectives. Trapped water in the base can cause high pore-water pressure and result in pumping under dynamic traffic loads[16]. Only non-plastic, open-graded aggregates (plasticity index of 0) that sustain their strength in the presence of water should be used in porous pavement installations[17].

Open-graded materials for porous pavements should originate from a hard, durable crushed rock with 90% fractured face and a Los Angeles (LA) Abrasion of <40. A design CBR of 80% is recommended[18].

Crevice fill:

An IDOT CA16 (or ASTM C33 No. 8) crushed stone should be used to fill the paver openings and crevices. The IDOT CA16 is also commonly referred to as 3/8-inch stone chips. The size and porosity of this material allows accumulated dust particles to flush out during heavier storm events. This helps to prevent clogging and sustain good infiltration rates over time. The infiltration rate of the IDOT CA16 should be at least 1,000-inches/hour[19]. Because the crevice fill material is much finer than the base and subbase materials, the crevice material also creates a design failure point in a readily remediated location (see also Section § T1602(g)(2)). The crevice fill material will clog rather than pass material that could clog the base or subbase

Bedding layer:

Besides filling the paver openings and crevices, the IDOT CA16 (or ASTM C33 No. 8) crushed stone should be used for the bedding layer. As with the paver openings and crevices, the size and porosity of this material allows accumulated dust particles to flush out during heavier storm events. The infiltration rate of the IDOT CA16 should be at least 1,000-inches/hour[20].

Base course:

This structural/load bearing component of the pavement should be constructed using an IDOT CA7 (or ASTM C33 No. 57) crushed stone. The infiltration rate of the IDOT CA7 should be at least 1,000-inches/hour[21].

Subbase course:

This pavement component has several objectives: capillary break, structural support of the pavement, and storage and drainage. The latter is essential, although a drainage rate (hydraulic conductivity) greater than necessary will reduce detention time and amount of runoff infiltrated unless other means are used to slow drainage of this layer. A crushed rock, such as the IDOT CA7 (or ASTM C33 No. 57) or larger rock, such as the IDOT CA1 (or ASTM C33 No. 2) has good porosity and structural characteristics and provides both excellent drainage and an effective capillary barrier.

§ T1602(e)(10) Filter criteria:

It is of critical importance to specify and use materials that are resistant to migration within the pavement and thus meet filter criteria. Finer-graded materials that wash out (migrate) and erode into underlying coarser graded materials do not meet the filter criteria and lead to settlement and pavement failure. The installation of an IDOT CA16 (bedding layer) over an IDOT CA7 (base course) installed over an IDOT CA1 (subbase course) meets the filter criteria.

If materials are used that differ from the above stated gradations, it is recommended that their filter criteria be verified. The following method is commonly applied in geotechnical analysis[22]:

$$\frac{D_{15}}{d_{85}} \leq 5$$

Another method, recommended by the International Concrete Pavement Institute (ICPI) is as follows[23]:

$$\frac{D_{15}}{d_{50}} < 5 \text{ and } \frac{D_{50}}{d_{50}} > 2$$

Where:

D = coarser aggregate (open graded stone)

d = finer aggregate (choke stone)

A coarse, open-graded subbase placed over a subgrade of fine material may not meet the filter criteria. In this case, subgrade material can migrate up into the subbase, choking it and leading to failure. Wet subgrade (expected in porous

pavement systems) in combination with dynamic traffic loads (causing vibration) can lead to pumping, which compromises the structural performance of the pavement.

Pumping can be prevented and the filter criteria met by placing an appropriate geotextile between the subbase and subgrade. Both woven monofilament and non-woven, needle-punched fabrics will provide an adequate filter. Woven monofilament fabrics may be less subject to blinding that non-woven, needle-punch fabrics. Further, woven monofilament fabrics generally have lower elongation than non-woven products and therefore provide superior bridging capability. However, many woven fabrics have relatively low permittivity and it is therefore critical that a high permittivity (>1.2/sec) be specified (see Section § T1602(i)). Standard woven (tape) filter fabrics should not be used as they are insufficiently permeable and do not pass sufficient volumes of water.

Aggregates must be kept clean and protected from soil contamination throughout the construction process. This is to preserve their porosity and drainage characteristics. All installed porous block paver systems must be protected from siltation during and during construction. Eroding soils that wash onto the pavement will clog the crevices and effectively eliminate the infiltration capacity of the paver surface.

§ T1602(e)(11) Surface drainage design:

Runoff onto the porous paver surface from the contributing drainage area must be free of sediment, such as construction site runoff to prevent clogging of the crevices and loss of infiltration capacity. This requires thorough erosion control throughout the installation process, including the re-establishment of the vegetation on disturbed soils in the contributing drainage area. Porous pavements should be designed and installed in a manner that eliminates or reduces the risk of erosion contamination for the life of the pavement.

The porous unit block pavement in itself is a drainage tool since it transmits water through the pavement surface. The infiltration capacity of the pavement surface is not determined by the percentage of openings, rather it is determined by the infiltration capacity of the crevice fill material since runoff water is routed to the openings by the paver surface. That fill material must be open-graded with no or a limited amount of fines (see also Section § T1602(e)(9)). Use of the proper fill material will sustain a good infiltration capacity and surface drainage over the lifetime of the pavement and reduce or eliminate the need for catch basins and other drainage structures.

Field test data is available on the infiltration capacity of porous pavements that were constructed similar to the recommendations in these guidelines. One research project shows that virtually all water was infiltrated on permeable parking stalls for a number of monitored storms[24]. Data from a six year old porous paver installation from Havre de Grace (MD) yielded average infiltration rates of 40 cfs/ac (~40 in/h)[25]. In another instance, two and five year old installations were tested. The two year old installation infiltrated 2.8-inches/hour after 60-minutes of constant sprinkling, whereas the five year old installation infiltrated 5.7-inches/hour after the same loading. The lower infiltration capacity of the more recent installation (two years of

age) is explained with a higher percentage or organic substances and fine particles in the crevice fill[26]. This data illustrates the importance of clean and open-grade materials in porous pavement construction.

Data on the infiltration capacity through the pavement surface of permeable interlocking concrete pavements further shows that 2.5-inches/hour is a conservative design infiltration capacity for mature systems. It is, however, imperative that the open-graded materials meet the specifications. A significantly more conservative approach recommends the use of a surface infiltration capacity of 1-inch/hour over a 20-year life for porous pavements[27]. This design infiltration capacity though is based on data from infiltration trenches and therefore may not be applicable to permeable pavement surfaces. One research project on pavement systems found that surface infiltration capacity of interlocking concrete paver systems was restored to near full capacity through remedial maintenance[28] (see Section § T1602(g)(1)).

As with most pavements, it is recommended that the porous unit block pavers be installed with at least 1% slope[29]. Because a properly installed porous pavement will only generate surface runoff during very heavy storms, conventional catch basin and stormwater pipe installations can be reduced in number, substituted by vegetated swales or eliminated all together[30]. The use of vegetated swales instead of catch basins reduces costs relative to conventional drainage infrastructure. Vegetated swales have the added advantage of treating and filtering the surface runoff. Provisions for frequent curb cuts should be made if the pavement edge is a raised curb. These curb cuts can be as frequent as one for every parking stall; this frequency allows any excess surface water to drain into adjacent vegetated swales with nominal energy dissipation such as a splash pad or small amount of stone. For large flow rates through the curb cuts, larger stone material, level spreaders (see Section § T1605), or inflow chambers may be necessary (see also Section § T1603(f)(6)).

<u>§ T1602(e)(12)</u> <u>Subsurface drainage:</u>

The subsurface drainage design of porous pavements is largely determined by the infiltration capacity of the subgrade soils. A porous pavement installation can tolerate temporary storage of runoff in the base and subbase without compromising its structural integrity. Maintaining structural integrity under periodic wet conditions is contingent on subgrade strength, sufficient base and subbase depth, and the use of appropriate aggregates and geotextiles[31]. The stored runoff will ultimately be exfiltrated into the ground, or collected and discharged through a drainage system.

Porous pavements on freely draining soils with an infiltration capacity that equals or exceeds 8.0-inches/hour and have adequate depth to groundwater do not require any additional drainage infrastructure. The soil permeability should be measured at the proposed depth of the subgrade and under compacted conditions.

The same also applies to paths, patios, driveways and small parking installations on soils with infiltration capacities between 8.0- and 0.8-inches/hour. However, it is important to ensure that water in the pavement base is drained within sufficient time to prevent weakening of the subgrade soils. Pavements designed based on the

California Bearing Ratio (CBR) should be designed to drain within 72 hours to not exceed the conditions under which CBR testing is conducted.[32] (see also Table 2 and Table 3). A geotechnical engineer should be consulted if a drainage time longer than 72-hours is required. Under no circumstances should the maximum ponding time under the pavement exceed 72-hours to ensure that the volume is available for subsequent events and to avoid sealing of the subgrade soils due to growth of biological slimes. To meet these drainage requirements, subsurface drainage may be necessary in many cases. For large parking lots and local roads, the same standard applies and, at a minimum, subsurface drainage should be provided at the pavement edge (see also Table 4 and Table 5). This requires that the subgrade of the installation is graded with a minimum of 1% slope towards the pavement edge.

Soils with an infiltration rate of 0.8- to 0.1-inch/hour may exhibit a reduction in their structural capacity when saturated for extended periods. The pavement base of paths, patios, driveways, and small parking installed on such soils should drain within 72-hours (see also Table 2 and Table 3). To meet the 72-hour requirement, subsurface drainage will be necessary in most cases, particularly at the low end of the permeability range. The same 72-hour drain time applies to porous pavement on large parking lots and local road installations. The traffic load on the latter two further necessitates subsurface drainage at the pavement edge (see also Table 4 and Table 5), which requires that the subgrade of the installation is graded with a minimum of 1% slope towards the edge and other locations of subsurface drainage.

Where drainage is required, adequately sized perforated pipe should be used to ensure drainage within 72-hours. In most cases 4-inch pipe will be adequate. The openings should be sufficiently small to prevent migration of subbase material. No sock should be used as it may clog over time.

To provide detention within the pavement subbase and base, the perforated pipe may be fitted with an orifice(s) to control the rate of drainage. Provided that there is no surface inlet to the drain, very small orifices may be used since there is no access for debris that could clog the orifice. Never the less, cleanouts should be provided at all orifice locations. Cleanouts should also be provided at both ends of each drain and at all significant changes in direction.

Building foundation and basements:

Porous pavement installations should be a minimum of 10-feet down slope from building foundations and 100-feet upslope unless adequate waterproofing is provided and direct drainage to footing drains can be prevented. Another rule that can be applied to protect building basements is to set back the porous pavement 1.5 times the distance of the building foundation depth[33].

Retention volume and detention volume:

The runoff stored in porous pavements can be divided into the retention volume and detention volume. The retention volume represents the runoff in the porous pavement that is exfiltrated into the underlying subgrade. The detention volume

represents the runoff that is removed from the pavement base through perforated drain pipes or other drainage structures to meet the 72-hour drainage requirement. Most porous pavements will have a combination of retention and detention volume, with the invert of the perforated drain pipe set at an elevation that allows the retention volume to exfiltrate in 72-hours.

To meet the Kane County retention standards, porous pavements should be sized for 0.75-inch retention volume. However, porous pavements that contain the 1- to 2-year event prevent increases in runoff volumes for these storms that are most affected by urbanization. The storage in porous pavement can be sized for larger events to increase retention and reduce downstream detention needs. The sizing and drainage design for porous pavements is further described under Section § T1602(e)(13).

On subgrade soils with low or no infiltration capacity that require that an additional subsurface drain be located at the bottom of the subbase, it may be difficult to demonstrate that the 0.75-inch retention standard is being met. However, due to wetting of the aggregate and other losses that occur for small storms, it may be assumed for purposes of the Kane County Stormwater Ordinance, that the 0.75-inch retention standard is being met for permeable interlocking concrete paver systems designed and installed according to this guidance.

With the large aggregate specified for the subbase, the subbase will drain quickly, providing only nominal detention. As described in Section § T1602(e)(12) above, orifices may be placed in the drains to extend the detention time to 24-hours.

Monitoring well:

In some instances a monitoring well may be installed with the system, which will provide for access to bottom of system for observation for rate of exfiltration. The monitoring well also could be used to take water samples to permit runoff water quality analysis.

§ T1602(e)(13) Hydrologic analysis:

There are two components to the hydrologic analysis: the required size to meet the Kane County retention standard and the impact of the porous pavement on downstream detention requirements.

Retention standard:

Assuming that the only drainage to the pavement base is from the rainfall onto the pavement surface, only 0.75-inches of retention depth would be required under the pavement. Assuming a porosity of the base material of 40%, 1.9-inches of base depth would be required to provide the retention storage. If the drainage area to the permeable paving is greater than the area of the paving itself, the base depth allocated to the retention storage will need to be increased accordingly.

The drainage time of the retention volume is:

$$T_r = \frac{D_r}{i}$$

Where:

T_r = retention drain time in hours

D_r = depth of retention storage volume in inches

i = infiltration capacity of subgrade soils in inches/hour

In most cases the retention depth will be 0.75-inches. The total drain time should not exceed 72-hours unless a geotechnical analysis or the measured CBR-value indicates that longer durations would be acceptable.

Impact on downstream detention sizing:

The critical duration for detention sizing is typically 24-hours. Thus, the volume of runoff exfiltrated from a permeable pavement system during a 24-hour detention design storm will often be significant. For example, for a pavement system that is only managing its own runoff and has a subgrade permeability equal to 0.1-in/hr, the volume of infiltrated runoff during a 24-hour period would be 2.4-inches, which would reduce the runoff volume associated with the 2-year event by over 75%.

Permeable pavement systems can be modeled as storage reservoirs in standard hydrologic models such as TR20 or HEC-1.

Rainfall intensities that exceed the infiltration capacity of the paver surface should be diverted away from the under paver storage reservoir as indicated in Figure 1. To represent mature pavement systems that may have received little or no maintenance, the diversion rate should be the equivalent of 2.5- inches per hour.

The rate of infiltration Qi through the subgrade is equal to:

$$Q_i = i * A_p$$

Where:

Q_i = the volumetric flow rate through the pavement subgrade in cubic feet per second (cfs)

i = infiltration capacity of subgrade soils in inches/hour

A_p = Area of permeable pavement in acres

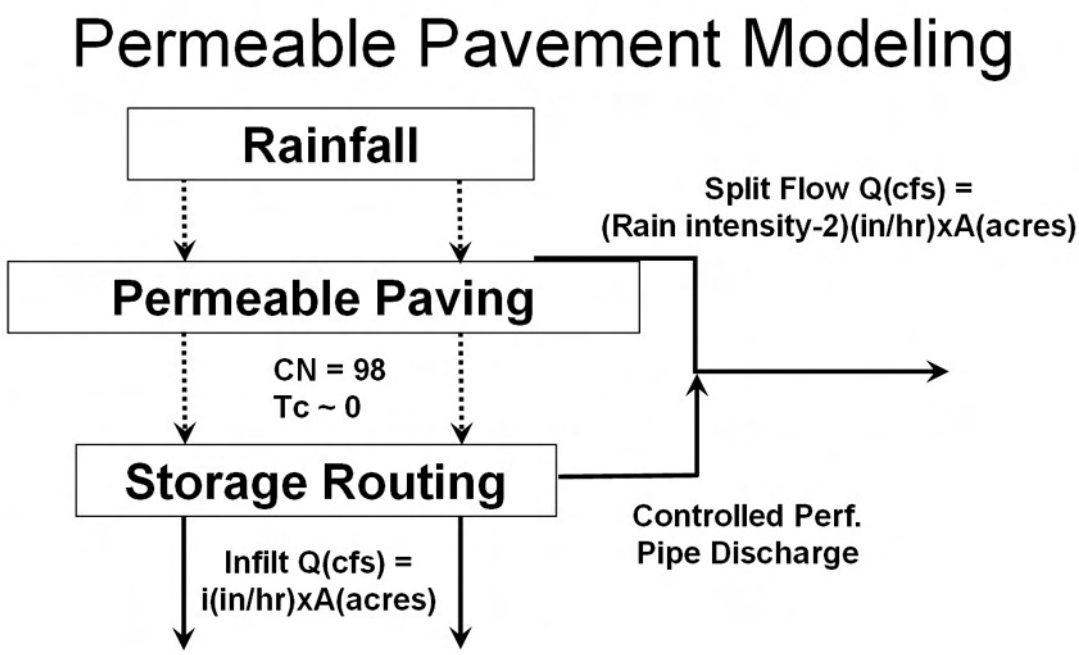


Figure 1 – Permeable Pavement Modeling Diagram

The rate of drainage by the perforated drains will depend on the characteristics of the aggregate material and the drain pipe. To more reliably predict the rate of drainage and to fully utilize the available volume within the base and subbase, the drains can be fitted with an orifice(s).

For models that allow multiple outlets, infiltration outflow can be treated as a separate outlet that does not contribute downstream. For models that only allow a single outlet, the total subbase outflow is equal to the infiltration outflow plus the surface outflow through the perforated drains (if any). The infiltration outflow rate can then be diverted out of the system so that it does not contribute to the downstream detention facility.

The diverted flow from the pavement surface should then be combined with the perforated pipe discharge to obtain the permeable pavement discharge hydrograph.

§ T1602(f) Construction Considerations

Construction of porous pavements requires special care and changes to normal construction practice and schedules for the optimal functioning of the porous pavement and its long-term viability.

It is recommended that the consultant meet with the contractor prior to construction to debrief him/her on preventative measures and to coordinate proper execution of the pavement installation. The consultant should further routinely visit the site to

review and observe the installation process. This proactive approach can avoid pavement failure due to poor construction practices.

§ T1602(f)(1) Excavation:

Unless the pavement can be protected from all construction site runoff, the excavation of the porous pavement area should be scheduled after the completion of other site work, such as all other earthwork, landscaping operations, and other heavy construction[34]. This is to prevent soil compaction and clogging of the porous pavement system or contamination of the porous pavement aggregates (see also Section § T1602(f)(2)). It is recommended to use methods and mean during final excavation of the porous pavement base that minimizes soil compaction and thus preserves the infiltration capacity of the natural soils.

§ T1602(f)(2) Soil erosion and sediment control:

Runoff from the contributing watershed must be free of sediment, such as construction site runoff to prevent clogging of the subgrade, base, or crevices and loss of infiltration capacity. This requires thorough erosion control throughout the installation process, including the re-establishment of the vegetation on disturbed soils in the contributing watershed. Porous pavements should be designed and installed in a manner that eliminates or reduces the risk of erosion contamination for the life of the pavement. It is further recommended to limit the runoff from the contributing watershed onto the porous pavement.

Soil erosion and sediment control practices should be maintained and inspected on a regular basis. Accumulated sediments within on-lot sediment traps and along silt fences should be promptly removed. All disturbed areas shall be promptly stabilized and compromised erosion and sediment control devises should be promptly repaired.

Stockpiles should be located downstream of the porous pavement; if unable to do so, stockpiles shall have a double row of silt fence that surrounds the perimeter of the stockpile.

Before the porous pavement goes online, the contributing drainage area (if any beyond the surface of the pavement) must be stabilized/fully vegetated.

§ T1602(f)(3) Aggregate installation principles:

Woven monofilament or non-woven, needle-punched fabrics should be placed over the subgrade to provide an adequate filter and prevent soil migration and pumping (see also Section § T1602(e)(2) and Section § T1602(e)(10)). Standard woven (tape) filter fabrics should not be used as they are insufficiently permeable and do not pass sufficient volumes of water.

The open graded subbase and base course must be installed in lifts that do not exceed 12-inches to assure sufficient compaction. Compaction equipment should be

approved by the project engineer. Depending on the size of the installation, a Steel Drum Compactor (min. 60-inch drum) or Vibratory Plate Compactor (min, 42-inch plate), both capable of controlled frequency, can be used. Full particle interlock of the open-graded material must be achieved, which requires three passes with an approved compactor. More than three passes may lead to over compaction, which may result in particle abrasion. The process of particle abrasion will add undesired fine matter to the open graded material.

The bedding layer is typically not compacted until after the paver installation. A plate compactor with 3000 to 5000 lbs of centrifugal compaction force that operates at 80-90 Hz should be used across the installed pavement[35]. This operation sets the pavers firmly into place and also compacts the underlying bedding layer.

§ T1602(g) Operation and Maintenance

It is recommended that permeable interlocking concrete pavements be inspected on an annual basis, preferably in spring after a major rain storm to verify that the stormwater is infiltrating into the system. Areas that have pooled water standing on the surface need to be addressed through remedial maintenance as opposed to routine maintenance. A monitoring well may be installed with the system in some instances and will provide for access to the bottom of the system for observation for rate of exfiltration. The monitoring well also could be used to take water samples to permit runoff quality analysis.

§ T1602(g)(1) Routine maintenance:

It is imperative that permeable interlocking concrete pavements be designed and installed in a manner that eliminates or reduces the risk of sedimentation and erosion contamination for the life of the pavement. If the permeable pavement is connected to a contributing watershed (i.e. other pavements or lawn areas) it should be monitored on an annual basis to insure that run-off from these sources is not depositing sediments and debris on the porous pavement. Areas near construction traffic, agricultural land (no ground cover), beaches, and areas subject to high winds that will carry fine particles will require more frequent monitoring and sweeping.

Sweeping:

Routine maintenance involves normal street sweeping, similar to that used on standard asphalt and concrete paving. While high efficiency vacuum sweepers are more effective at capturing and removing fine sediment than mechanical broom sweepers, mechanical sweeper equipment is sufficient to dislodge surface encrusted sediment. Permeable paving surfaces should be dry-swept (water should be turned off) in dry weather to remove encrusted sediment that appears as small curled “potato chips”. When vacuum equipment is used, vacuum settings should be adjusted to prevent uptake of aggregate from the pavement openings and joints. Sweeping porous pavements once a year (preferably in spring) is normal; if excessive silts and fines are present, additional monitoring of the surface to

determine silt build-up and additional sweeping may be needed (i.e. late fall and spring) to remove accumulated debris.

Closed joint permeable interlocking pavements may be pressure washed if desired. Care should be exercised to keep wand at an angle and away from the surface to prevent abrading and blasting of void material from joints and void openings. It is not recommended to utilize a pressure washer on open-jointed systems.

Winter maintenance:

As with any pavement, snow plowing is required after snowstorms. Four season parking surfaces, streets, and plaza areas may be plowed with truck-mounted blades, power brooms, snow-blowers, or manually shoveled. Rubber or nylon, rather than steel, are recommended for the replaceable snowplow tip, if bladed snow plowing equipment is used. However, steel tips are used for plowing many installations, particularly where plowing speeds are low. Manufacturers of permeable interlocking concrete pavements state that the chamfered top edges minimize chipping and allows for normal plowing procedures. Shoes at the edges of the blade and rubber nylon tipped blades are recommended for all pavements to protect the equipment and driver from impact at manholes, pavement joints, etc. that are common to asphalt and poured concrete roads.

Due to the short flow distance from the paver surface to a joint opening, the opportunity for ice formation is greatly reduced. Also, researchers state that the underlying stone bed tends to absorb and retain heat, further reducing ice formation. For these reasons, regular deicing should not be necessary and is not recommended for water quality protection reasons. However, for occasions when icing does occur, a mild application of deicing salt may be used. If abrasives are necessary, stone chips that are preferably of the same quality and specification as the void material should be used rather than sand. The application of stone chips may require sweeping and removal in the spring. If sand is used, it will tend to clog the openings and lead to the premature need for remedial maintenance.

Void filling:

The open graded stone ships in the voids and joints are subject to settling, particularly during the first year after installation. If necessary, additional voids materials may be added by manually sweeping into joints and voids. Refer to specifications for type and grade.

§ T1602(g)(2) Remedial maintenance:

Studies have shown a high initial infiltration capacity of permeable interlocking concrete pavements with a decrease and leveling off over time[36]. The decrease in infiltration capacity over time is due to deposition of fine material such as silt, organic debris, and subsequent vegetation in the joint aggregate.

The need for remedial maintenance can be determined by visual inspection. Areas that pond water on the surface will require remedial maintenance. Remediation can be achieved using a vacuum sweeper with water jets, sweeper, and vacuum bar attachment to evacuate clogged joint material. The evacuated joint material can either be washed and replaced or new joint material can be used to refill the joints (refer to specifications for size and grade). Jointing materials are to be swept into joints and voids until full, typically to the bottom of the chamfer. The frequency of required remedial maintenance depends on the degree of sediment and debris loading as well as the level of routine maintenance. Experiences from older installations show, however, that permeable interlocking concrete pavements continue to function many years after installation, which makes remedial maintenance operation more an exception. The need for remedial maintenance is also a function of sediment and erosion control during construction of the site and during the lifetime of the pavement. Proper erosion control will be necessary during construction of the homes and remedial maintenance should be performed after the home sites have been built out.

One research project on pavement systems found that surface infiltration capacity of interlocking concrete paver systems was restored to near full capacity after remedial maintenance[37].

Structural maintenance:

Settlement/ruts in pavement surface, access for utility repair, and removal of broken or damaged pavers may be performed by an experienced paver installer. Pavers should be removed, and the setting bed and void materials can be salvaged and kept separate. Base materials are to be removed if access for utilities is required. Settlement repair depending on depth should be restored with additional base materials if settlement exceeds 0.5-inch. The setting bed should be made level and pavers re-instated with void materials replaced in the joints and voids with compaction bringing the pavers to flush condition and ready for use.

§ T1602(h) Porous Pavement Easement Protection

The Kane County ordinance requires that stormwater features (such as the permeable pavement) are protected by an easement. All permeable pavement areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If the permeable pavement is not part of the stormwater management system, such as a parking stall installed by a homeowner on his or her own accord, it is exempt from the easement requirement.

§ T1602(i) Specifications

The ICPI (Interlocking Concrete Pavement Institute) provides “Guide Specifications” for the construction of interlocking concrete pavement” (1997 ICPI Tech Spec No. 9) that generally address most permeable interlocking concrete pavement issues. A

guide specification is listed below that addresses the various porous pavement components more specifically.

PART 1 – GENERAL

1.01 SECTON INCLUDES

A. Concrete units

B. Bedding Materials

C. Geotextiles

1.02 RELATED SECTIONS

A. Section [_____-_____]: Curbs.

B. Section [_____ - _____]: Open-graded base materials.

C. Section [_____ - _____]: Stabilized aggregate base.

D. Section [_____ - _____]: Impermeable liner.

E. Section [_____ - _____]: Edge restraints.

F. Section [_____ - _____]: Drainage pipes and appurtenances.

G. Section [_____ - _____]: Earthworks/excavation/soil compaction.

1.03 REFERENCES

A. American Society of Testing Materials (ASTM)

1. C 936, Standard Specification for Solid Interlocking Concrete Pavements.

2. C 33, Specification for Concrete Aggregates.

3. D 2490, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.

1.04 QUALITY ASSURANCE

A. The contractor shall have experience with placement of permeable interlocking concrete pavements. The contractor shall have completed [ ] projects comprising of not less than [ ] sy (m^2) of permeable interlocking concrete pavements within the last [24] months. The contractor shall submit a list of projects, the area of permeable paving for each, locations, and details on the type of permeable interlocking concrete pavement(s) built.

B. As applicable by state/provincial and local laws, contractor shall hold a current contractor's and business license in the state/province and locality where work is to be performed.

1.05 SUBMITTALS

A. Shop or product drawings data.

B. Samples of paving units to indicate shape selections and color(s).

C. Sieve analysis of aggregates for base and bedding materials.

D. Test results for compliance of paving units to ASTM C 936 or CSA A231.2 as applicable.

E. Soils report indicating density test reports, classification, and infiltration rate measured on-site under compacted conditions, and suitability for the intended project.

F. Erosion and sediment control plan.

G. Stormwater management (quality and quantity) calculations.

1.06 MOCK UPS

A. Install a 6 ft. x 6 ft. (2 m x 2 m) paver area as described in Article 3.02. This area will be used to determine surcharge of the sand layer, joint sizes, lines, laying pattern(s), and texture of the job. This area shall be the standard form which the work will be judged.

B. Mock up approved by [engineer] [architect] [landscape architect] shall be part of the work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

B. [Protect sand and top soil with waterproof covering to prevent exposure to rainfall, removal by wind, or contamination from any source. Secure covering in place.]

1.08 ENVIRONMENTAL CONDITIONS

A. Do not install pavers during rain or snowfall.

B. Do not install frozen base materials.

PART 2 – PRODUCTS

2.01 PAVING UNITS

A. Manufactured/supplied by a member(s) of the Interlocking Concrete Pavement Institute (ICIP). The ICIP manufacturer/supplier shall be:

[name:]

[address:]

[phone:]

[fax:]

B. Product name/shape, overall dimensions, and thickness of the paver (s):

_____mm/in. x _____ mm/in and _____mm/in thick.

_____mm/in. x _____ mm/in and _____mm/in thick

C. Meet the requirements of ASTM C 936 or CSA A231.2 as applicable.

1. When testing 3 1/8 in. (80mm) thick units for conformance to ASTM C 936, comprehensive strength tests shall be corrected by multiplying the results by 1.18.

2. When testing 4 in. (100mm) thick units for conformance to ASTM C 936, comprehensive strength tests shall be corrected by multiplying the results by 1.24.

D. Certified by the ICPI.

2.02 MATERIALS FOR BEDDING AND OPENINGS

Grading Requirements for ASTM C33 No.8

Sieve Size	Percent Passing
½ in. (12.5 mm)	100
3/8 in. (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.16 mm)	0 to 5

2.03 MATERIALS FOR BASE

Grading Requirements for ASTM C33 No. 57

Sieve Size	Percent Passing
1 ½ in. (37.5 mm)	100
1 in. (25mm)	95 to 1000
½ in. (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

2.04 MATERIALS FOR SUBBASE

Grading Requirements for ASTM C33 No. 57

Sieve Size	Percent Passing
1 ½ in. (37.5 mm)	100
1 in. (25mm)	95 to 1000
½ in. (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

or

Grading Requirements for ASTM C33 No. 2

Sieve Size	Percent Passing
3in. (75 mm)	100
2 ½ in. (63 mm)	90 to 100
2 in. (50 mm)	35 to 70
1 ½ in. (37.5 mm)	0 to 15
¾ in. (19 mm)	0 to 5

2.05 GEOTEXTILES

A. Per [manufacturer, product name/number] as supplied by [source].

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that base is free from standing water, uniform, even, free from any organic material or debris, ready to accept bedding materials, pavers and imposed loads.

B. Verify correct gradients and elevations of open-graded base.

C. Verify placement of geotextile [impermeable liner].

D. Verify compaction of soil to specified density and moisture content.

E. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.

F. Beginning of installation means acceptance of base, edge restraints, drain pipes, and overflow devices.

3.02 INSTALLATION

A. Keep area where pavement is to be constructed free from sediment during entire job. Geotextiles, base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.

B. Place and compact the No. 8 bedding material. Compact with a minimum [10] ton static roller. Make at least [4] passes. No visible movement should occur in the base material when compaction is complete.

C. The elevation of the compacted surface should not deviate more than ±1/2 in. (± 13 mm) over a 10 ft. (3 m) straightedge.

D. Loosen and evenly smooth ¾ to 1 in. (20 to 25 mm) of the compacted surface of the No. 8 bedding material. Maintain smooth, even surface during paver installation.

E. Lay the pavers [and spacers] in the pattern(s) and joint widths shown on the drawings. Maintain straight pattern lines.

F. Fill gaps at the edges of the paved area with cut pavers [edge units].

G. Cut pavers to be placed along the edges with a double-bladed splitter or masonry saw.

H. Compact and seat the pavers into the bedding material using a low amplitude, 75-90 Hz plate compactor capable of at least 5,000 lbs. (22kN) centrifugal compaction force. For units thicker than 4 in. (100 mm) use a compactor capable of at least 6,800 lbf (30 kN).

I. Vibrate and compact the pavers again, sweeping No. 8 aggregate into the openings until it is within ½ inch (13 mm) from the top surface. This will require at least two or three passes with the compactor.

J. Do not compact within 3 ft (1m) of the unrestrained edges of the paving units.

K. Remove excess aggregate by sweeping pavers clean.

L. All pavers within 3 ft (1 m) of the laying face must be left fully compacted at the completion of each day.

M. The final surface elevations shall not deviate more than ± 3/8 in. (± 10mm) under a 10 ft (3 m) long straightedge.

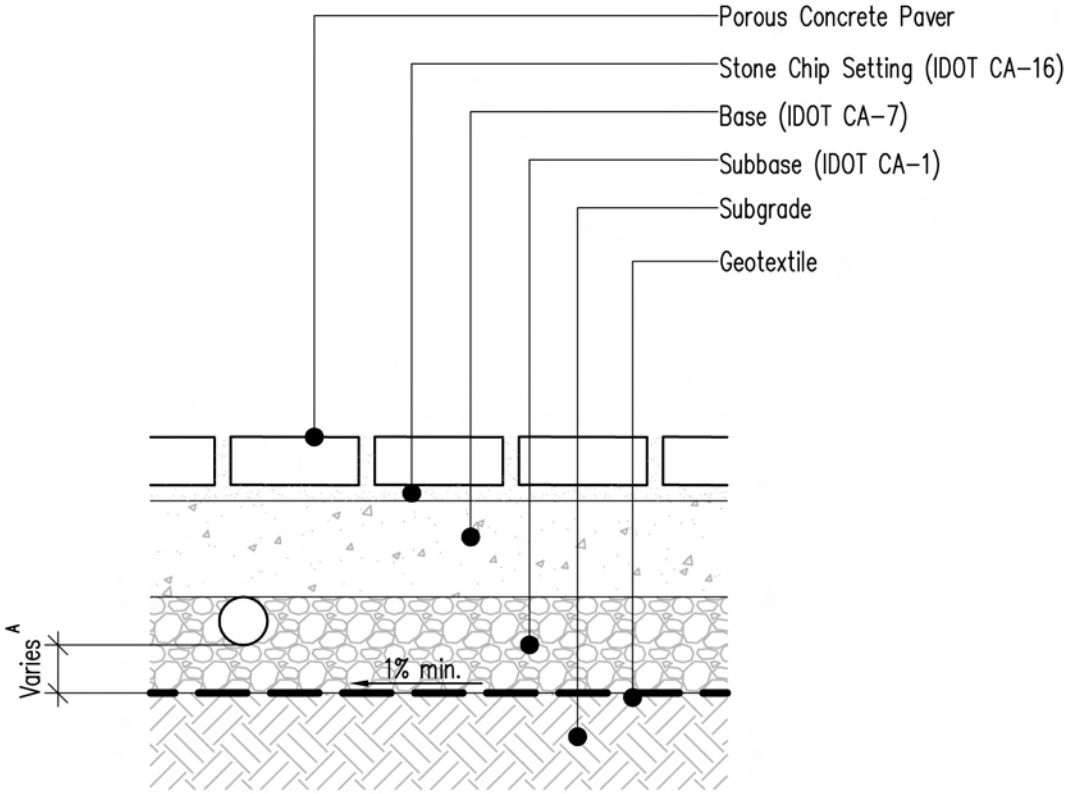
N. The surface elevation of pavers shall be 1/8 to ¼ inch (3 to 7 mm) above adjacent drainage inlets, concrete collars or channels.

3.03 FIELD QUALITY CONTROL

A. After removal of excess aggregate, check final elevations for conformance to the drawings.

END OF SECTION

§ T1602(j) Typical Detail



A) Maximum draintime not to exceed 24 hours.

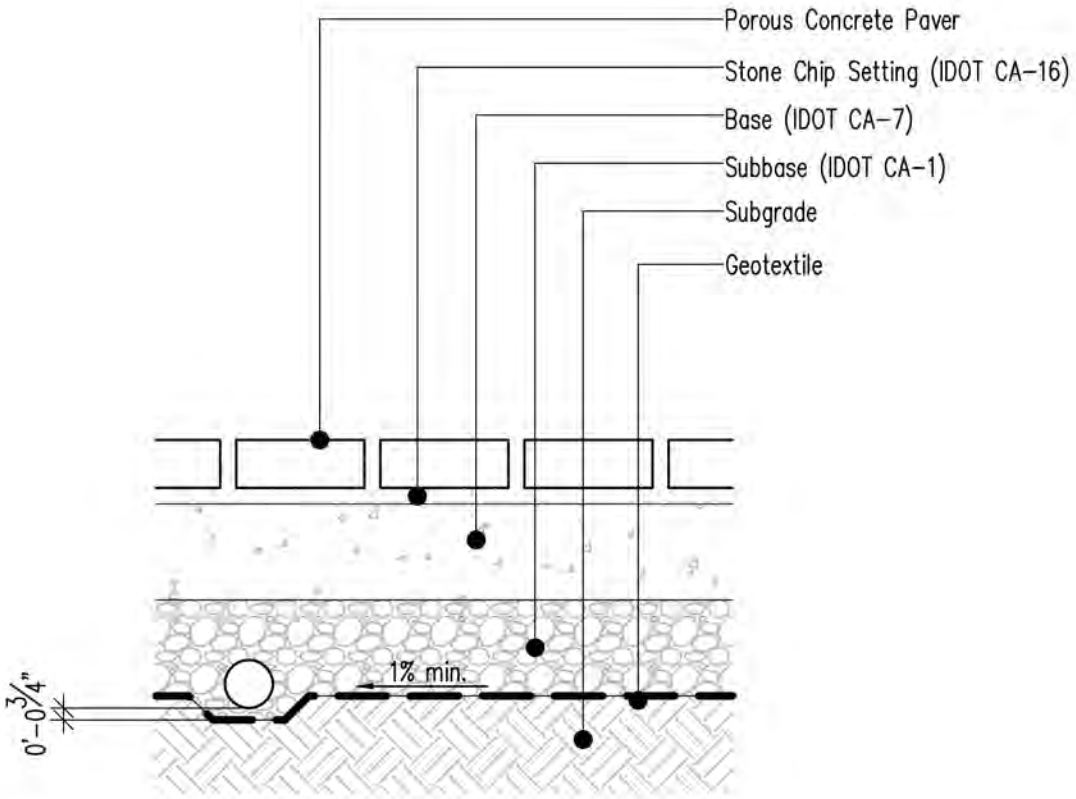
Notes:

1. Depth of base and subbase varies based on structural requirements and/or detention storage needs.

Porous Pavement with Retention Cross Section

Not to Scale

Figure 2 – Porous Pavement Detail (with retention storage volume)



Notes:

1. Depth of base and subbase varies based on structural requirements and/or detention storage needs.

Porous Pavement Cross Section

Not to Scale

Figure 3 – Porous Pavement Detail (without retention storage volume)

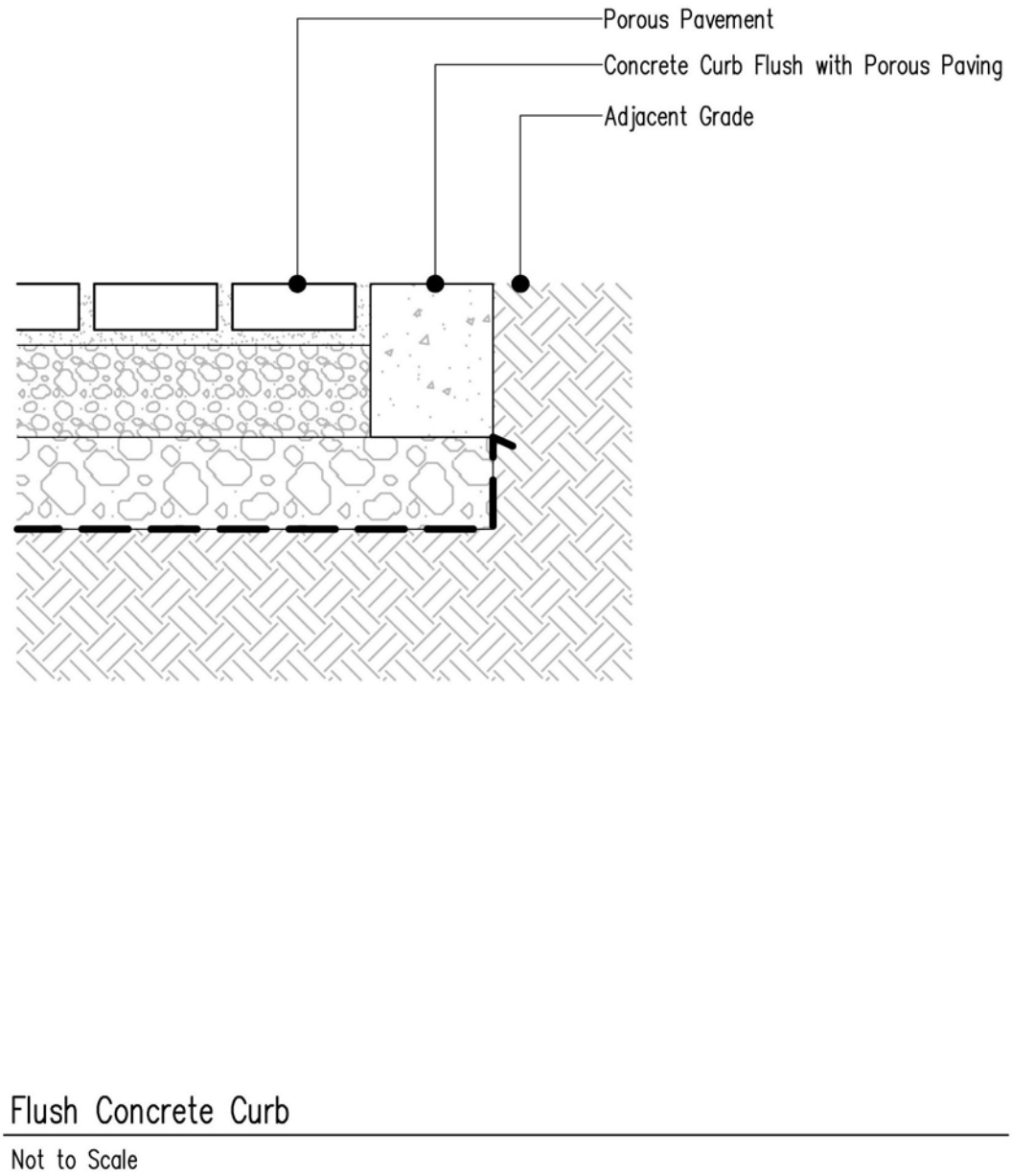
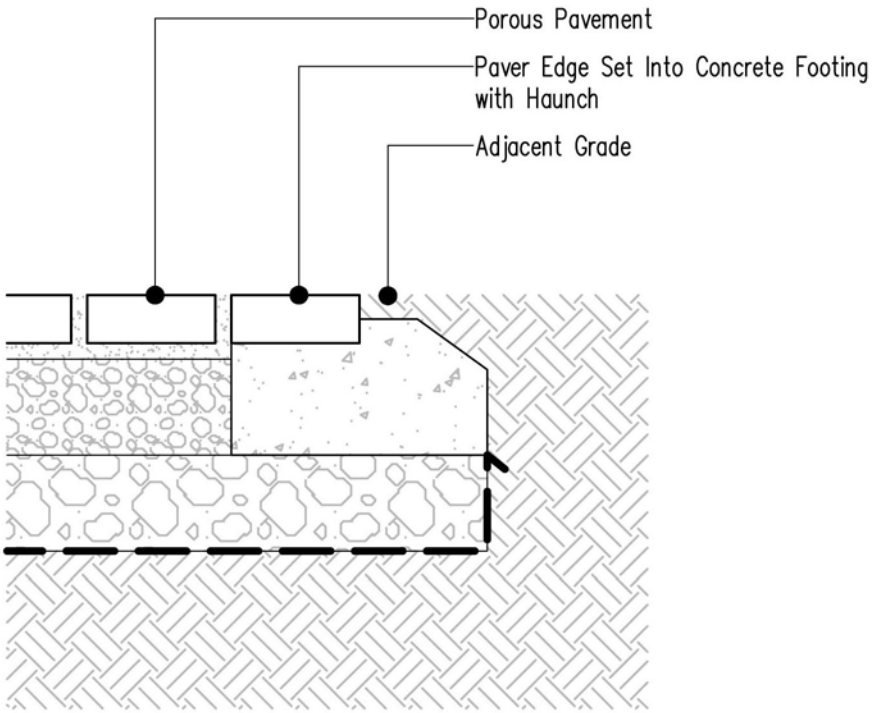


Figure 4 – Porous pavement edge restraint: Flush Concrete Curb



Concrete Paver Footing

Not to Scale

Figure 5 – Porous pavement edge restraint: Concrete Paver Footing

[1] Smith (2001); Smith (2003)
[2] JEGEL (2000)
[3] Smith (2001); Smith (2003)
[4] EPA (1999)
[5] Smith (2001); Smith (2003)
[6] Rollings *et al*. (1993)
[7] Schueler (1987); Horner *et al*. (1994); EPA (1998)
[8] Rollings *et al*. (1992)
[9] Borgwardt *et al.* (2000); Rollings *et al*. (1992); Yoder *et al*. (1975)
[10] Rollings *et al*. (1993)
[11] Smith (2001)
[12] Borgwardt *et al.* (2000)
[13] Dorman *et al*. (1964)
[14] Schueler (1987); Horner *et al*. (1994); EPA (1998)
[15] Smith (2001)
[16] Borgwardt *et al.* (2000)
[17] Rollings *et al*. (1993)
[18] Smith (2001)
[19] Smith (2001)
[20] Smith (2001)
[21] Smith (2001)
[22] Dunn *et al.* (1980); Rollings *et al*. (1992); Borgwardt *et al.* (2000)
[23] Smith (2001)
[24] Brattebo (in print)
[25] Bean *et al.* (2004)
[26] Borgwardt (1994)
[27] Smith (2001)
[28] Bean *et al.* (2004)
[29] Smith (2003); Borgwardt *et al.* (2000)
[30] Backstrom (2000)
[31] Hansen *et al.* (1997)
[32] EPA (1999)
[33] Mahabadi (2001)
[34] Cahill *et al.* (2004)
[35] Rollings *et al*. (1992)
[36] Borgwardt(1994); Bean *et al.* (2004)
[37] Bean *et al.* (2004)

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§ T1603 Rain Gardens

§ T1603(a) Definition and Examples

Rain gardens are shallow excavated garden areas designed to retain stormwater runoff from individual lots and associated impervious areas. They provide an effective runoff filtering mechanism through the vegetation and microorganisms in the root zone. Rain gardens should receive evenly distributed sheet flow, but can also receive point discharge runoff. The latter has to be specifically addressed in the rain garden design to prevent erosion and scour. Rain gardens are sized to drain or fully infiltrate the received runoff within approximately 12-hours and are typically planted with grasses and perennials, which help to improve and maintain stormwater infiltration over time.

The term "rain garden" is used here to denote a variety of biofiltration measures designed to filter and/or infiltrate runoff through a vegetated soil surface. For example, linear rain gardens located within parking lot islands are often referred to as biofiltration swales or simply bioswales.

Rain gardens can be combined with other BMP's in this guidance manual. For example, many rain gardens are combined with infiltration trenches (see Section § T1604) to provide for greater infiltration than a rain garden alone and improved water quality and resistance to clogging than an infiltration trench alone. Rain gardens can also be combined with vegetated swales to provide both infiltration and conveyance.

§ T1603(b) Suitable Applications

Rain gardens are a cost-effective stormwater management application if strategically placed near impervious surfaces such as roof areas (downspout discharge points) and pavements, or other areas that generate runoff, such as lawn areas. Rain gardens can be integrated into new developments and can be retrofitted into existing developments. Suitable areas or development types in which rain gardens can be incorporated are:

Residential gardens/yards

Commercial development plantings

Parking lot landscape islands (often referred to as bioswales)

Parkway/right-of-way areas along streets

Median strips

§ T1603(c) Benefits

By minimizing the amount of stormwater that drains to the local storm sewer drainage system, rain gardens help to reduce the potential for flooding and

associated bank and shoreline erosion in areas where stormwater discharges into wetlands, streams, and lakes. Rain garden benefits can be summarized as follows:

Reduces runoff volumes and rates from roofs, pavements, and lawns

Recharges groundwater and sustains base flows to natural water bodies

Reduces sediment, nutrient runoff, and other pollutants

Can be used to meet Kane County 0.75-inch retention standard

Ancillary benefits:

Reduces maintenance requirements compared to conventional lawn surfaces or other irrigated plantings

Can reduce detention needs

Effective land use through combination of stormwater management and ornamental planting

Can increase aesthetic value for the property

Can diversify site habitat

Can reduce the need for costly stormwater infrastructure

§ T1603(d) Limitations

The following considerations are necessary to sustain the long term performance of rain gardens:

The rain garden surface-area should generally be a minimum 10% to 15% of the contributing impervious area.

Rain gardens should not be used for areas with high sediment loadings such as plant nurseries, material storage yards, etc. unless the sediment load can be reduced using filters strips or other measures prior to release to the rain garden. The high sediment load can cause clogging.

Rain gardens and other infiltration measures should not be used for areas with potential for contaminated runoff to avoid groundwater contamination. Areas to be avoided include fueling and vehicle maintenance facilities (gas stations) and hazardous materials storage facilities. Runoff from parking lots, roofs and other typical urban surfaces should not lead to groundwater contamination, provided the design recommendations within the manual are followed.

Rain gardens must be protected from construction site runoff and/or the garden must be rehabilitated once the site is stabilized.

The drain time for rain gardens should be limited to approximately 12-hours to ensure longevity of the vegetation and prevent complaints. Where soil permeability is insufficient and/or the volume of runoff is too great, an infiltration trench can be

placed below the rain garden to increase the available storage volume (see also Section § T1604).

Rain gardens should not be placed over septic systems and should be located at least 100-feet from well heads.

Rain gardens must have an adequate separation above the seasonal high ground water table (see also Section § T1603(e)(2)).

Rain gardens should not be placed over contaminated soils.

Rain gardens should be located at least 10-feet down slope from building foundations unless adequate waterproofing is provided and direct drainage to footing drains can be prevented.

§ T1603(e) Required Design Data

§ T1603(e)(1) Soil type and permeability:

The infiltration capacity of the subsoils under the rain garden will determine the volume of runoff that can be exfiltrated from the rain garden into the ground over a given time. The infiltration capacity, along with the contributing watershed will help to determine the rain garden size.

The Kane County Soil Survey provides some guidance with regards to soil permeability. It is, however, recommended that a hydraulic conductivity test be performed at the location and elevation of the proposed rain garden bottom to establish the site-specific permeability rate (double ring infiltrometer test per ASTM D3385, lab test per ASTM D2434 through a Shelby tube sample, or have a Certified Professional Soil Classifier conduct an on-site soil investigation to determine soil suitability or a Falling Head Percolation Test (described in Appendix A). The data from the infiltration test will allow for adequate sizing and design of the rain garden.

§ T1603(e)(2) Seasonal high water table:

If the site in question for the rain garden placement is known to have a relatively high water table, data on the elevation of the seasonal high water table is needed. The invert of the rain garden shall be at least three feet above the seasonal high water table[1] to provide adequate runoff treatment prior to discharge into shallow ground water.

§ T1603(e)(3) Contributing drainage area and imperviousness:

Along with the infiltration capacity, the drainage area and level of imperviousness contributing to the rain garden are needed to determine its size.

§ T1603(f) Rain Garden Design

§ T1603(f)(1) Rain garden location:

As a general rule, rain gardens should be located adjacent to or near the impervious surfaces they are designed to treat.

Topography:

Place the rain garden in flat areas to maximize the surface area for infiltration. Construct the rain garden with a shallow slope at the edges and flat invert to allow for even runoff distribution and infiltration. Avoid low areas with a longer ponding time, which may cause sediment accumulation and sealing. If the rain garden must be constructed in sloping terrain, give it a linear shape and place it along a contour, or terrace the rain garden along the slope.

Building foundation and basements:

Some references call for a minimum set back of 10-feet from any building foundation. Another rule that can be applied to protect building basements is to set back the rain garden 1.5-times the distance of the building foundation depth[2]. These rules may not apply to foundation that are water proofed and where no leakage into the footing drain is assured.

Light level conditions:

An important component of rain garden design is the planting of grasses and sedges with strong fibrous root systems. Such root systems contribute to the build up of soil organic carbon that ensures the longevity of the rain garden's filtration and infiltration capacity. In order to maximize the production of soil organic carbon, the grasses and sedges need to be 'fueled' by sufficient sunlight. The placement of the rain garden in full sun or partial sun conditions is preferable. Sites that are exposed to full sun for about half the day are suitable for a rain gardens.

Seasonal high water table:

The rain garden invert will need to be a minimum of three feet[3] above the seasonal high water table to provide adequate runoff treatment prior to discharge into shallow ground water. The greater the separation between the seasonal high water table and rain garden invert, the more effective the runoff treatment.

§ T1603(f)(2) Rain garden ponding depth and drain time:

The drain time for rain gardens should be limited to 12-hours and the depth of ponding should generally be limited to 18-inches. However, greater depths may be appropriate if the duration can be limited to less than 12-hours.

The time necessary to drain the rain garden should be no more than approximately 12-hours to ensure the health of the vegetation in the rain garden and to avoid complaints. In many cases, the drain time and soil permeability will determine the maximum depth of ponding. For example, if the infiltration capacity of the soils is 1-inch/hour, the maximum depth would be 12-inches, if the infiltration capacity is 0.5-inches/hour, the maximum depth would be 6-inches.

In higher permeability soils, it may be feasible to support greater depths of ponding without exceeding the 12-hour duration. However, to protect the health of the vegetation, the depth should generally be limited to 18-inches unless the duration can be reduced to less than 12-hours. For example, certain areas of Kane County have permeability rates as high as 5- inches/hour. In these areas, it may be appropriate to use greater depths since even a 24-inch deep rain garden would drain in less than 5-hours.

Where greater depths of ponding are necessary due to space constraints, rain gardens can be placed over infiltration trenches for which the maximum recommended drain time is 72-hours[4] (see also Section § T1604(f)(3)).

§ T1603(f)(3) Rain garden area:

Although the term rain garden conjures images of small backyard gardens, there is really no size limit to the area of a rain garden. Thus, a rain garden could be as large as what is commonly known as an infiltration basin provided the guidance in this document is followed, including ponding depth and drain time described above.

To minimize the potential for clogging at the bottom of the rain garden and to maximize the runoff volume potential, the rain garden area should not be less than 10% to 15% of the impervious drainage area.

§ T1603(f)(4) Rain garden sizing:

To meet the Kane County retention standards, rain gardens should be sized for 0.75-inches of runoff over the impervious area draining to the rain garden. However, rain gardens in other regions are often sized to contain the 1- to 2-year event to prevent increases in runoff volumes for these storms that are most affected by urbanization. Rain garden sizing is described further under Section § T1603(f)(9).

In general, the surface area of a rain garden will need to increase and the depth will need to decrease with lower permeability soils. In other words, the lower the soil permeability, the shallower the depth and the larger the surface area needed to retain and infiltrate runoff within the recommended maximum drain time of 12-hours.

Depending on site limitations (e.g. soils with a very low infiltration rate, limited available space, etc.), it may be difficult or impossible to meet the 0.75-inch retention standard with a rain garden alone. In this case, rain gardens can be underlain with gravel filled infiltration trenches to provide additional storage without exceeding the surface ponding depth and duration standards. Also, rain gardens can be combined or sequenced in the watershed with other decentralized stormwater tools, such as porous pavements, to meet the retention standard.

§ T1603(f)(5) Runoff treatment:

High runoff temperatures and poor water quality can stress the rain garden vegetation and their root systems that are important to ensure the system's long term performance and aesthetics. Runoff water quality can be improved and temperatures reduced by routing impervious runoff through level spreaders and vegetated filter strips (see Section § T1605).

High runoff temperatures can also be mitigated through the point discharge dissipation approaches, which are described in Section § T1603(f)(6), below.

§ T1603(f)(6) Flow energy dissipation:

Energy dissipation is often necessary to prevent scour where runoff enters the rain garden. At curb cuts along a street or within a parking lot or for residential downspouts, only nominal energy dissipation such as a splash pad or small amount of stone may be necessary. For large flow rates (entering larger rain gardens), larger rip rap material, level spreaders or inflow chambers may be necessary.

Level spreader (see also Section § T1605):

Level spreaders can be as simple as a gravel edge where the parking surface meets the rain garden or can be more complex such as long gravel trenches containing perforated pipe to distribute the runoff over the length of the spreader. In addition to dissipating energy and distributing the runoff, level spreaders provide cooling of the first flush runoff from high temperature paved or roof surfaces.

Inflow-chamber:

Route point discharge to an inflow-chamber in the rain garden. The inflow-chamber functions like a drywell in reverse, allowing the runoff to slowly rise by head pressure and flow into the rain garden.

§ T1603(f)(7) Rain garden top soil:

Eight to 12-inches of loamy sand / sandy loam topsoil should be placed in the bottom of the rain garden to provide filtration and a growing media for the vegetation.

The topsoil should generally conform to the following specifications to ensure adequate permeability and growing conditions.

70% medium to coarse sand (IDOT FA2)

8 to 10% organic content

Less than 10% clay

Compaction of 70% (modified) to 75% (standard) max. dry density

In some cases, the existing site topsoil may meet the specifications above. In other cases, site topsoil may need to be amended with coarse sand (IDOT FA2) and/or organic material such as leaf compost. The specifications section provides detail on the amended topsoil (see Section § T1603(i)).

Where a rain garden is located above an infiltration trench, the minimum amended topsoil depth should be 8-inches. Where the rain garden is located directly on subgrade soils, the amended topsoil depth should be increased to 12-inches unless the subgrade soils have a tested infiltration capacity greater than 1-inch/hour.

§ T1603(f)(8) Vegetation design:

The use of perennials, fibrous rooted grasses, and sedges will enhance the rain garden's longevity and improve water quality benefits. The extensive root system of native grasses and forbs contribute to the sustainability of soil organic carbon that ensures the longevity of the rain garden's filtration and infiltration capacity. Native grasses alone will achieve the rain garden objectives. However, forbs are often added to achieve certain aesthetic objectives. The vegetation of a rain garden depends on a number of factors:

Soil type and soil moisture content:

In spite of the name "rain garden" the vegetation should be that which flourishes in soils that are neither particularly wet nor particularly dry. Appendix B – Species Guide lists recommended native plant species. Rain gardens located over infiltration trenches or high permeability soils must be tolerant of dry conditions.

Light level conditions:

As described in Section § T1603(f)(1) native grasses and sedges need to be 'fueled' by sufficient sunlight to produce soil organic carbon. The placement of the rain garden in full sun or partial sun conditions is thus preferable.

Aesthetic objectives:

Use of the recommended native grasses, forbs, and sedges in a rain garden does not mean that the appearance automatically translates into a "naturalistic" look. Midwestern native vegetation provides sufficient variation in flowering color,

flowering time, textures, and plant heights to create rain garden plantings that provide an ornamental "flowering border" appearance, or even a formal design. The latter two options will require more maintenance than a "naturalistic" planting (see Section § T1603(h)(1)).

If mowed more often than once a year or planted with a low ratio of grasses and sedges, soil organic carbon will deplete over time. This may reduce the water quality benefits of the rain garden over time. It may also lead to a slow loss of infiltration capacity that may need to be restored by tilling in additional organic material.

§ T1603(f)(9) Hydrologic analysis:

There are two components to the hydrologic analysis: the required size to meet the Kane County retention standard and the impact of the rain garden on downstream detention requirements.

Retention standard:

The Kane County retention standard states that 0.75-inches over the impervious area must be retained. To ensure that the retention standard is met for all storm durations, a one-hour design storm should be used to size the rain garden. Except on soils with very high permeability, the volume of water infiltrated during a 1-hour event will be small. Thus, the required surface volume of the rain garden (Vr) is:

$$V_R = 0.75 * A_i * 0.083$$

Where:

V_R = retention storage volume in acre-feet

0.75 = retention volume standard in inches

A_i = impervious area (acres)

0.083 = conversion from acre-inches to acre-feet

If there is insufficient space to provide the required volume without exceeding the maximum ponding depth or duration, the rain garden may be supplemented with an infiltration trench below or with downstream retention features such as additional rain garden and native filter strips.

Impact on downstream detention sizing:

The critical duration for detention sizing is typically 24-hours. Thus, the volume of runoff infiltrated within a rain garden during a 24-hour detention design storm will often be significant. For example, with a watershed to rain garden area ratio of 8:1 and soil permeability equal to 0.5-in/hr, a properly sized rain garden, designed according to these guidelines can reduce the runoff volume associated with the 2-year event by 50%.

Rain gardens can be modeled as storage reservoirs in standard hydrologic models such as TR20 or HEC-1. The rate of infiltration Qi is equal to:

$$Q_i = i * A_g$$

Where:

Q_i = the volumetric flow rate through the rain garden subgrade in cubic feet per second (cfs)

i = infiltration capacity of subgrade soils in inches/hour

A_g = bottom area of the rain garden in acres

For models that allow multiple outlets, infiltration outflow can be treated as a separate outlet that does not contribute downstream. For models that only allow a single outlet, the total rain garden outflow is equal to the infiltration outflow plus the surface outflow. The infiltration outflow rate can then be diverted out of the system so that it does not contribute to the downstream detention facility.

§ T1603(g) Construction Considerations

Construction of rain gardens requires special care and changes to normal construction practice and schedules for the optimal functioning of the rain garden facility and its long-term viability.

§ T1603(g)(1) Soil erosion and sedimentation control:

Soil erosion and sediment control practices should be maintained and inspected on a regular basis. Accumulated sediments within on-lot sediment traps and along silt fences should be promptly removed. All disturbed areas shall be promptly stabilized and compromised erosion and sediment control devises should be promptly repaired.

Stockpiles should be located downstream of rain garden facility; if unable to do so, stockpile shall have a double row of silt fence that surrounds the perimeter of the stockpile.

Before the rain garden goes online, the contributing drainage area must be stabilized/fully vegetated.

Rain garden facility shall be stabilized with vegetation and erosion blanket prior to facility receiving stormwater runoff.

§ T1603(g)(2) Avoidance of soil compaction and contamination:

Soil compaction in the rain garden area must be avoided to conserve the permeability rate of the existing subsoils.

Areas where rain gardens are to be located should be protected from construction traffic using construction fencing or other barriers.

Avoid working on or with soils that are excessively wet or saturated.

Excavation of the rain garden should be performed using a backhoe or other equipment that can be staged outside the rain garden facility during excavation operations. Where the rain garden is too large to be excavated from outside the garden, low ground pressure equipment should be used and the area tracked by the equipment should be minimized (see also sample specifications in Section § T1603(i)).

§ T1603(g)(3) Amended soil mix:

After placement of topsoil, the rain garden facility must be protected from construction impacts, including placement of building materials and foot and vehicle traffic.

When onsite topsoil needs to be amended to meet the specifications of Section § T1603(f)(7) the recommended method of amended soil mix placement is:

Mixing of the amended soil outside of the rain garden area.

Unloading of the amended soil at the rain garden edge.

Spreading of the amended soil with a backhoe or other equipment that can be staged outside the rain garden facility.

Manual fine grading, such as raking.

Compaction using a roller or other equipment that will provide adequate compaction to support moderate foot traffic but not exceed 80 to 85% compaction.

§ T1603(g)(4) Vegetation installation:

Prepare seed bed through manual means or use low ground pressure equipment.

Hand broadcast seed or use low ground pressure seeding equipment.

Install erosion control blanket and plant live material by carefully slitting slots into the erosion blanket.

The success of a rain garden installation can be assured by simple proactive measures. It is recommended that the consultant meet with the contractor prior to construction to discuss the above listed items, construction sequencing and construction schedules. Supervisory construction staff, such as the foreman, should participate in the meeting. Construction inspections should be mandatory at crucial junctures to verify compliance with design parameters and specifications.

§ T1603(h) Operation and Maintenance

Rain garden maintenance can be greatly reduced by taking a proactive approach during construction. The greater the care taken during construction, the fewer items there will be to look after or to repair. Care during construction will also assure a

smooth and shortened establishment period, which reduces intensive maintenance requirements.

The following activities should be completed routinely in the first two to three years of establishment: erosion repair, weed control, and supplemental watering. After full vegetation establishment, the required maintenance within rain gardens that use native grasses, sedges, and perennials in a naturalistic fashion should be minimal. More intensive maintenance may be required in rain gardens that use ornamental and non-native species but no greater than the maintenance required of a typical perennial garden.

§ T1603(h)(1) Vegetation management:

Initially, plant plugs and other live material should be watered immediately after planting and continue to be watered as necessary until plugs are rooted into the ground, unless there is adequate rainfall.

During the plant establishment period – up to 3-years after installation – monthly site visits during the growing season (April – October) should be undertaken to identify and carry out maintenance requirements.

If a rain garden is seeded and plugged, the establishment period may be only 1.5 to 2-years, depending upon the success of the initial weed and weed seed bank treatment and the vigilance of the initial weed control.

Due to the typical size of a rain garden, the most effective manner of weed control will be hand weeding and/or use of appropriate herbicide (by licensed applicator). To determine the appropriate weed control, one has to distinguish between annual weeds and perennial weeds. The former requires a less intense control than the latter.

Annual weeds:

Annual weeds do not need to be pulled but only to be cut/trimmed back to prevent them from flowering and setting seed. In rain gardens that use native prairie vegetation, control of annual weeds can also be achieved in the first growing season through mowing, cutting vegetation to a height of 6- to 8-inches. A string trimmer may also be used to cut vegetation to this same height. Where vegetation growth is heavy, cuttings should be removed to prevent smothering of the desirable rain garden vegetation. Mowing should be conducted when the weed vegetation reaches a height of 12 to 15-inches and before any noxious weeds set seed.

Perennial weeds:

Perennial weeds should be hand pulled or spot treated with herbicide (by licensed applicator). Hand pulling should include the removal of all above ground and belowground stems, roots, and flower masses prior to the development of seeds. Care should be taken to disturb as little soil as possible during hand pulling to avoid

exposure of additional weed seed in the soil layer, and to protect adjacent emerging seedlings. Care must be taking during herbicide spot treatment to avoid damaging surrounding vegetation.

After sufficient graminoid (grasses and sedges) development to provide an adequate fuel source in rain gardens with native prairie vegetation, annual burn management should be implemented. Burning dead plant material reduces weed growth, stimulates native grass and forb growth, and increases nutrients available to the plants. In rain gardens where burning is difficult or impossible, the vegetation should be mowed annually in fall or spring. To mimic the burn cycle all clippings and thatch must be removed after mowing. Please note that mowing does not provide the full benefit to native prairie vegetation that fire provides and will often result in a lower ratio of wildflowers (forbs) relative to the grasses.

Rain gardens planted with ornamental plants and/or non-native species may require cutting back and winter protection of individual species as part of winter preparations typical of any ornamental garden. These rain gardens may also require thinning of some plants to encourage the development of other species.

§ T1603(h)(2) Debris removal:

In those systems where there is no burn regime, dead plant debris, trash, leaves and any other material that may obstruct infiltration or smother desired vegetation should be removed. Dead plant stalks should be cut back or mowed each spring.

§ T1603(h)(3) Sedimentation removal:

If the rain garden is properly designed and protected from sedimentation through use of an adequate pretreatment area, the rain garden basin is likely to maintain its effectiveness for many years (20+ years). The rain garden basin should be scraped and replanted when accumulated sedimentation is one-quarter of the basin depth.

The initial erosion and sediment control inspections should identify and initiate remediation of any early signs of erosion or sedimentation within the rain garden basin. Thereafter, annual inspections for sediment accumulation within the pretreatment area and basin should occur.

§ T1603(h)(4) Rain garden easement protection:

The Kane County ordinance requires that stormwater features (such as a rain garden) are protected by an easement. All rain garden areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If rain gardens are not part of the stormwater management system, such as a rain garden installed by a homeowner on his or her own accord, it is exempt from the easement requirement.

§ T1603(i) Specifications

(see next page)

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the testing, mixing, and installation of topsoil material in conjunction with a rain garden installation.

1.3 RELATED DOCUMENTS

A. AASHTO T 194 Standard Method of Test for Determination of Organic Matter in Soils by Wet Combustion.

B. ASTM D 4972 Standard Test Method for pH of Soils.

C. ASTM D 422-63 Standard Test Method for Particle-Size Analysis of Soils.

D. ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

E. ASTM D 1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

F. Solvita by Woods End Research: Guide to Solvita Testing for Compost Maturity Index.

1.4. QUALITY ASSURANCE

A. Field Control Tests:

1. Organic Content and pH measurement of amended soil mix shall be in accordance with AASHTO T 194 and ASTM D 4972, respectively.

2. Sand and clay content of amended soil mix shall be measured in accordance with ASTM D 422-63.

3. One test per 300 square feet of rain garden.

PART 2 – PRODUCTS

2.1. ON-SITE LOAMY SAND/SANDY LOAM TOPSOIL

A. Topsoil for use in a rain garden shall be a sandy loam that conforms to the following specifications.

Proportion of Sand	70%
Proportion of Organic Material	8% - 10%
pH	$6.0 \leq pH < 8.0$
Maximum Clay Content	10%

B. If the onsite topsoil does not conform to the above specifications, it may be amended with sand and/or organic material to create Amended Rain Garden Topsoil as described in Section 2.2.

2.2. AMENDED RAIN GARDEN TOPSOIL

A. Sand: Shall be clean and free of toxic materials and shall be per IDOT specifications. Gradation shall conform to IDOT FA2. The sand mix constitutes approximately 70% of the rain garden amended soil mix.

B. Silt-Clay-Loam Planting Soil: Planting soil shall be used to create amended soil, but after mixing of amended soil, clay shall not constitute more than 10% of the amended rain garden soil mix. Soils for use in the amended rain garden soil mix shall be obtained from A-horizon soils without admixture of subsoil. Planting soil shall be fertile, friable, (i.e., not pulverized), free from subsoil, clay lumps, brush, litter, stones, weed propagules (seeds, rhizomes, and plants), roots, or similar objects larger than 1-inch in any dimension, or deleterious materials, including any toxic materials.

C. Organic Matter: Organic matter shall constitute a minimum of 8% and maximum 10% of the amended rain garden soil mix. The organic matter shall be well-composted, stable, and weed-free with a pH range of 6.0 to 8.0. The organic matter or hereafter, referred to as the compost, shall also meet the following requirements:

1. The compost shall be derived of material that consists of chipped, shredded, or ground vegetation or clean, processed, recycled wood products.

2. The compost shall be processed or completed to reduce weed seeds, pathogens, and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides, or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal, or rocks shall not exceed 0.1 percent by weight or volume.

3. A minimum internal temperature of 57℃ shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 9.5-mm screen.

4. The moisture content of the compost shall not exceed 35 percent. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35-40 percent.

5. The compost shall measure a minimum of 6 on the maturity and stability scale by Solvita (Woods Research).

6. Compost shall be tested for maturity and stability and a certificate shall be provided that indicates the organic material meets the specified requirements.

D. The onsite and/or amended rain garden topsoil mix shall be friable, free of clumps of clay, brush, weed propagules (seeds, rhizomes, and plants) including but not limited to Circium arvense, Arctium minus, Lythrum salicaria, Phalaris arundinacea, Phragmites australis, Typha latifolia, and Typha angustifolia, roots, stones larger than 1", other extraneous or toxic matter harmful to plant growth.

E. Erosion blanket, North American Green (NAG) S75, or equivalent, if rain garden execution is completed between April 1st and October 1st; or NAG S150, or equivalent, if work is completed after October 1st.

PART 3 – EXECUTION

3.1. AMENDED RAIN GARDEN SOIL PREPARATION

A. Verify sand, clay, organic content, and pH measurement of amended soil mix via field control tests. Refer to Quality Assurance of this Section for required field control tests.

B. If amended topsoil is placed over an infiltration trench, mixing of the amended soil must be done outside of the infiltration trench.

3.2. RAIN GARDEN EXCAVATION

A. Excavation shall be achieved via backhoe or other similar excavation equipment that shall be situated outside the boundary of the rain garden. If the rain garden scale is too large to accommodate this requirement, use low ground pressure excavation equipment, which shall be confined to a "one-track" alignment within the rain garden to accomplish the excavation, placement of the amended soil, or reapplication of topsoil into the rain garden basin.

3.3. EXAMINATION OF SUBGRADE

A. Subgrade shall be examined by the Contractor prior to start of amended rain garden soil mixture placement and planting. All subgrade elevations shall be approved by the Construction Manager prior to placement of amended soil mix.

B. Compaction Mitigation – If compaction occurs during basin excavation (within "one-track" area), a chisel plow or rotary device with the capability of reaching a depth of 12 inches below the surface shall be used within the compacted area.

3.4. AMENDED RAIN GARDEN SOIL PLACEMENT

A. Installation of amended topsoil must be done in a manner that will ensure adequate infiltration. Place amended soil mix in 8" –12" lifts. Lifts shall not be compacted. Overfill above the proposed final grade to accommodate natural

settlement to meet finish grades. Do not spread if amended soil or subgrade is frozen, muddy, or excessively wet.

1. Placement of amended soil should be sequenced with seed and erosion blanket installation to prevent traffic over amended soil mix lifts and final grading to prevent undesirable soil compaction.

2. Seed installation shall be by method that minimizes compaction to soil.

B. Light Compaction of Amended Rain Garden Soil. Avoid over compaction by allowing time for natural settlement and compaction. Amended Rain Garden Soil shall have a maximum dry density of 70% (ASTM D 1557) or 75% (ASTM D 698) after completion of the Rain Garden installation. If time does not allow for natural settlement of soil, light compaction methods as specified below, may be implemented; if needed, additional amended soil mix shall be placed as previously stated to meet final grades.

1. Amended soil mix may be compacted by presoaking the placed soil until water flows from an underdrain (if present). Water for saturation shall be applied by spraying or sprinkling. Additional settlement may occur subsequent to the initial wetting.

2. Roll the entire rain garden area with a hand roller weighing no more than 100 pounds per foot of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional amended rain garden soil mix and the surface shall be re-graded and rolled until a smooth and even finish to the required grade is achieved.

C. If amended soil becomes contaminated by construction site runoff during the construction of the facility, the contaminated material shall be removed and replaced with uncontaminated material at no additional cost to the Owner.

D. Contractor shall place construction fencing or other approved barriers to prevent compaction of amended rain garden soil mix from vehicle, equipment, or foot traffic.

3.5. FINE GRADING

A. Carefully prepare the amended rain garden soil bed by scarifying and hand raking after amended soil mix has been spread.

3.6. VEGETATION COVER

A. Permanent seed matrix installation shall be conducted during installation seasons normally recognized in the job locality for the native species that are proposed, and shall be approved by the Design Professional.

B. A cover crop shall be installed in conjunction with the seeding of the permanent vegetation if the timing of the installation is appropriate. Otherwise, a cover crop shall be installed immediately following fine grading and the permanent seed matrix shall be installed at the next installation season.

C. Plant live material after seeding and placement of erosion control blanket. Contractor will be required to carefully slit installed erosion control blanket for plug installation. Contractor shall ensure minimal disturbance to the erosion control blanket.

3.7. MAINTENANCE

A. Maintain and establish native vegetation by watering, weeding, mowing, trimming, reseeding, and other operations. Re-grade and replant bare or eroded areas.

B. Dependent upon the timing of installation, a provision for watering for the establishment of the native species may be required. Water the seeded/planted areas a minimum rate of 1/2 inch per week for 8 weeks after installation, and thereafter as needed for successful establishment of native vegetation.

C. During the first couple growing seasons, occasional mowing may be needed to reduce weed height to provide direct sunlight for the establishing native species. Mowing heights and dates should be adjusted to maximize weed control and minimize damage to native species. The mower blade height should be set at a minimum, to six (6) to eight (8) inches. For areas not accessible with mowing equipment, the rain garden may be cut to the minimum specified height with a string trimmer or equivalent.

3.8. PERFORMANCE CRITERIA

A. Satisfactory performance by the end of the first full growing season shall consist of the following criteria:

1. Complete vegetative cover. A minimum 95% cover shall be achieved and no area greater than one (1) square meter within the seeded/planted rain garden shall be devoid of vegetation.

2. At a minimum, 95% of the planted plugs and container-grown plants shall be alive and growing in a healthy condition.

3. No less than 25% occurrence of the seeded species shall be present within the rain garden.

4. None of the following shall be among the five most dominant plant species in the overall vegetative cover:

a. Common reed (Phragmites australis)

b. Sandbar willow (Salix interior)

c. Box elder (Acer negundo)

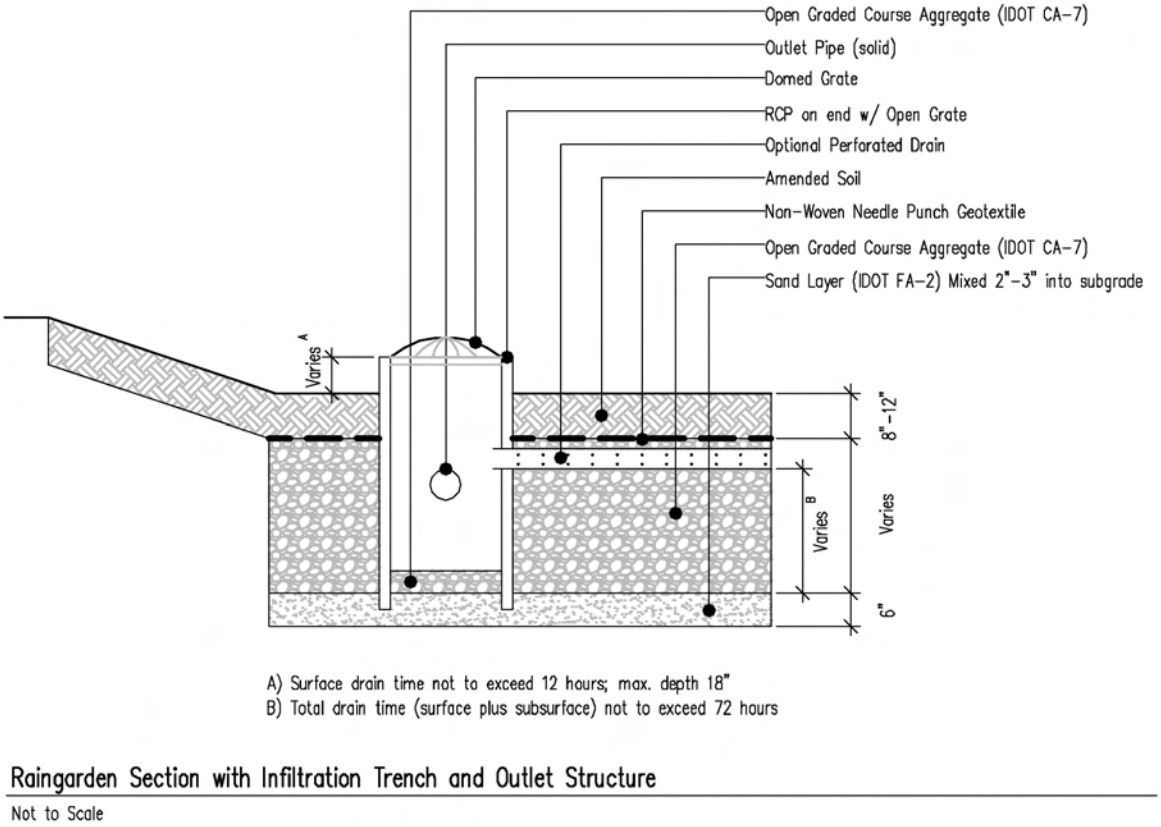
d. Giant ragweed (Ambrosia trifida)

e. Common ragweed (Ambrosia artemisiifolia elatior)

f. Non-native species

END OF SECTION

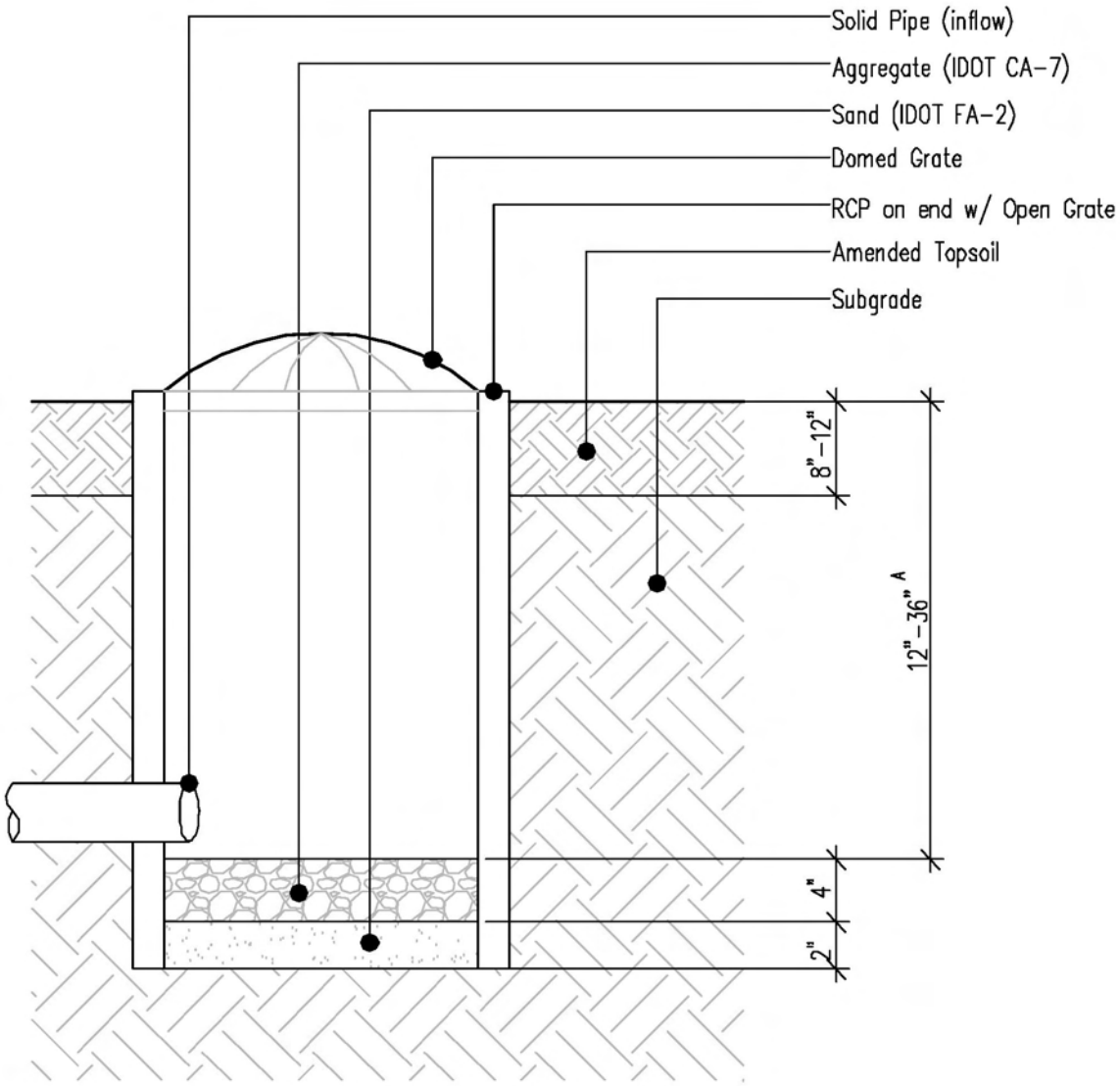
§ T1603(j) Typical Detail



Raingarden Section with Infiltration Trench and Outlet Structure

Not to Scale

Figure 6 – Rain Garden Section with Infiltration Trench (in profile) and Outlet Structure



A) Total drain time not to exceed 72 hours

Inflow Chamber

Not to Scale

Figure 7 – Inflow Chamber Detail

[1] Barr Engineering Company (2001)
[2] Mahabadi (2001)
[3] Barr Engineering Company (2001)
[4] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Lowndes, M.A. (2000); Los Angeles County Department of Public Works (2002)

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Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992), Northern Virginia BMP Handbook: A guide to planning and designing best management practices in Northern Virginia.

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Lowndes, M.A. (2000), The Wisconsin Storm Water Manual: Infiltration Basins and Trenches (G3691-3). Wisconsin Department of Natural Resources, Madison, Wisconsin.

§ T1604 Infiltration Trenches

§ T1604(a) Definition

Infiltration trenches are excavations filled with open graded aggregate for temporary stormwater runoff storage. Although many stormwater manuals describe stand-alone infiltration trenches, within Kane County, infiltration trenches must be overlain with rain gardens or vegetated swales constructed with amended topsoil. The vegetated amended topsoil media (see Section § T1603(g)(3)) filters the runoff, protecting the trench and subgrade soils from clogging with sediments. The soil filter must be amended to meet the specified permeability rate and be planted with native grasses and sedges to sustain soil organic carbon and hence the infiltration capacity.

Although the term "trench" implies a linear feature, the aggregate reservoir may occupy any shape.

The stored runoff in the aggregate reservoir must be partially or fully exfiltrated into the ground within 48 to 72-hours[1]. The infiltration trench thus provides runoff volume control, recharges shallow ground water and helps to sustain base flows. In the case of partial exfiltration, excess runoff is collected through a perforated pipe or other drain and conveyed to additional BMP's downstream.

Infiltration trenches are combined with other BMP's in this guidance manual, such as rain gardens (see Section § T1603) to meet the Kane County 0.75-inch retention standard.

§ T1604(b) Suitable Applications

Infiltration trenches are a suitable application where the 0.75-inch Kane County retention standard can not be met with rain gardens or vegetated swales alone. They improve the retention capacity by increasing the storage volume available for infiltration, increasing the allowable drain time, and may facilitate connection to a lower lying soil horizon that has a better infiltration capacity. In this case the infiltration trench will function as a linear dry well. It is critical, though, to insure that the invert of the infiltration trench has sufficient separation from the seasonal high water table to reduce the risk of ground water contamination (see also Section § T1604(e)(2)).

Infiltration trenches are ideal for residential, commercial and mixed-use developments. Their physical configuration allows integration into narrow areas, such as along parking lot edges and within parking lot islands and medians. The contributing area should not exceed five-acres[2].

§ T1604(c) Benefits

Suitable for narrow and small spaces that cannot accommodate larger conventional treatments

Good pollutant removal capabilities[3]

Facilitates decentralization of the stormwater system, particularly when incorporating detention into the aggregate reservoir

Potential increase in retention capacity through penetration of shallow soil horizons that have a low permeability rate

Shallow and deep groundwater recharge and subsequent improved and sustained base flows to natural water bodies

Reduction of the total runoff volume and subsequent reduction of potential flooding and associated bank and shoreline erosion in areas where stormwater discharges into wetlands, streams, and lakes

Can be used to meet Kane County 0.75-inch retention standard

§ T1604(d) Limitations

Infiltration trenches are subject to clogging by high sediment loads (even with an amended soil filter) and, therefore, are not suitable for areas such as construction sites, agricultural sites, or plant nurseries. In short, infiltration trenches should not be used if the sediment load in upstream areas cannot be controlled.

Infiltration trenches are not suitable for manufacturing and industrial sites, automobile service facilities, and other land uses with potential for high concentrations of pollutants due to accidental or other releases, or for sites that may receive high levels of pesticides or pathogens.

To minimize the risk of pollution, the invert of the infiltration trench must have adequate separation from the seasonal high ground water table (see also Section § T1604(e)(2)).

Infiltration trenches require a minimum separation from private and public wells. It is recommended that the designer reference the private and public water supply standards to determine current standards. It is further recommended that infiltration trenches be located at least 10-feet down-slope and 100-feet up-slope from building foundations[4] unless the invert of the trench is below the footing elevation, adequate waterproofing is provided and direct drainage to footing drains can be prevented.

The contributing watershed to the infiltration trenches should not exceed 2-acres[5].

Infiltration devices should not be located adjacent to high and steep slopes where seepage could destabilize the slope.

Infiltration trenches should not be located on soil fill to avoid excessive settlement and loss of fill stability. However, the trench may be located on granular fill that will remain stable when saturated.

§ T1604(e) Required Design Data

§ T1604(e)(1) Soil type and permeability:

The infiltration capacity of the subsoils under the infiltration trench will determine the volume of runoff that can be exfiltrated into the ground over a given period of time. The infiltration capacity, along with the porosity of the open graded aggregate fill, the required drain time, and contributing watershed will determine the infiltration trench dimensions (see Section § T1604(f)(7)).

The Kane County Soil Survey provides some guidance with regard to soil permeability. In general terms, soils with a 30% or greater content of clay or 40% or greater content of silt and clay combined tend to have insufficient infiltration capacity[6]. Likewise, soils with an infiltration rate greater than 5-inches/hour or a combined silt/clay content less than 5% may not be suitable because of limited capacity to remove pollutants[7].

It is recommended that a hydraulic conductivity test be performed at the location and elevation of the proposed infiltration trench invert to establish the site-specific permeability rate (double ring infiltrometer test per ASTM D3385, lab test per ASTM D2434 through a Shelby tube sample, or have a Certified Professional Soil Classifier conduct an on-site soil investigation to determine soil suitability or a Falling Head Percolation Test (described in Appendix A). A minimum of two soil investigations should be performed per infiltration trench. If the trench is longer then 100-feet, one additional sampling for each 100-foot increment is recommended[8]. On sites with cohesive soils the lowest recorded infiltration rate should be used for the sizing and design[9]. On sites with varying soils (and varying hydraulic conductivity) the lowest recorded infiltration rate per soil type should be used. The data from the hydraulic conductivity test will allow for adequate sizing and design of the infiltration trench.

§ T1604(e)(2) Seasonal high water table:

The invert of the infiltration trench should be at least three-feet[10] to above the seasonal high water table to reduce the potential for shallow ground water contamination.

§ T1604(e)(3) Contributing drainage area:

It is recommended that the drainage area to the infiltration trench be limited to two acres[11] to protect the device from excess sediment loads and high flow rates at inflow points. A larger number of smaller devices is less likely to fail than a single facility treating a large area.

§ T1604(f) Infiltration Trench Design

Infiltration trenches should be combined with rain gardens and vegetated swales where these systems, by themselves, do not meet the 0.75-inch Kane County retention standard or where a higher degree of retention is desired.

Runoff to the rain gardens or vegetated swales passes through an amended top soil with high hydraulic conductivity into the top of the infiltration trench. This process improves the runoff quality entering the trench by removing suspended solids and pollutants from the runoff. When underlain with a geotextile it protects the infiltration trench from sediment accumulation and subsequent clogging (see also Section § T1604(f)(2)). The vegetated amended top soil must be designed to sustain its hydraulic conductivity over time[12]. It should generally conform to the following specifications to ensure adequate permeability (2- to 5-inches/hour) and growing conditions (see also Section § T1603(g)(3)):

70% medium to coarse sand (IDOT FA2)

8 to 10% organic content

less than 10% clay

compaction of 70% (modified) to 75% (standard) max. dry density

The following subsections describe the various key design elements.

§ T1604(f)(1) Site selection:

The infiltration trench must be located down gradient from the contributing drainage area. The placement must further allow for overflow of excess runoff with a suitable outfall. Areas that become unstable under saturated conditions, such as locations close to cut or fill slopes, are unsuitable for infiltration trenches. Furthermore, infiltration trenches shall not be placed over fill, but must exfiltrate into natural, undisturbed soils with adequate infiltration capacity.

Soils:

The first step in the design process is to determine the suitability of the soils and their hydraulic conductivity. It is not uncommon to find very low infiltration rates in the A-horizon (either because of the soil type or compaction), while soils in the underlying horizons offer a higher infiltration capacity. Part of the design process is to seek permeable soil horizons that allow the infiltration trench to drain within the specified time. The elevation of the permeable horizon partially determines the depth of the infiltration trench. Other factors are adequate separation from the seasonal high water table and the infiltration rate, which determines the volume that can be exfiltrated. The latter is further influenced by the surface area over which the exfiltration takes place – in other words – the surface area of the infiltration trench invert. As a general rule, the invert area of the trench must increase with lower permeability soils to achieve the retention standard without exceeding the allowable

drain time. The trench invert should be flat to allow for uniform distribution and infiltration of the runoff.

Topography and access:

Infiltration trenches should not be located adjacent to steep slope where seepage could destabilize the slope. The placement of infiltration trenches should take into consideration the need for vehicular maintenance access.

Foundation protection:

Infiltration trenches should be placed at least 10-feet down-slope and 100-feet up-slope from building foundations[13] unless the invert of the trench is below the elevation of the foundation. Another rule that can be applied to protect building basements is to set back the infiltration trench 1.5 times the distance of the building foundation depth[14].

Groundwater protection:

To avoid contamination of shallow groundwater, infiltration trenches should not be applied on sites such as automobile service facilities and sites where there is potential for stormwater to come in contact with hazardous materials (see also Section § T1604(d)). The invert of the infiltration trench shall be at least 3-feet [15] above the seasonal high water table.

To protect public water supplies, infiltration trenches require a minimum separation of 100-feet from private wells[16] and 1,200-feet from public well[17].

§ T1604(f)(2) Permanent sedimentation control and protection:

Infiltration trench design requires provisions for sedimentation control to prevent failure through clogging. Any design that incorporates infiltration trenches must have an erosion and sedimentation control plan in place and the practices must be maintained. It is imperative that stormwater bypass the infiltration trench area during construction until the contributing watershed is fully stabilized.

If a temporary sedimentation pond is placed in the area of the planned infiltration trench, a minimum 12-inches separation between the bottom of the sedimentation pond and the final invert of the infiltration trench is necessary[18].

To protect the infiltration trench from clogging over its lifetime, there can be no direct discharge of runoff into the trench. Instead, the runoff must be filtered through vegetated amended top soil (see also Section § T1603).

§ T1604(f)(3) Infiltration trench drain time:

The duration of ponding within an infiltration trench should not exceed 72- hours to ensure that the volume is available for subsequent events and to avoid sealing of the subgrade soils due to growth of biological slimes. The duration that water will be contained within in the trench is approximately equal to the storm duration plus the drain time. (Drain time is equal to the time required to drain the trench from full assuming no inflows.) For a 24-hour storm duration, the drain time should be limited to 48-hours.

The maximum allowable drain time, along with the subgrade permeability will control the maximum depth of the infiltration trench. (see Section § T1604(f)(8) for more information on maximum depth and drain time.)

§ T1604(f)(4) Overflow and subsurface drainage design:

To assure safe bypass for excess runoff flows, infiltration trenches require an overflow.

Infiltration trenches in combination with vegetated swales or rain gardens may or may not require a subsurface drainage mechanism to dispose of excess water when the retention storage capacity is exceeded.

If the infiltration trench is combined with a vegetated swale and sized for the 0.75-inch retention standard only, no subsurface drain structure is needed. The trench can be allowed to fill up through the vegetated amended top soil, where excess runoff is drained through surface conveyance in the vegetated swale. If the infiltration trench is sized for both retention and detention, a perforated drain pipe must be placed above the retention volume elevation to provide drainage for the detention volume.

If the infiltration trench is combined with a rain garden and sized to drain the 0.75-inch retention standard within the required time frame, no subsurface drain structure is needed since the excess runoff can drain through the rain garden overflow. If the in infiltration trench is sized for both retention and detention, a perforated drain pipe must be placed above the retention volume elevation.

The outfall of any subsurface drainage system must be designed to prevent erosion, scour and concentrated flows.

A backflow prevention flap valve may be necessary to prevent sediment laden runoff from entering the system.[19]

§ T1604(f)(5) Observation wells and clean outs:

It is recommended that all infiltration trenches be outfitted with an observation well (four to six-inch perforated pipe with a cap on an anchor plate) located in the center of the trench.

Infiltration trenches with subsurface drainage structures (perforated pipes) should have a cleanout at each end, which can also be modified to serve as observation wells. Cleanouts should also be provided at each significant change in direction. Another function of the observation wells and cleanouts is to provide air vents while the trench fills with runoff[20].

§ T1604(f)(6) Materials:

The infiltration trench should be lined with a 6-inch sand layer (IDOT FA2) at the bottom[21]. The sand will act as a filter layer and prevent compaction of the trench invert during the aggregate fill placement. The bottom 2-inches of the sand should be vertically mixed 2-inches into the subgrade[22].

The aggregate fill shall consist of open graded IDOT CA1 or CA7, preferably washed to prevent the introduction of remaining fines. The porosity for these open graded aggregates is approximately 0.40. Rigid perforated pipes or storm chambers can be integrated into the infiltration trench to reduce the amount of gravel and increase the trench storage.

The vertical sides of the infiltration trench should be lined with a non-woven needle punch geotextile to prevent migration of the adjacent soils into the open graded aggregate. A separate piece of non-woven needle punched geotextile should be placed on top of the open graded aggregate fill as a filter and sediment barrier. It is further recommended to place a one-inch sand layer (IDOT FA2) on top of the geotextile, prior to the placement of the amended top soil. The sand layer will reduce the risk of “blinding” the geotextile and sustain the capacity to pass runoff into the infiltration trench[23].

§ T1604(f)(7) Infiltration trench sizing:

To meet the Kane County retention standards, infiltration trenches should be sized for 0.75-inches of runoff over the impervious area draining to the trench. Trenches may also be sized for larger events to increase retention and reduce downstream detention needs.

Trenches may also be used for detention where the retention volume is located below a perforated drain pipe and the detention volume is located above the drain. As with the retention-only trench, the total duration of ponding for both the retention and detention portions should not exceed 72-hours. The drain pipe can be fitted with a restrictor for controlled and slow release. The restrictor shall be located at a cleanout or manhole for easy maintenance access.

This combination of retention and detention volumes effectively decentralizes the stormwater management system and allows for downsizing of detention facilities downstream. Infiltration trench sizing is described further under Section § T1604(f)(8).

§ T1604(f)(8) Hydrologic analysis:

There are two components to the hydrologic analysis: the required size to meet the Kane County retention standard and the impact of the infiltration trench on downstream detention requirements.

Retention standard:

The Kane County retention standard states that 0.75-inches over the impervious area must be retained. To ensure that the retention standard is met for all storm durations, a one-hour design storm should be used to size the infiltration trench. Except on soils with very high permeability, the volume of water infiltrated during a 1-hour event will be small. Thus, the required runoff storage volume (Vr) is:

$$V_R = 0.75 * A_i * 0.083$$

Where:

V_R = retention storage volume in acre-feet

0.75 = retention volume standard in inches

0.083 = conversion from acre-inches to acre-feet

Because the infiltration trench is backfilled with gravel, the excavation volume must be increased to accommodate the storage lost to the aggregate material. Thus, the volume of the trench (Vt) must be:

$$V_t = \frac{V_r}{n}$$

Where:

V_t = volume of trench or excavation required to provide V_r

V_r = retention storage volume

n = the volume of the voids divided by the total volume of the aggregate material. For clean, open aggregate materials such as IDOT CA1 or CA7 the porosity is typically 0.40.

As described in Section § T1604(f)(3) the drain time for the infiltration trench should not exceed 48-hours and this limitation will determine the maximum depth of the infiltration trench. For example, if the infiltration capacity of the soils is 1-inch/hour and the porosity of the aggregate in the trench is 40%, the maximum depth would be 120-inches, if the infiltration capacity is 0.5-inches/hour, the maximum depth would be 60-inches.

Impact on downstream detention sizing:

The critical duration for detention sizing is typically 24-hours. Thus, the volume of runoff infiltrated within an infiltration trench during a 24-hour detention design storm

will often be significant. For example, with a watershed to infiltration trench area ratio of 8:1 and soil permeability equal to 0.5-in/hr, a properly sized infiltration trench, designed according to these guidelines (volume equal to 0.75-inches/impervious acre) can reduce the runoff volume associated with the 2-year event by more than 50% and the runoff volume associated with the 100-year event by over 20%. For the same 8:1 drainage area ratio and 0.5-in/hr infiltration capacity, an infiltration trench sized to make full use of a 48-hour drain time, could eliminate surface runoff for the 2-year event and reduce the surface runoff volume associated with the 100-year event by over 60%.

In addition to the retention storage, detention can be included within the trench through use of a perforated drain pipe located above the retention volume. The outlet of the drain can be outfitted with an orifice(s) to control the rate of drainage and maximize utilization of the detention volume.

Infiltration trenches can be modeled as storage reservoirs in standard hydrologic models such as TR20 or HEC-1. The rate of infiltration Qi is equal to:

$$Q_i = i * A_t$$

Where:

Q_i = the volumetric flow rate through the infiltration trench subgrade in cubic feet per second (cfs)

i = infiltration capacity of subgrade soils in inches/hour

A_t = bottom area of the infiltration trench in acres

For models that allow multiple outlets, infiltration outflow can be treated as a separate outlet that does not contribute downstream. For models that only allow a single outlet, the total rain garden outflow is equal to the infiltration outflow plus the surface outflow through the perforated drain (if any). The infiltration outflow rate can then be diverted out of the system so that it does not contribute to the downstream detention facility.

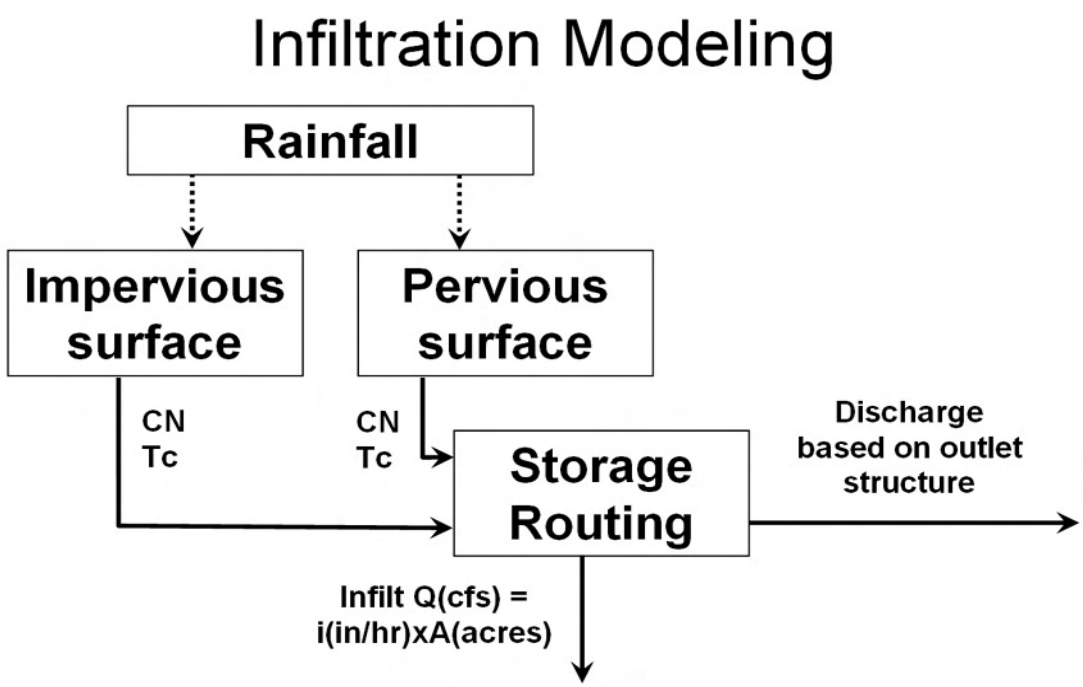


Figure 8 – Infiltration Trench Modeling Diagram

§ T1604(g) Construction considerations:

The area set aside for infiltration trenches should be protected with construction fencing during grading operations to protect it from construction traffic and compaction[24].

Sedimentation control:

Construction of the infiltration trench should not start until the all erosion and sedimentation control measures are in place or the contributing watershed is stabilized and/or runoff diverted from the infiltration trench site. It is imperative that stormwater bypass the infiltration trench area during construction until the contributing watershed is fully stabilized. Furthermore, the infiltration trench should not go into service until the entire contributing watershed is stabilized and the risk of erosion and sedimentation eliminated.

An excavated infiltration trench should never be used as a temporary sediment trap for construction site runoff[25]. If a temporary sedimentation pond is placed in the area of the planed infiltration trench prior to excavation, a minimum of 12-inches of undisturbed soil between the bottom of the sedimentation pond and the final invert of the infiltration trench are necessary[26].

Excavation:

To preserve the infiltration capacity of the infiltration trench, it is imperative that the invert is not compacted or smeared during the excavation process. Suitable excavation equipment is backhoes (with toothed buckets) or similar equipment that can be staged outside the infiltration trench area. Bulldozers or front end loaders are not suitable for infiltration trench excavation.

The excavated material should be placed 10-feet away and to the downstream side of the trench to prevent re-deposition during storm events[27]. Larger tree roots should be cut flush with the walls to protect the geotextile from puncturing and tearing during placement and filling of the infiltration trench.

Geotextile placement:

The vertical infiltration trench walls should be lined with a non-woven needle punch geotextile. The geotextile must be installed flush with the vertical trench walls. It is recommended to cut the geotextile to the appropriate dimensions prior to placement. Allow for six inch overlap at the top of the trench. The overlap between two ends should be at least two feet, where the upstream section must overlap the downstream section[28] (shingle effect). A separate precut geotextile should be placed horizontally over the aggregate prior to covering the infiltration trench with torpedo sand and amended top soil layers. The horizontally placed geotextile must be installed as an individual unit to allow for easy removal in case of remedial maintenance (see Figure 9 – Infiltration Trench Detail).

It is imperative that the geotextile is placed properly, with the indicated overlaps to prevent immediate and future sedimentation and subsequent clogging of the infiltration trench.

Filling of infiltration trench:

It is recommended to line with infiltration trench with a 6-inch torpedo sand layer (IDOT FA2) at the bottom[29]. The sand will act as a filter layer and reduce the risk of compaction of the trench invert during the aggregate fill placement. In case of a very broad trench, all sand must be placed ahead of the loader to prevent compaction and smearing of the trench invert. The first three inches of sand should be vertically mixed with the subgrade soils to a minimum depth of 2-inches prior to placing the remaining three inches.

As with the sand, the aggregate should be placed with a low ground pressure backhoe or front loader and the gravel should be placed ahead of the equipment to minimize compaction. The aggregate should be placed in lifts of 12-inches and compacted lightly with plate compactor.

All aggregate must be kept clean and uncontaminated at all times. Materials contaminated with soil, silt, or sediments must be removed and replaced.

§ T1604(h) Operation and Maintenance

Once the infiltration trench is online, it should be inspected several times after rain events to assure proper functioning and drain times. Routine maintenance inspections should be conducted on an annual basis[30], preferably after a significant rain event. The observation well should be inspected for proper drainage and the surface should be inspected for sediment accumulation, vegetation health, and proper drainage through the amended top soil.

If the subsurface trench is continuing to hold water long after the design drain time, the trench bottom has likely become clogged with sediments. Provided that the trench was properly installed and protected from construction site runoff, this is a very unlikely scenario. However, if clogging occurs the infiltration trench will need to be reconstructed to remove the sediments and restore the exfiltration capacity.

If water is ponding for extended periods on top of the amended topsoil (but not within the subsurface trench), there two are likely causes:

If water is found ponding on top of the amended top soil, whereas the bottom of the amended top soil does not seem as saturated (as determined with a soil probe), it is likely that sediment accumulation on top of the amended top soil has clogged the soil. Removal of the sediments and replacement of the top inch of the amended top soil may suffice to restore the infiltration rate.

If water is ponded and the amended topsoil is saturated throughout its profile (as determined using a soil probe), it is likely that the geotextile on top of the infiltration trench is clogged. This will require replacement of the geotextile and reapplication of the amended top soil and vegetation. The placement of a one-inch torpedo sand layer (IDOT FA2) on top of the geotextile, prior to the placement of the amended top soil will reduce the risk of blinding the geotextile and sustain its capacity to pass runoff through to the infiltration trench[31].

For vegetation maintenance refer to (Section § T1603(h).

§ T1604(i) Infiltration Trench Easement

The Kane County Stormwater Management Ordinance requires that stormwater features (such as infiltration trenches) be protected by an easement. Thus, all infiltration trenches that are part of the submitted and approved stormwater management system are required to be in an easement. If infiltration trenches are not part of the stormwater management system, such as a trench installed by a homeowner on his or her own accord, it is exempt from the easement requirement.

§ T1604(j) Infiltration Trench Specifications

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the installation of infiltration trench materials.

1.2 RELATED SECTIONS

A. Section [_____ - _____]: Open-graded base materials.

B. Section [_____ - _____]: Drainage pipes and appurtenances.

C. Section [_____ - _____]: Earthworks/excavation/soil compaction.

D. Section [_____ - _____]: Rain Garden.

1.3 RELATED DOCUMENTS

A. ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D 2239 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

C. ASTM D 3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.

D. ASTM D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

E. ASTM D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

F. ASTM D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

G. ASTM D 4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.

H. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

1.4 SUBMITTALS

A. Product Data: For Geotextile.

B. Sieve Analyses: For sand and open graded aggregate according to ASTM C 136.

C. Samples for Verification:

1. Four by four-inch sample of geotextile

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

B. Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

C. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

D. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geotextile.

PART 2 – PRODUCTS

2.1 AGGREGATES

A. Coarse sand: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1003.01 (c) FA-2.

B. Open graded aggregate: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1004.01 (c) CA-7.

2.2 NON-WOVEN NEEDLE PUNCHED GEOTEXTILE

A. Mechanical properties:

1. Grab Tensile Strength (ASTM D 4632)

a. Strength at ultimate (lbs) 205

b. Elongation at ultimate (%) 50

2. Mullen Burst Strength (ASTM D 3786) (psi) 380

3. Trapezoidal Tear Strength (ASTM D 4833) (lbs) 80

4. Puncture Strength (ASTM D4833) (lbs) 130

5. UV Resistance after 500 hrs. (ASTM D 4355) (%) 70

B. Hydraulic properties:

1. Apparent Opening Size (ASTM D 4751) (US sieve #) 80

2. Permittivity (ASTM D 4491) (sec-1) 1.2

3. Flow Rate (ASTM D 4491) (gal/min/ft2) 95

C. Selected non-woven needle punched Geotextile shall be approved by Engineer or Construction Manager.

2.3 PIPES

A. Perforated HDPE distribution pipes shall conform to ASTM D 2239. The perforated pipe should have ½ inch slot openings, 6 inches center to center, along two to three longitudinal rows.

2.4 CLEAN OUTS

A. The clean out/observation well is to consist of 6-inch diameter rigid HDPE pipe and conform to ASTM D 2239. A rigid perforated 6-inch diameter HDPE pipe that conforms to ASTM D 2239PVC shall be provided and placed vertically within the gravel portion of the infiltration trench.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. The infiltration trench systems may not receive run-off until the entire contributing drainage area to the infiltration system has received final stabilization.

B. Heavy equipment and traffic shall be restricted from traveling over the location of the infiltration trench to minimize compaction of the soil.

3.2 EXCAVATION

A. Excavate the infiltration trench to the design dimensions and elevations. Excavated materials shall be located a minimum 10-feet away and to the downstream side of the trench to prevent re-deposition of excavated soils during storm events and to enhance trench wall stability. Large tree roots shall be trimmed flush with the trench sides in order to prevent fabric puncturing or tearing of the filter fabric during subsequent installation procedures. The side walls of the trench shall be roughened where smeared and sealed during excavation.

3.3 COARSE SAND PLACEMENT

A. Place 6-inch sand filter layer (IDOT FA-2) at the bottom of the infiltration trench.

B. First 3-inches of sand shall be vertically mixed with the subgrade soils to a minimum depth of 2-inches prior to placing the remaining 3-inches.

3.4 GEOTEXTILE PLACEMENT

A. The width of the geotextile must include sufficient material to conform to trench perimeter irregularities and for a 6-inch minimum top overlap. The filter fabric shall reach to the sand layer on the bottom of the infiltration trench. Stones or other anchoring objects should be placed on the fabric at the edge of the trench to keep the fabric in place during construction. When overlaps are required between rolls, the uphill roll shall lap a minimum of 2-feet over the downhill roll in order to provide a shingled effect.

B. Following the stone aggregate placement, the filter fabric shall be folded over the stone aggregate to form a 6-inch minimum longitudinal lap.

C. A separate precut geotextile shall be placed horizontally over the aggregate prior to covering the infiltration trench with sand and amended top soil layers. The horizontally placed geotextile shall be installed as an individual unit to allow for easy removal in case of remedial maintenance.

3.5 PIPES

A. Perforated pipe shall be provided as indicated in the drawings and shall terminate 1-foot short of the infiltration trench end wall. Free ends of perforated pipe, where no clean-outs are specified, shall be capped.

3.6 CLEAN OUTS

A. The clean out/observation well shall be fitted with a cap set 6-inches above ground level and located near the lateral center of the infiltration trench as indicated in the drawings. The pipe shall have a plastic collar or ribs to prevent lifting when removing cap. The screw top lid of the cleanout/observation well shall be fitted with a locking mechanism or special bolt to discourage vandalism. The cap shall be open or closed as indicated on the drawings. The pipe shall have a cap at the bottom of the pipe. The bottom of the cap shall rest on the infiltration trench bottom.

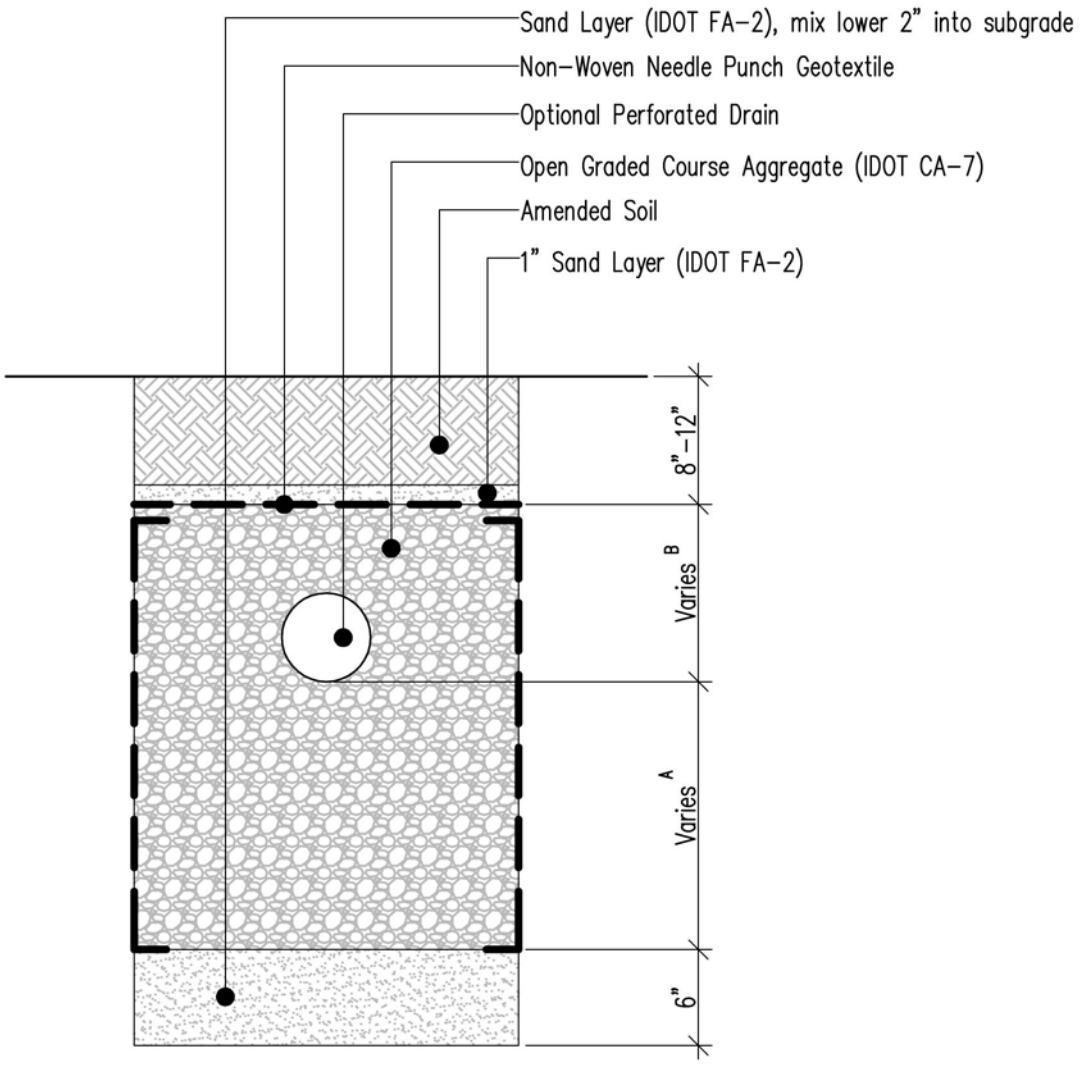
3.7 AGGREGATE PLACEMENT

A. The stone aggregate (IDOT CA-7) shall be placed in lifts and lightly compacted using plate compactors. The maximum loose lift thickness is 12-inches.

B. All aggregates must be kept clean and uncontaminated at all times. All contaminated aggregates shall be removed and replaced with uncontaminated aggregates (IDOT CA-7).

END OF SECTION

§ T1604(k) Typical Detail



A) Retention volume (exfiltrated into soils)
B) Detention volume (drained through perforated pipe)

Note: Duration of ponding shall not exceed 72 hours

Infiltration trench

Not to Scale

Figure 9 – Infiltration Trench Detail

[1] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Lowndes (2000); Los Angeles County Department of Public Works (2002)
[2] Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Schueler *et al.* (1992)
[3] Schueler (1987)
[4] Schueler (1987); Lowndes (2000)
[5] WDNR (2004b)
[6] MA Department of Environmental Protection (1997); Lowndes (2000)
[7] Lowndes, M.A. (2000)
[8] WDNR (2004a)
[9] MA Department of Environmental Protection (1997)
[10] Schueler (1987); Horner et al. (1994); EPA (1998); Barr Engineering Company (2001)
[11] WDNR (2004b)
[12] Mahabadi (2001)
[13] Schueler (1987); Lowndes (2000)
[14] Mahabadi (2001)
[15] Schueler (1987); Horner et al. (1994); EPA (1998); Barr Engineering Company (2001)
[16] Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Lowndes (2000)
[17] Lowndes, M.A. (2000)
[18] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)
[19] Mahabadi (2001)
[20] Mahabadi (2001)
[21] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Los Angeles County Department of Public Works (2002); WDNR (2004b)
[22] WDNR (2004b)
[23] Mahabadi (2001)
[24] MA Department of Environmental Protection (1997)
[25] MA Department of Environmental Protection (1997)
[26] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)
[27] Lowndes (2000)
[28] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)
[29] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Los Angeles County Department of Public Works (2002)
[30] Lowndes (2000)
[31] Mahabadi (2001)

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Wisconsin Department of Natural Resources (2004a), Site Evaluation for Stormwater Infiltration, Conservation Practice Standard, (1002) 02/04.

Wisconsin Department of Natural Resources (2004b), Bioretention for Infiltration, Conservation Practice Standard, (1004) 10/04.

§ T1605 Level Spreader and Filter Strips

§ T1605(a) Definition

Level spreaders and filter strips represent two separate BMP's that have been combined for more effective stormwater management treatment. The effectiveness of filter strips alone in urban applications is often compromised by concentration of runoff that causes erosion. This problem can be resolved through use of a level spreader that directs runoff evenly over the filter strip[1]. Level spreaders and filter strips can also be combined with other BMP's. They can, for instance, receive discharge from rain gardens, porous pavement areas, and naturalized detention for further treatment, infiltration, and de-concentration of flow.

Level spreader:

A level spreader is a device used to dissipate concentrated runoff into uniform surface sheet flow. The concentrated runoff may be received through subsurface structures (such as perforated pipes) or surface structures (such as parking lot curb cuts). The conversion of concentrated flow into sheet flow greatly reduces the risk of erosion and scouring and creates conditions for proper filter strip function. The uniform sheet flow from the level spreader is released to an adjacent filter strip on the downstream side.

Filter strip:

The filter strip receives evenly distributed overland sheet flow, typically from either a level spreader or a level pavement edge. The filter strip is sloped such that the overland runoff drains slowly, providing an opportunity for runoff treatment (pollutant removal) and infiltration (surface ground water recharge)[2]. Preferably, filter strips are vegetated with native prairie grasses and forbs that will improve the water quality and infiltration performance of the strip. However, filter strips can be vegetated with turf and still provide a benefit. (Where filter strips are used to offset hydraulically impervious area for the Kane County ordinance, they must be vegetated with native species.)

§ T1605(b) Suitable Applications

Filter strips can be applied to a variety of urban land uses. They are particularly well suited for residential developments[3] and campus type commercial and industrial developments. Since these developments usually have large expanses of areas that can readily be planted with native vegetation and used to accept runoff from impervious surfaces or other BMP's. The strips can easily be incorporated into the site layout and landscape designs. However, smaller filter strips can also be used to treat runoff from almost any parking lot.[4]

Vegetated filter strips function best on gradual slopes, ideally less than 5%. Slopes steeper than 15% should be avoided[5]. Only smaller drainage areas (e.g. roadway pavement draining across a vegetated embankment) should be connected to filter strips with slopes of 5% to 15% to prevent erosion and scour of the filter strip.

Urban stormwater systems often produce concentrated discharges that require a level spreader to disperse flows to the filter strip[6]. The level spreader can be applied as a flow interceptor device at small culverts or other surface discharges to redistribute the flow. Another application is within a filter strip (mid slope) where re-concentrated runoff can be intercepted and redistributed (see also Section § T1605(g) and Section § T1605(g)(3)).

In other applications, concentrated runoff is discharged to a perforated distribution pipe within the level spreader trench. The perforated pipe distributes the runoff over the length of the level spreader and the flow wells up out of the trench over the length of the spreader. In many cases, impervious surfaces, such as small parking lots and roads that produce unconcentrated sheet flow can drain directly onto the filter strip with no level spreader.[7]

§ T1605(c) Benefits

In addition to dissipating energy and distributing the runoff, level spreaders provide cooling of the first flush runoff from high temperature paved or roof surfaces. Filter strips also help to reduce runoff temperature[8] prior to the introduction of excess runoff into local waterways.

The uniform sheet flow of level spreaders and filter strips can provide effective infiltration and filtration. Filter strips with native vegetation serve as effective buffers between developments and sensitive features such as streams, lakes, and wetlands[9].

Level spreaders and filter strips can reduce both the rate and volume of stormwater runoff on a site. In addition to dispersing concentrated flows, level spreaders can also serve as infiltration trenches (without the vegetated cover), if sized accordingly. The majority of smaller rain events are exfiltrated through the bottom of the trench, whereas larger flows are discharged as sheet flow onto the filter strip. However, it should be recognized that the infiltration performance of level spreaders may be lost over time due to the lack of sediment filtration prior to introducing runoff into the trench.

Filter strips provide a level of rate control by increasing the length of flow paths and reducing the velocity to the primary drainage system[10]. This can reduce runoff volumes by providing greater opportunity for infiltration of runoff into the soil[11]. Well maintained filter strips can be very effective in reducing runoff volumes, particularly when the impervious drainage area is less than two to three times the filter strip area[12]. NIPC[13] found that annual storm runoff volumes could be reduced by up to 40 to 45% with conservatively designed and maintained filter strips.[14]

Filter strips can be used to meet the 0.75-inch Kane County retention standard since hydraulically connected impervious surfaces can be reduced by the area of filter strips planted with native vegetation.

Level spreaders, and even more so filter strips, are low cost BMP's. Filter strips further provide cost savings through ease of maintenance compared to other conventional landscape treatments such as turf grass.

§ T1605(d) Limitations

Impervious areas connected to the filter strip should be no more than two or three times the filter strip area to assure runoff filtering and volume reduction unless the flow rates are controlled upstream of the filter. The length of the imperious area (parallel to the flow) should not exceed 200-feet[15].

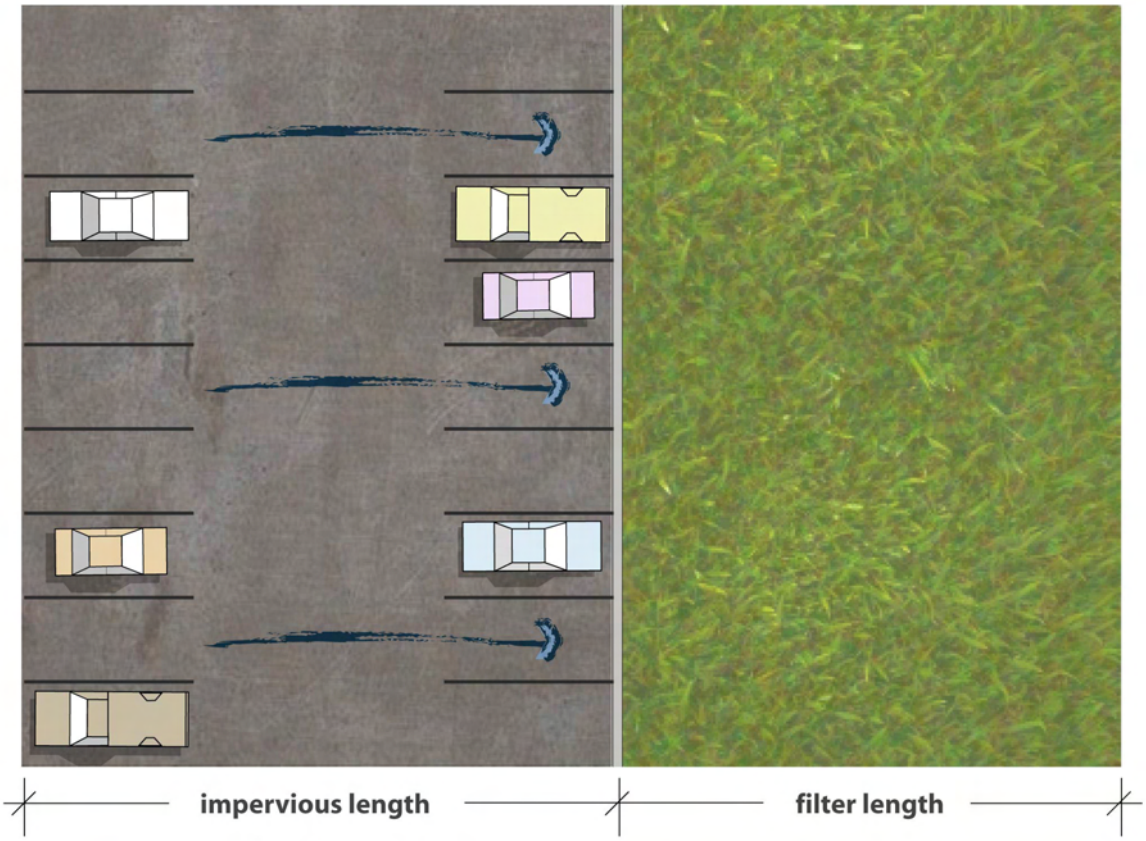


Figure 10 – Filter strip schematic

Filter strips should be located such that they do not conflict with the project site programming and are protected from heavy foot or any vehicular traffic. This will protect the native vegetation and prevents soil compaction[16].

Filter strips are not suitable for hilly or highly paved areas because of high runoff velocities[17]. Some topographic challenges, however, may be resolved with frequent

level spreader placement within the filter strip to intercept re-concentrated flows. The area considered for the filter strip application must be free of gullies and rills[18].

Areas considered for a filter strip application that will be subject to applications of fertilizers and pesticides are not suitable as filter strips[19].

Level spreaders and filter strips may not be economically suitable for dense developments with high land values due to the limited availability of space for the filter strip.

§ T1605(e) Required Design Data

The ultimate design objective is to maintain evenly distributed sheet flow and very low runoff velocities. Design parameters are the length and slope of the filter, surface area and nature of the drainage area, existing soil types, type of planned vegetation cover, and runoff velocity[20]. The following data should be collected to inform the design process:

Character, geometry, and size of the impervious area tributary to the level spreader and filter strip.

Topographic information, including slopes, for the planned filter strip area.

Soil type information, from county soil survey to assess erosion risk and type composition of native vegetation mix.

§ T1605(f) Level Spreader Design

Level spreaders are similar to infiltration trenches (see also Section § T1604). Typical differences include the trench size (level spreaders tend to be smaller) and the trench cover. Level spreaders are not covered with a vegetated amended top soil, but rather with an open graded aggregate (IDOT CA 7).

The primary performance objective of level spreaders is to convert concentrated flows into uniform overland sheet flows. They may further provide nominal retention through runoff exfiltration through the trench bottom.

Level spreader function can, however, be combined with infiltration trench function and sized for retention. With this combination, only excess runoff that exceeds the capacity of the infiltration/level spreader trench is released into the adjacent filter strip. For infiltration trench details refer to Section § T1604(k). It should be recognized that since level spreaders are not protected from sediment by a topsoil filter as recommended in Section § T1604(f), they will be more prone to subgrade clogging and the infiltration benefit of the level spreader will be reduced over time.

The minimum depth of the level spreader should be 6-inches[21] when there is no distribution pipe, and the minimum width should be 6- to 12-inches or greater. The level spreader will need to be deeper and wider when it includes a distribution pipe. The bottom of the level spreader trench should be lined with 2- to 4-inches of torpedo sand (IDOT FA 2) vertically mixed into the subgrade. The vertical infiltration trench walls should be lined with a non-woven needle punch geotextile to prevent

migration of the adjacent soils into the open graded aggregate. The overlap between two ends of the fabric should be at least two feet (shingle effect). The level spreader is filled to 2-inches inches above the surrounding grade and the gravel should extend minimum 6-inches downstream of the trench to protect the downstream lip of the trench from erosion. The trench should be filled with open graded, preferably washed, aggregated (IDOT CA7). A separate piece of non-woven needle punched geotextile should be placed near the top of the open graded aggregate fill but below the top of the trench as a filter and sediment barrier. This piece can be removed and replaced as part of remedial maintenance if necessary. The remaining depth of the level spreader is filled with the same aggregate (IDOT CA7) as in the lower trench portion.

Runoff can be conveyed into the level spreader through surface flow, or a perforated distribution pipe.

§ T1605(f)(1) Level spreader surface inflow design:

Parking lots without curbs or with curb cuts and small culverts (see also Section § T1605(b)) are examples of surface discharge option into a level spreader. Parking lots with a level edge and flush curb should not need a level spreader. The surface flow runoff into the level spreader should be free of sediments to prevent clogging of the trench and premature failure. Another surface inflow application is within a filter strip (mid-slope) where re-concentrated runoff is intercepted and redistributed.

§ T1605(f)(2) Level spreader subsurface inflow design:

Runoff is conveyed to the level spreader through a stormwater sewer pipe that connects to a standard perforated pipe or slot drain in the level spreader. A standard perforated pipe allows runoff to uniformly fill the level spreader trench and overflow at the downstream edge onto the filter strip. A slot drain will drain water out of the slot. The base of the slot drain should be perforated to allow drainage between events. The discharge to the level spreader should be free of sediments to prevent clogging of the trench and premature failure.

It is essential that the level spreader be surveyed level. If a slot drain is used, the rim of the slot that must be level. If a slot drain is not used, the downstream lip of the level spreader trench and the low gravel mound must be level. If grades are such that the full length of the spreader cannot be installed on the same contour, the spreader should be broken into multiple reaches with each reach located on its own contour.

The first pipe reach of level spreader pipe from the inflow pipe (minimum of five pipe diameters or five feet, whichever is less) should be solid pipe with no slot drain. This is necessary to prevent excessive surface discharge at an elbow or tee where there may be significant head loss associated with the change in direction in flow.

Slot drains or perforated pipes within the level spreader should include cleanouts at the ends and at significant changes in direction to allow for maintenance. Cleanouts

may also be required at intermediate points for long level spreader lengths. The cleanout covers should be located at a higher elevation than the rim of the level spreader such that hydraulic head will not lift the cap.

§ T1605(f)(3) Level spreader discharge:

The pipe within the level spreader (slot drain or standard perforated pipe) should be sized for less than 0.1-foot of head loss from the inflow to the end of the pipe under the design flow. If there is greater head loss, the runoff will discharge from less than the full length of the level spreader. Level spreaders should not be constructed on a slope to compensate for a smaller pipe as this will cause most of the flow to discharge at the far end of the spreader during events less than the design event.

The allowable flow rate per foot of level spreader is determined by the downstream slope, the allowable flow velocity on the slope, and the allowable depth of flow on the slope. The flow should not exceed 1-inch[22] in depth during the design event under full vegetative cover, which translates roughly into 0.01 to 0.02 cfs per linear foot of level spreader, depending on slope. Also, to prevent scour, the velocity should not exceed the allowable velocity for the soil type, vegetation, and slope, assuming dormant season vegetative cover.

§ T1605(g) Filter Strip Design

The most important design factors for a filter strip are the drainage area tributary to the filter strip, width, length, and slope of the filter, and the permeability of the soils. Filter strips should be designed to promote shallow, slow velocity, sheet flow (see also Section § T1605(f) and Section § T1605(h)) through the filter to allow for settling and infiltration. The health and density of the vegetation will also significantly affect the in-situ performance of the filter strip[23].

During growing season storm events, velocities across the strip will be very low which will promote settling and infiltration. However, during the dormant season, when vegetative cover may be less dense and lower height, velocities may be greater but must not exceed the maximum permissible velocity for the soil and vegetation being used on the filter strip (see also Section § T1605(f)(3), Section § T1605(h), and Table 7)[24].

If at least temporary vegetative cover cannot be established prior to discharge of runoff to the level spreader, erosion control blanket should be applied over the area of the filter strip.

Longitudinal slopes up to 5% are ideal for level spreaders. Such slopes reduce the risk of re-concentrating flows and erosion and gully formation[25]. Slopes of 5% to maximum 15% may be acceptable for shorter flow lengths. Flow lengths can be reduced through placement of additional level spreaders within the filter strip.

§ T1605(g)(1) Vegetation:

Native prairie grasses, sedges, and forbs that achieve a good, dense stand at the soil interface are preferred over turf grass and should be the first choice for vegetate filter strips. Prairie vegetation has the distinct advantage of a deep fibrous root system that can significantly enhance infiltration[26]. Native vegetation further reduces maintenance needs compared to turf vegetation and eliminates the introduction of pollutants through turf pesticides and fertilizers.

Furthermore, when the drainage area is relatively large, slopes flatter than 2% could lead to periods of prolonged inundation and difficulty in maintaining healthy turf[27]. Slope concerns are less critical for filter strips planted with prairie vegetation tolerant to temporarily saturated soil conditions[28].

The filter strip vegetation should be fully stabilized with cover crop and erosion blanket before the contributing impervious surface is created and its runoff directed onto the filter strip[29].

For further information on vegetation design, refer to Section § T1603 and the Species Guide in Appendix B.

§ T1605(g)(2) Filter strip area:

Under the Kane County Stormwater Ordinance, filter strips can be used to reduce the hydraulically connected impervious area that must meet the 0.75-inch retention standard. To eliminate the need for the 0.75-inch retention volume, the area of the filter strip must equal the area of impervious cover tributary to it. However, filter strips with less area can still be effective in removing sediments and other pollutants and reducing annual runoff volumes. Filter strips whose area is 50% or more of the tributary impervious area, should remove up to 80% of the total suspended solids load and reduce annual runoff volumes by 40% to 45%[30].

§ T1605(g)(3) Filter strip length:

The required filter strip area and the limitations on flow rates (see Section § T1605(h)) will generally determine the length of the filter strip. However, the maximum length of the filter will be determined by the length over which sheet flow can be maintained. Level spreaders should be installed every 50-feet of filter strip length on slopes greater than 5% and every 100-feet of filter strip length on slopes 5% or less[31]. Filter strips exceeding 100- to 150-feet without any flow interception and redistribution should be avoided to prevent concentration of flow that naturally occurs as the length of flow increases[32].

§ T1605(h) Hydraulic and Hydrologic Analysis

Depth of flow:

The depth of flow within filter strips should not exceed approximately one inch under full vegetative cover to prevent re-concentration of flow and submergence of the vegetation, which will lead to reduced filter strip effectiveness. The depth of flow within the filter strip will depend on the slope, vegetation, and discharge rate within the filter strip. Because flow depths will be very shallow, retardance should be used to determine the appropriate n-value (see also Table 6 and Figure 11). For shallow flow, under native vegetative cover, retardance A or B should be used, which translates into an n-value of 0.30 or higher for determining the depth of flow.

Level spreader pipe size:

The perforated pipe located within the level spreaders is intended to distribute the inflow over the length of the level spreader, ensuring uniform discharge over the length of the level spreader. The perforated pipe must be adequately sized such that the head loss from the upstream to the downstream end of the pipe is less than 0.1-feet to avoid concentration of flow at the upstream end.

Growing Season Retardance Factors for Vegetated Swales[1]		
Retardance	Cover	Conditions
A Very High	Cattail Smooth Brome River Bulrush Hard-stem Bulrush	Excellent stand, tall Excellent stand, tall (avg. 30”) Excellent stand, tall Excellent stand, tall
B High	Smooth Brome Tall Fescue Alfalfa Native grasses	Good stand, mowed (avg. 12–15”) Good stand, unmowed (avg. 18”) Good stand, uncut (avg. 15”) Good stand, unmowed
C Moderate	Kentucky Blue Grass Red Fescue Redtop Smooth Brome	Good stand, headed (12–18”) Good stand, headed (12–18”) Good stand, headed (15–20”) Good stand, mowed (6–8”)
D Low	Kentucky Blue Grass Red Fescue Redtop Smooth Brome	Good stand, mowed (3–4”) Good stand, mowed (3–4”) Good stand, mowed (3–4”) Good stand, mowed (3–4”)
E Very Low	Kentucky Blue Grass	Good stand, cut (2” or less)
[1] For turf and other low growing grasses, a dormant season retardance factor one less than the growing season factor should be used. For native vegetation and other tall growing vegetation mowed or burned in the fall, a dormant season factor two less than the growing season factor should be used. Adapted from Natural Resource Conservation Service (NRCS)		

Table 6 – Growing Season Retardance Factors for Vegetated Swales

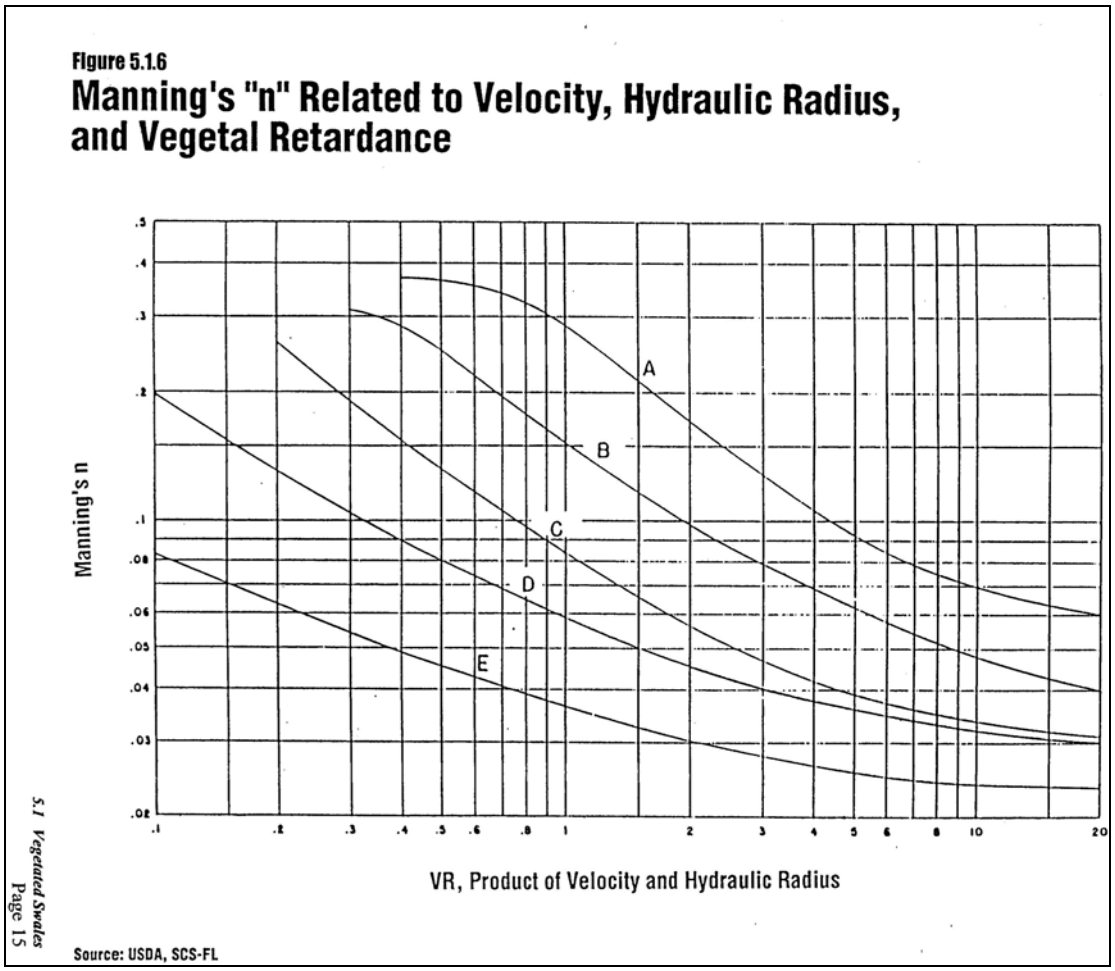


Figure 11 – Manning's "n" Related to Velocity, Hydraulic Radius, and Vegetal Retardance

<u>Maximum permissible velocity:</u>

To avoid scour within the filter strip, the velocity should not exceed the maximum permissible velocity for the slope, vegetation, and soils of the filter strip (see Table 7). For native landscapes, the dormant season, after burn management has occurred, will be the conditions under which retardance will be lowest and the potential for exceeding permissible velocities will be the greatest. Under these conditions, retardance E should be used, which translates into a Manning's n value of 0.08 to 0.10 for shallow flow.

Permissible Velocities for Channels Lined with Vegetation[1]		
Channel Slope[2]	Lining	Permissible Velocity (ft/sec)[3]
0 to 5%	Tall Fescue Kentucky Blue Grass Smooth Brome	4
	Grass-legume mixture Native grass mixture	3
	Red Fescue Redtop	2.5
	Small grains[4]	2
5 to 10%	Tall Fescue	4
	Kentucky Blue Grass Smooth Brome	3
	Grass-legume mixture Native grass mixture	2.5
Greater than 10%	Tall Fescue Kentucky Blue Grass Smooth Brome	2.5

[1] Use velocities exceeding 4 to 5 ft/s only where good cover and proper maintenance can be assured.
[2] Slopes greater than 10% should be avoided unless it is for a short distance or the flow rate is low.
[3] Cohesive (clayey) fine-grained soils and course grained soils with cohesive fines and a plasticity index of 10 to 40 (CL, CH, SC, and GC) are erosion resistant. Soils that do not meet this criteria should be considered easily erodible.
[4] For temporary seedings.
Source: IL Natural Resource Conservation Service (NRCS)

Table 7 – Permissible Velocities for Channels Lined with Vegetation

Maximum flow rate:

The maximum flow rate will typically be determined by the allowable maximum depth, slope, and vegetation of the filter strip. However, under some conditions, maximum permissible velocity may control. For native vegetation cover with a Manning's n of 0.30 and an allowable flow depth of one inch, the flow rate would be 0.01 to 0.02 cfs/foot of level spreader, depending on filter strip slope.

Impact on downstream detention sizing:

Filter strips can be used to meet the 0.75-inch Kane County retention standard since hydraulically connected impervious surfaces can be reduced by the area of filter strips planted with native vegetation (see also Section § T 203(g) and Figure 8, and Kane County Stormwater Ordinance Section § 203(g)(2).

Because filter strips contain no storage and runoff spends relatively little time on the filter strip, the runoff volume reduction for the 100-year detention design storm may be relatively small. However, the increase in time of concentration due to the low velocity may serve to reduce detention requirements to some degree.

Typically, the combined impervious and filter strip area would be represented by a composite curve number and a relatively long time of concentration based on the travel time through the filter strip.

A filter strip can also be modeled as a storage reservoir. In this case, the total tributary area, including the area of the filter strip itself would discharge to the "reservoir". The surface discharge-elevation rating curve for the reservoir would be determined by slope, roughness, and width of the filter strip. The volume-elevation rating curve for the reservoir would be based on the area of the filter strip (length and width) and depth of flow. The subsurface (infiltration) discharge from the "reservoir" would be based on the saturated hydraulic conductivity of the filter strip soils. Only the surface discharge would be routed to the downstream detention basin. Also see Section § T1604(f)(8) for a discussion of modeling infiltration practices.

§ T1605(i) Construction Considerations

Sediment laden construction site runoff should not be discharged to the level spreader as it will clog the gravel trench and cause premature failure. For additional construction considerations on level spreader trenches, refer to Section § T1604(g).

Areas where level spreaders and filter strips are to be located should be protected from construction traffic using construction fencing or other barriers to prevent compaction. Maintenance of the soil permeability will both protect the infiltration potential and facilitate the establishment and maintenance of a dense, deep-rooted vegetative cover[33].

Filter strips should be cleared of stumps, brush, rocks and similar obstacles that may lead to runoff flow concentration. Machinery used to work on the filter strip and level spreaders should be low ground pressure equipment.

Vegetation must be established on the filter strip as soon as possible to prevent erosion and scour. Filter strips should be graded and vegetated early in the construction schedule, preferably before paving increases the rate of runoff. If the latter is impossible, runoff from the hydraulically connected area must bypass the level spreader and filter strip until they are fully stabilized with cover crop and erosion blanket.

§ T1605(j) Operation and Maintenance

Proper maintenance of the filter strip to prevent loss of vegetation and erosion of the strip may be as important as the initial design. Vegetation should be inspected and replaced as necessary during the first year after construction[34].

Filter strips and level spreaders should further be inspected for proper distribution of flows and signs of rilling and other erosion during and after major storm events, particularly during the first one or two years. After the first one or two years, the strip and spreader may be inspected annually. If erosion is discovered, the eroded areas should be filled, reseeded, and mulched. Then the causes for the erosion should be determined and prevented from recurring[35].

After sufficient graminoid (grasses and sedges) development to provide an adequate fuel source on the filter strip with native prairie vegetation, annual burn management should be implemented. Burning dead plant material reduces weed growth, stimulates native grass and forb growth, and increases nutrients available to the plants. On filter strips where burning is difficult or impossible, the vegetation should be mowed annually in fall or spring. To mimic the burn cycle all clippings and thatch must be removed after mowing. If the filter strip is mown, low ground pressure equipment should be used to prevent compaction. Mowing should not be conducted under saturated soil conditions to prevent rutting. Note that mowing does not provide the full benefit to native prairie vegetation that fire provides and will often result in a lower ratio of wildflowers (forbs) relative to the grasses.

For further operation and maintenance guidance refer to Section § T1603(h) and the Species Guide in Appendix B.

§ T1605(k) Easement

The Kane County Stormwater Ordinance requires that stormwater features (such as level spreaders and filter strips) be protected by an easement. All level spreader and filter strip areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If level spreaders and filter strips are not part of the permitted stormwater management system, such as those installed by a homeowner on his or her own accord, they are exempt from the easement requirement.

§ T1605(l) Specifications

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the installation of level spreader materials.

1.2 RELATED SECTIONS

A. Section [_____ - _____]: Open-graded base materials.

B. Section [_____ - _____]: Drainage pipes and appurtenances.

C. Section [_____ - _____]: Earthworks/excavation/soil compaction.

D. Section [_____ - _____]: Rain Garden

1.3 RELATED DOCUMENTS

A. AASHTO M252 Corrugated Polyethylene Drainage Pipe.

B. AASHTO M294 Corrugated Polyethylene Pipe, 300- to 1200-mm Diameter.

C. ASTM D 1117 Standard Guide for Evaluating Nonwoven Fabrics.

D. ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

E. ASTM D1388 Standard Test Method for Stiffness of Fabrics.

F. ASTM D 2239 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

G. ASTM D 3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.

H. ASTM D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

I. ASTM D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

J. ASTM D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

K. ASTM D 4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.

L. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

M. ASTM D5035 Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).

N. ASTM D 6475 Standard Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets.

O. ASTM D 6525 Standard Test Method for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products.

P. ASTM F 405 Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

Q. Erosion Control Technology Council (ECTC) Guidelines.

1.4 SUBMITTALS

A. Product Data:

1. For Geotextile.

2. Slot drain with perforated base pipe or perforated pipe.

B. Sieve Analyses: For sand and open graded aggregate according to ASTM C 136.

C. Samples for Verification:

1. Four by four-inch sample of geotextile.

2. One-foot section of slot drain with perforated base or perforated pipe.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

B. Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

C. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

D. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geotextile.

PART 2 – PRODUCTS

2.1 AGGREGATES

A. Coarse sand: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1003.01 (c) FA-2.

B. Open graded aggregate: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1004.01 (c) CA-7.

2.2 NON-WOVEN NEEDLE PUNCHED GEOTEXTILE

A. Mechanical properties:

1. Grab Tensile Strength (ASTM D 4632)

a. Strength at ultimate (lbs)	205
b. Elongation at ultimate (%)	50
2. Mullen Burst Strength (ASTM D 3786) (psi)	380
3. Trapezoidal Tear Strength (ASTM D 4833) (lbs)	80
4. Puncture Strength (ASTM D4833) (lbs)	130
5. UV Resistance after 500 hrs. (ASTM D 4355) (%)	70

B. Hydraulic properties:

1. Apparent Opening Size (ASTM D 4751) (US sieve #)	80
2. Permittivity (ASTM D 4491) (sec-1)	1.2
3. Flow Rate (ASTM D 4491) (gal/min/ft2)	95

C. Selected non-woven needle punched Geotextile shall be approved by Engineer or Construction Manager.

2.3 PIPES

A. HDPE Solid pipe: Pipe shall meet AASHTO Type S specifications, with soil-tight couplings. Fittings and couplers shall be fabricated HDPE with fitting and coupling hardware as supplied by pipe manufacturer. Perforated and solid piping shall be provided of the size and locations as shown on the drawings.

B. Slot drain: Manufactured from corrugated polyethylene pipe with a smooth interior wall, pipe and fittings conforming to AASHTO M252 and/or M294. A grate frame that forms a slot shall be mounted in the pipe so as to provide a linear outlet to the top of the pipe to distribute sheet flow. The slot shall be manufactured from 0.063 tempered commercial aluminum and shall have two parallel plates separated by vertical spacers spanning the slot on 6-inch centers. The grating within the slot opening shall be1/2 - #13 galvanized steel. The slot shall be painted with a zinc chromate primer to protect the aluminum when installed in concrete. The flange at

the bottom of the slot shall be riveted to the pipe with a minimum of two rivets per linear foot. The pipe shall have a section removed to accept the slot so as to maintain the original diameter, providing ease in transition to conventional systems. The pipe should have 0.5-inch slot openings, 6-inches center to center, along two to three longitudinal rows.

1. Size and dimensions:

a. Pipe diameter: refer to drawings

b. Slot height: 2 ½-inch or 6-inches

c. Slot opening: 1 ¼-inch wide for 4-inch pipe, 1 ¾-inch wide for 6 and 8-inch diameter pipe

C. Perforate pipe: Perforated HDPE distribution pipes shall conform to ASTM F 405, AASHTO M252, and AASHTO M252 and/or M294. The perforated pipe should have ½ inch slot openings, 6 inches center to center, along two to three longitudinal rows.

1. Roughness (Manning's "n") shall not exceed the following values

a. 3"-6"	0.015
b. 8"	0.016
c. 10"	0.017
d. 12"-15"	0.018
e. 18"-24"	0.020

2.4 CLEAN OUTS

A. Clean outs shall consist of 6-inch diameter rigid HDPE pipe and conform to ASTM D 2239.

2.5 EROSION CONTROL BLANKET

A. Straw erosion control blanket constructed with 100% agricultural straw fiber matrix and a functional longevity of approximately 12 months. The straw fiber shall be evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom with a lightweight photodegradable polypropylene net having an approximate 0.20 x 0.50 inch mesh size. The blanket shall be sewn together on 1.50 inch centers with degradable thread.

1. Thickness - ASTM D6525 - 0.32 inch (8.13 mm)

2. Resilience - ECTC Guidelines - 80.50%

3. Mass per Unit Area - ASTM D6475 - 7.59 oz/square yard (257 g/square meter)

4. Water Absorption - ASTM D1117/ECTC - 327%

5. Swell - ECTC Guidelines - 14.90%

6. Stiffness/Flexibility - ASTM D1388/ECTC - 6.06 oz-inch (67.699 mg-cm)

7. Ground Cover - ECTC Guidelines - 89%
8. Smolder Resistance - ECTC Guidelines - Yes (according to ECTC test)
9. MD Tensile Strength - ASTM D5035 - 156 lbs/ft (2.27 kN/m)
10. MD Elongation - ASTM D5035 - 23%
11. TD Tensile Strength - ASTM D5035 - 108 lbs/ft (1.57 kN/m)
12. TD Elongation - ASTM D5035 - 22%

(MD – Machine direction)

(TD – Traverse direction)

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. The level spreader and filter strip systems may not receive run-off until the entire contributing drainage area to the level spreader and filter strip system has received final stabilization.

B. Heavy equipment and traffic shall be restricted from traveling over the location of the level spreader and filter strip to minimize compaction of the soil.

3.2 EXCAVATION

A. Excavate the level spreader trench to the design dimensions and elevations. Excavated materials shall be located a minimum 10-feet away and to the downstream side of the trench to prevent re-deposition of excavated soils during storm events and to enhance trench wall stability. Large tree roots shall be trimmed flush with the trench sides in order to prevent fabric puncturing or tearing of the filter fabric during subsequent installation procedures. The side walls of the trench shall be roughened where smeared and sealed during excavation.

3.3 COARSE SAND PLACEMENT

A. Place 4-inch sand filter layer (IDOT FA-2) at the bottom of the infiltration trench.

B. First two-inches of sand shall be vertically mixed with the subgrade soils to a minimum depth of 2-inches prior to placing the remaining 2-inches.

3.4 GEOTEXTILE PLACEMENT

A. The width of the geotextile must include sufficient material to conform to trench perimeter irregularities and for a 6-inch minimum top overlap. The filter fabric shall reach to the sand layer on the bottom of the level spreader trench. Stones or other

anchoring objects should be placed on the fabric at the edge of the trench to keep the fabric in place during construction. When overlaps are required between rolls, the uphill roll shall lap a minimum of 2-feet over the downhill roll in order to provide a shingled effect.

B. Following the stone aggregate placement, the filter fabric shall be folded over the stone aggregate to form a 6-inch minimum longitudinal lap.

C. A separate precut geotextile shall be placed horizontally over the aggregate prior to covering the level spreader trench with the final aggregate layer. The horizontally placed geotextile shall be installed as an individual unit to allow for easy removal in case of remedial maintenance.

3.5 PIPES / SLOT DRAINS

A. Perforated pipe / slot drain shall be provided as indicated in the drawings and shall terminate 1-foot short of the level spreader trench end wall. Free ends of perforated pipe, where no clean-outs are specified, shall be capped.

1. Use of slot drain: The grate of the slot drain shall be installed level along one elevation for the entire continuous length of the level spreader.

2. Use of perforated pipe: The downstream lip of the level spreader trench shall be installed level along one elevation for the entire continuous length of the level spreader.

3.6 CLEAN OUTS

A. The clean outs shall be fitted with a cap located near the lateral center of the level spreader trench, and located at the ends of the distribution pipe as indicated on drawings. The pipe shall have a plastic collar or ribs to prevent lifting when removing cap. It shall withstand water head pressure of 10-feet and be manufactured with Hostalloy 731™ high density polyethylene. The screw top lid shall contain a magnet capable of being detected with a standard magnetic pipe and cable locator. The top shall include a locking mechanism or special bolt to discourage vandalism. The cap shall be open or closed as indicated on the drawings.

3.7 AGGREGATE PLACEMENT

A. The stone aggregate (IDOT CA-7) shall be placed in lifts and lightly compacted using plate compactors without damaging the distribution pipe. The maximum loose lift thickness is 12-inches.

B. Aggregate shall extend a minimum of six inches beyond the edge of the trench, on the downstream side and shall mound a minimum of 2- inches above the prevailing slope such that it will intercept runoff from upslope.

C. All aggregates must be kept clean and uncontaminated at all times. All contaminated aggregates shall be removed and replaced with uncontaminated aggregates (IDOT CA-7).

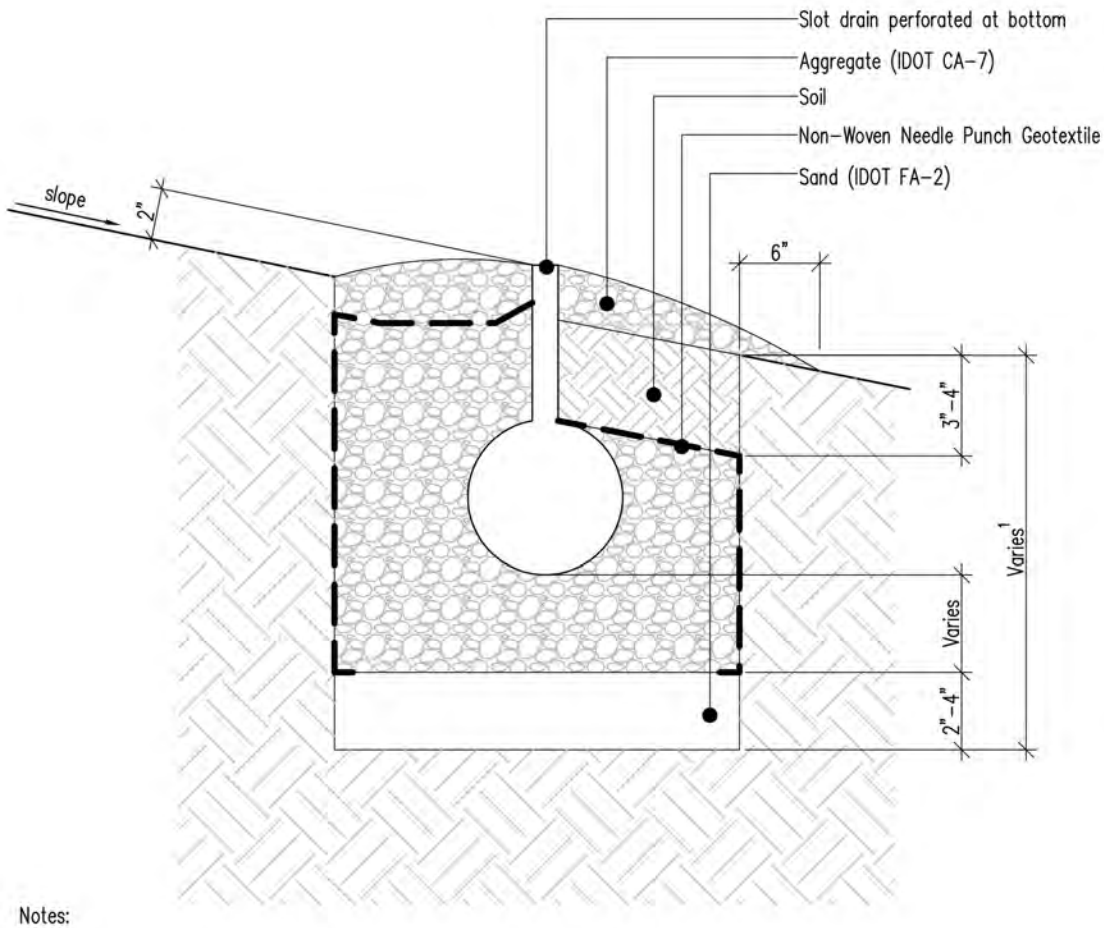
3.8 EROSION CONTROL BLANKET

A. Immediately following seed installation on the filter strip adjacent to the level spreader, install specified erosion control blanket as indicated on plan documents following manufacturer's specifications and installation procedures for areas as indicated on the plan documents. Erosion blanket shall be maintained as specified by manufacturer and as necessary for compliance with Kane County soil erosion and sediment control standards.

B. Uphill edge of erosion blanket shall be keyed into infiltration trench.

END OF SECTION

§ T1605(m) Typical Detail



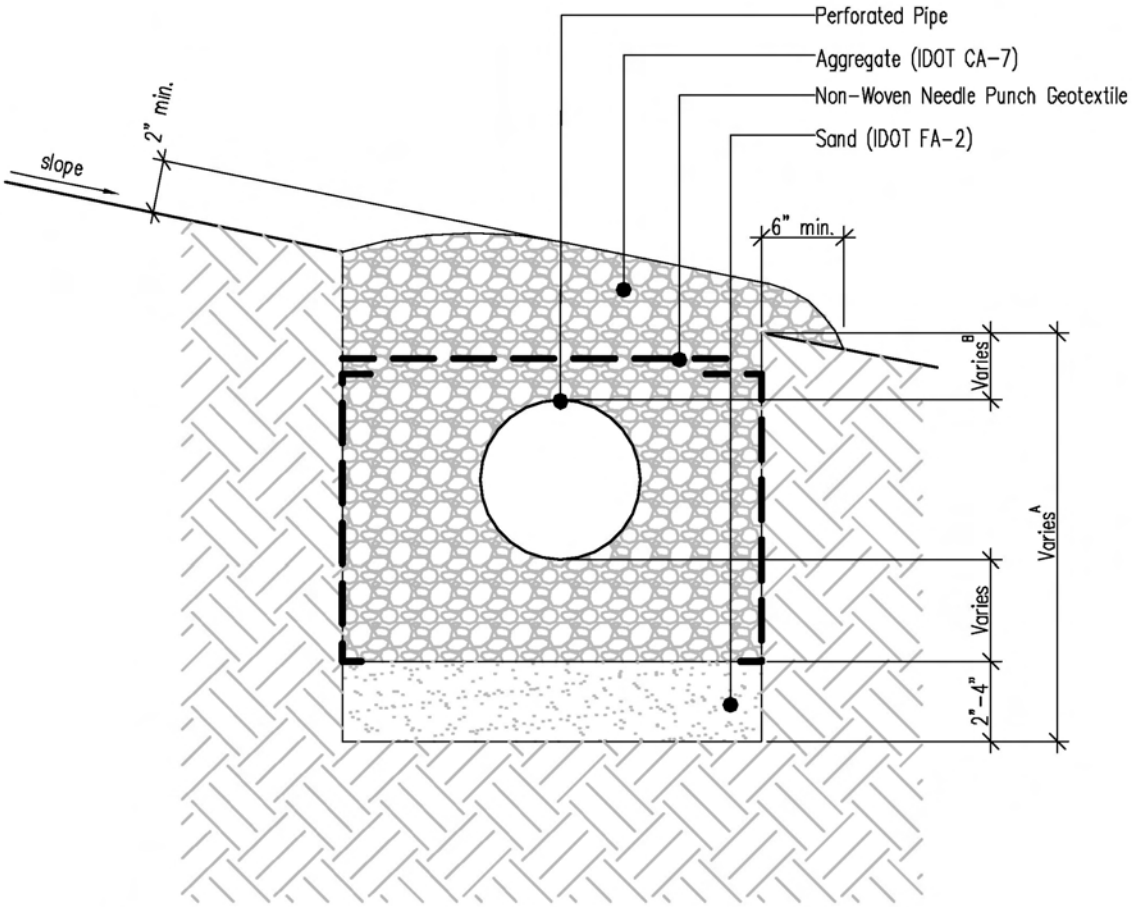
Notes:

1. Depth shall not exceed that which will drain in 72 hours.

Level Spreader with Inflow via Slot Drain

Not to Scale

Figure 12 – Level Spreader Detail (with slot drain)



A) Depth shall not exceed that which will drain in 72 hours.
B) Perforated Pipe located minimum of one pipe diameter below grade.

Level Spreader with Inflow via Perforated Pipe

Not to Scale

Figure 13 – Level Spreader Detail (with perforated pipe)

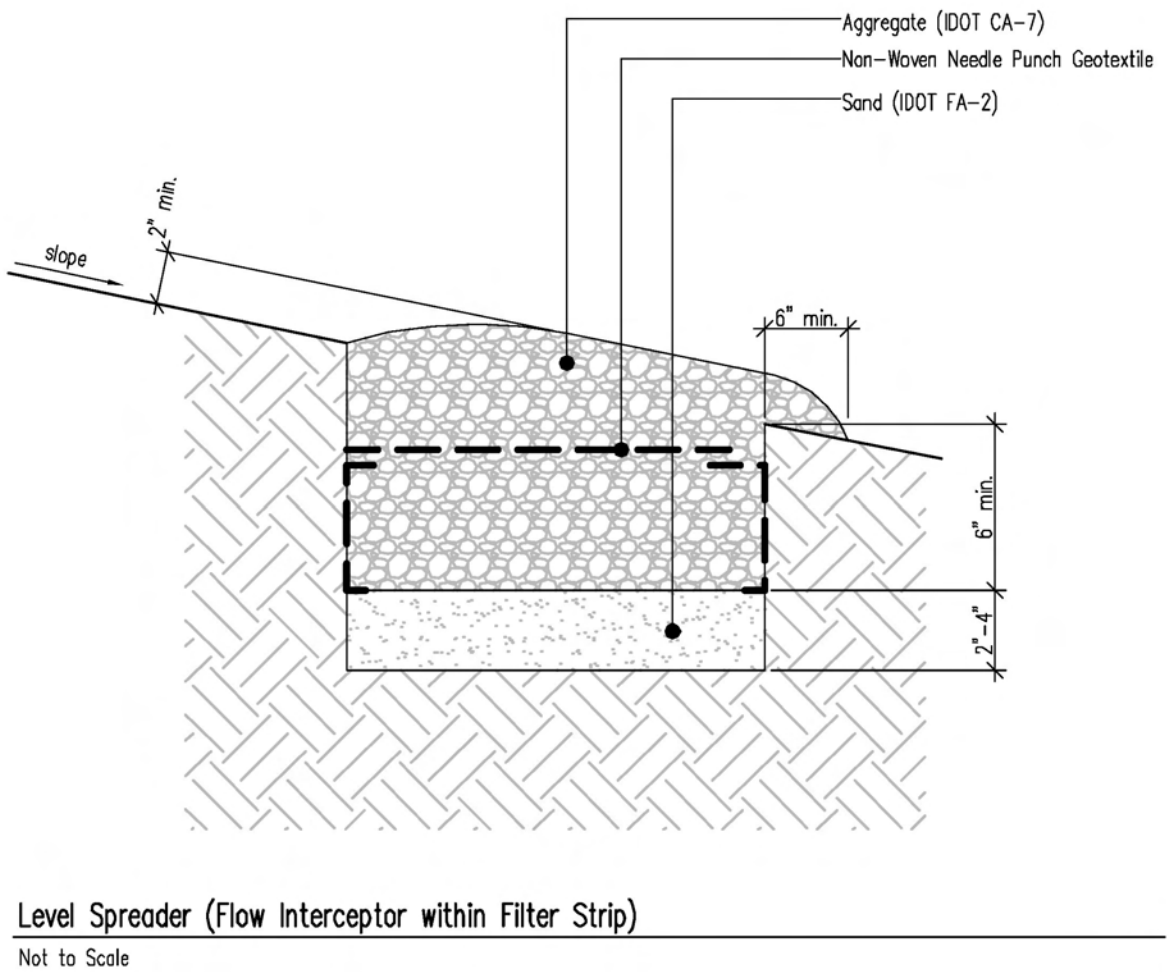


Figure 14 – Level Spreader Detail (within filter strip (mid-slope)

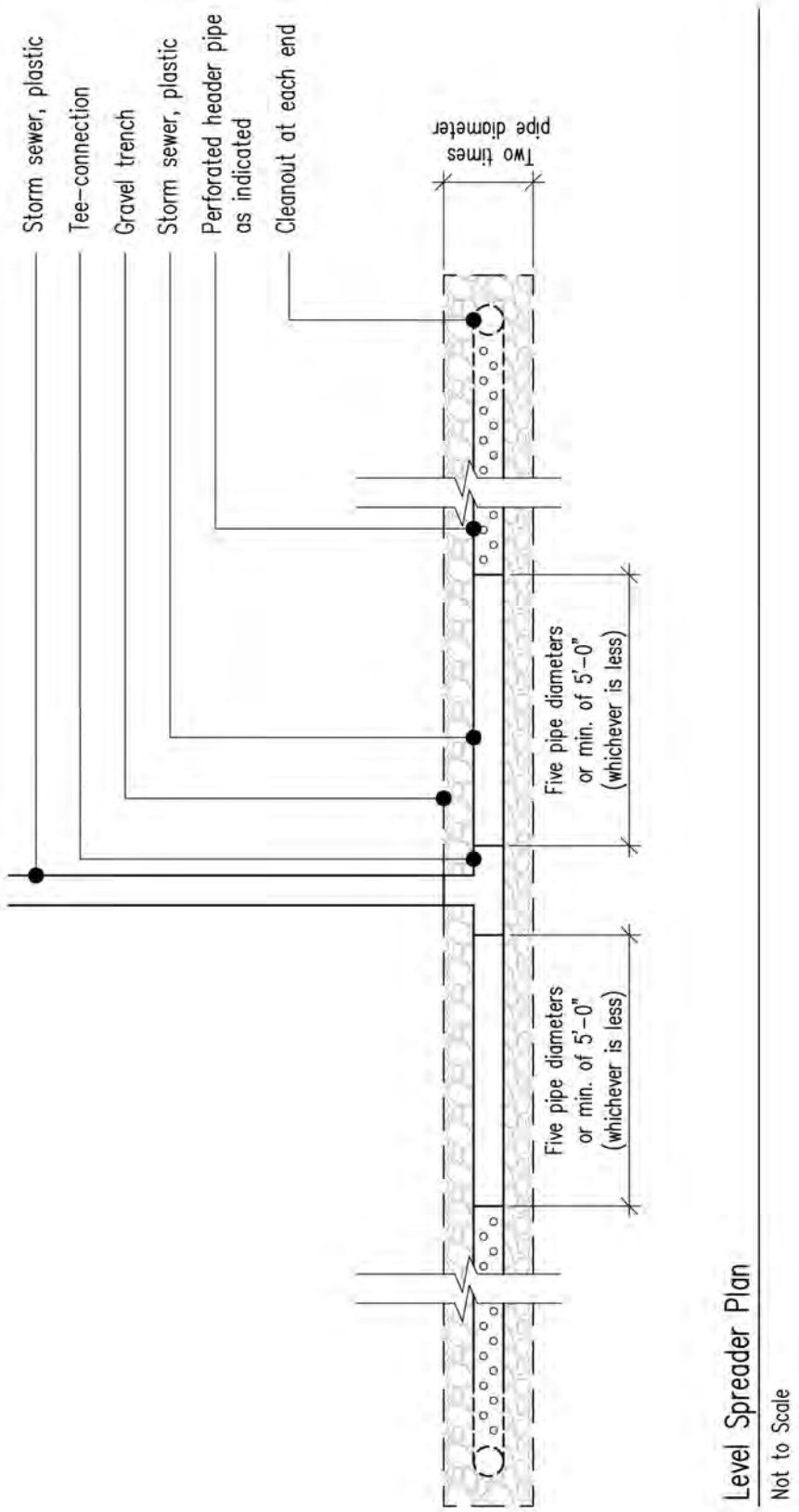


Figure 15 – Level spreader plan view

[1] Yu *et al.* (1992)
[2] Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Lowndes (2000)
[3] Lowndes (2000)
[4] Price *et al.* (1998)
[5] Horner (1993); NRCS-II (2001); Los Angeles County Department of Public Works (2002)
[6] Price *et al.* (1998); NRCS-II (2001)
[7] Price *et al.* (1998)
[8] USDA (1994)
[9] Schueler *et al.* (1992); Price *et al.* (1998)
[10] Price *et al.* (1998); Lowndes (2000)
[11] Schueler (1987); NRCS-II (2001)
[12] Price *et al.* (1998)
[13] Price *et al.* (1994)
[14] Price *et al.* (1998)
[15] Price *et al.* (1998)
[16] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); NRCS-II (2001)
[17] USDA (1994)
[18] Schueler (1987)
[19] Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)
[20] Lowndes (2000)
[21] NRCS-II (2001)
[22] Minton (2005)
[23] Price *et al.* (1998)
[24] Price *et al.* (1998)
[25] Md DNR ((1984)
[26] Price *et al.* (1998)
[27] Price *et al.* (1998)
[28] NRCS-II (2001)
[29] NRCS-II (2001)
[30] Price *et al.* (1998)
[31] NRCS-II (2001)
[32] Price *et al.* (1998)
[33] Price *et al.* (1998)
[34] Price *et al.* (1998)
[35] Price *et al.* (1998)

Bicknell, B.R., Imhoff, J.C., Kittle Jr., J.L., Donigian Jr., A.S., and R.C. Johnson (1993), Hydrologic Simulation Program - Fortran (HSPF): Users Manual for Release 10.0. Aqua Terra Consultants and University of the Pacific, for Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency and Office of Surface Water, U.S. Geological Survey. September 1993.

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§ T1606 Naturalized Stormwater Basins

§ T1606(a) Definition

Naturalized stormwater basins, for purposes of this technical manual, are wet detention basins or constructed wetland systems designed to provide greater water quality and habitat benefits relative to standard detention basin designs. Naturalized stormwater basins incorporate native vegetation on shallow emergent shelves as well as the side slopes of the basin. Appropriate native vegetation used within a naturalized basin can tolerate inundation and modest water level fluctuations, has deeper root systems to better stabilize side slopes, and typically deters usage of upland areas by geese.

Two basic naturalized basin designs will be discussed: wet basins that consist primarily of open water with shallow emergent wetland shelves around the perimeter of the open water habitat; and constructed wetland systems that consist of a shallow marsh habitat. Naturalized stormwater basins can also be designed as variations on these two basic designs (e.g., open water interspersed with shallow emergent marsh, combination of pond and shallow marsh habitat as separate zones, etc.).

Naturalized stormwater basins can and should be combined with other BMP's in this guidance manual, such as rain gardens, infiltration trenches, and filter strips as pretreatment measures to reduce sediment loads and water level fluctuations within the basin. Level spreaders and filter strips can also be located downstream of the naturalized basin to deconcentrate runoff prior to discharge to a stream or wetland buffer.

§ T1606(b) Suitable Applications

Stormwater detention basins have been used for stormwater management for decades in Kane County and Northeastern Illinois. Naturalized stormwater basins are essentially just a variation on the basic detention basin. As such, naturalized basins can be applied virtually anywhere that standard basins can be applied. When drainage areas are small, it may be difficult to maintain permanent water and therefore the vegetation may need to be adjusted for small drainage areas and/or for more permeable soils. Since on-stream detention basins are generally not allowed per the Kane County Stormwater Ordinance, this will tend to limit the maximum drainage area to detention basins.

Naturalized stormwater basins are appropriate for residential, commercial and mixed-use developments. The naturalized aspect of these basins is most suitable for an overall landscape plan that is less formal. However, due to their relatively large size, naturalized basins are often located within more formalized landscape plans as well.

§ T1606(c) Benefits

Enhancement of vegetation diversity and wildlife habitat in urban settings[1].

Increased pollutant removal efficiencies due to settling of particulate pollutants and biological uptake by wetland plants[2]; wet basins are better able to prevent settled pollutants from resuspending and washing out of the basin during subsequent storms[3].

Downstream environmental benefits include improved water quality, attenuation of runoff rates, and prevention of increased downstream flooding associated with development.

Improved aesthetics; can provide value to community open space.

Passive recreation opportunities.

Relatively low maintenance costs.

§ T1606(d) Limitations

Large land area requirement for generally single purpose facility (stormwater management).

Can be expensive when land costs are considered since detention basins are not as readily integrated into site plans as other BMPs such as permeable paving, rain gardens, and infiltration trenches that typically do not displace developable land.

Pollutant removal efficiencies are limited until vegetation is established[4].

Less pollutant removal/assimilation during non-growing season[5].

Potential habitation by undesirable vegetative species if pollutant load and water level fluctuations are not controlled[6].

Naturalized stormwater basins and other urban stormwater BMPs are typically not intended to address runoff with very high sediment concentrations, such as construction sites, agricultural fields or plant nurseries. However, sediment basins used to address construction site runoff can often be converted to naturalized stormwater basins once the site is stabilized.

Naturalized stormwater basins are not a substitute for adequate source controls on manufacturing, industrial, refueling, and other sites where toxic and other pollutants are used or stored.

Per the Kane County Stormwater Ordinance, naturalized stormwater basins should not be constructed within natural wetland systems or constructed as on-stream facilities.

§ T1606(e) Required Design Data

§ T1606(e)(1) Soil type:

Determine on-site soils within area proposed for naturalized stormwater basin. If soils are relatively permeable or well drained, such as soil types A and B, it may be difficult to maintain a permanent pool. Usage of a clay liner or adequate compaction of bottom soils may be necessary[7]. A preferred option may be to construct the detention basin as a combined retention and detention facility that infiltrates a portion of the runoff and releases the remaining runoff (see also Section § T1603).

§ T1606(e)(2) Contributing drainage area:

The contributing drainage area and level of imperviousness will determine size requirements to meet the Kane County allowable release rate of 0.1 cfs/acre. The drainage area will also partially determine the ability to maintain a permanent pool of water.

§ T1606(e)(3) Placement of naturalized stormwater basin in landscape:

If a naturalized stormwater basin is to be located in close proximity to a natural wetland, a hydrologic evaluation of the existing wetland system should be performed to ensure that placement of the naturalized stormwater basin will not significantly increase or decrease the water balance of the natural wetland.

§ T1606(f) Naturalized Stormwater Basin Design

As previously mentioned, a naturalized stormwater basin can have many variations to its design. The primary features or characteristics that all naturalized basins should include are:

some type of settling feature that also dissipates the energy of incoming flows, such as a forebay, settling basin, or open water area;

slopes (above and below water) that are more gradual than standard detention basins to create greater habitat opportunities;

pool depths that encourage particulate pollutant removal and prevent resuspension;

pool depths that vary to provide a range of habitat opportunities;

native vegetation that is tolerant of the designed hydrologic conditions (depth and duration).

These primary naturalized stormwater basin design features, as well as other design considerations, are further discussed in the following sections.

§ T1606(f)(1) Site selection:

Naturalized stormwater basins should not be located within existing wetland habitat nor negatively affect the hydrologic regime of an existing wetland. Wetland basins should also not be located on-stream such that they cause impoundment of flowing water and change the basic character of the stream habitat.

If a permanent pool is to be maintained, the drainage area should be sufficient to support the pool against evaporation and infiltration losses. Wet detention basins can be lined to prevent infiltration, if necessary.

§ T1606(f)(2) Release rate:

The design release rate should meet the local criteria and requirements for flood prevention. In most of Kane County, the maximum allowable release rate for the 100-year design event is 0.10 cfs/acre.

§ T1606(f)(3) Storage volume:

Sizing of the naturalized stormwater basin to meet the release rate requirements should follow standard detention design techniques as outlined in S T203(c), (e.g. TR55, TR20, HEC-1, etc.).

§ T1606(f)(4) Water level fluctuation and flow velocity:

Although the Kane County Stormwater Ordinance places no restriction on the amount of water level fluctuation within detention basins, it is recommended that stormwater basins be designed with a 100-year stage less than 4-feet above the normal water level (NWL) and 2-year stage less than 2-feet above NWL.

It is also recommended that the 0.75-inch Kane County Ordinance runoff retention standard be located upstream of the detention facility, distributed throughout the watershed via rain gardens, porous pavement, infiltration trenches, etc. If it is necessary to incorporate the 0.75-inch runoff volume within the detention facility, the water level fluctuation within the retention zone should be designed to be 6-inches or less. Water fluctuations that are greater than these may result in poor vegetation establishment and/or persistence and low vegetation and habitat diversity.

The flow velocity through a shallow constructed wetland marsh system can be high at the beginning of the event before there is a pool of water to slow the flow. Flow velocities through a shallow marsh should not exceed 1.5 ft/s, and, ideally, should be 0.6 ft/s or less during the beginning portion of the event before the basin begins to significantly fill[8]. High velocities can stress and potentially dislodge rooted vegetation and scour previously deposited sediments.

§ T1606(f)(5) Pretreatment/energy dissipation:

Pre-treatment and/or energy dissipation should be provided at all concentrated discharges to detention basins. An open water forebay provides both energy dissipation and provides an opportunity for settling of the heaviest sediment in an easily maintainable location. A separate forebay is not necessary for a wet basin. However, to concentrate the settled material within one area for ease of clean out, an underwater berm may be constructed to create a "forebay" near the inlet. Constructed wetland systems that consist only of shallow marsh, however, will require a forebay to prevent scour at the inlet and to minimize disturbance of established vegetation during dredging of accumulated sediments. The forebay should be designed following recommendations for settling basins. The NIPC recommendations state that the forebay should be designed with both active storage and a permanent pool. The permanent pool volume should include both treatment volume and sediment storage[9]. In general, the forebay should have the following features:

Inlet stabilization, such as rip rap, to prevent scour.

Length to width ratio that provides a flow path length of at least two to three times the width of the forebay.

Side slopes from 6-inches below the NWL to 6-inches above NWL should be 5:1 or flatter to facilitate the establishment of emergent vegetation. Side slopes below this zone should be no greater than 4:1 to prevent potential slope failure and improve safety.

The forebay should be located for easy access by sediment removal equipment.

The permanent pool volume within the forebay should be sized for treatment as well as sediment storage.

The treatment volume should be a minimum 500 cubic feet/impervious acre.

The sediment storage volume should be a minimum 100 cubic feet/impervious acre. For a stabilized watershed, this should provide for approximately 10-years of sediment storage.

The forebay should be designed with a minimum depth of 3-feet to prevent resuspension of sediments.

To distribute discharge from the forebay, a 1-foot high berm of rip rap should be installed between the forebay and the constructed wetland to create a small amount of active storage. The low berm will prevent scour and act as a level spreader (see also Section § T1605).

§ T1606(f)(6) Basin/marsh depths (below normal water level):

The basin/marsh permanent pool depth can vary based on the desired appearance of the stormwater facility. In general, a basin with permanent pool depths of 2- to 3-foot may be populated by rooted aquatic vegetation. Deeper open water design with greater than 6-foot depths will deter establishment of rooted aquatics and will tend to

provide less structure for aquatic habitat. A mixture of emergent, rooted aquatic, and open water zones will provide the greatest habitat and visual diversity.

§ T1606(f)(7) Naturalized stormwater basin configuration:

To minimize short circuiting between the basin inlet(s) and outlet, the basin inflow point(s) should be as far from the outlet structure as possible and the configuration of the naturalized stormwater basin should provide a flow path at least 3 times longer than the average basin width. This can be accomplished by a basin length to width ratio of 3:1, and/or through the addition of design features such as shallow berms. This will ensure that inflow runoff is distributed throughout the basin and there are no stagnant zones. For example, wet basins may include underwater berms that can be designed as emergent shelves and positioned to increase the flow path length. In addition to preventing short circuiting, these emergent shelves can provide habitat opportunities. Increasing emergent shelf area also increases runoff water/soil substrate contact area, improving water quality.

§ T1606(f)(8) Slopes:

The side slopes at the shoreline, from 0.5- to 1.0-foot above to 1.0-foot below NWL, should be no steeper than 10:1. The flatter the slope is graded, the greater the potential for vegetation establishment and habitat opportunities. The side slopes above the shoreline should be 5:1 to facilitate establishment of native vegetation, prevent slumping during drawdown, improve safety, and improve maintainability (e.g. mow management along slope during early stages of plant establishment). Where space is constrained or due to site topography, a 3:1 side slope above the shoreline may be used. At no time should the side slope be designed with a slope steeper than 3:1.

§ T1606(f)(9) Vegetation selection and planting:

Native vegetation should be integrated into the design as much as possible. Certain conditions or situations may warrant use of non-native species, which is discussed in further detail later in this section. Selection of vegetation should consider hydroperiod and light conditions, with preference given to species that are adaptable to the broadest ranges of depth, frequency, duration of ponding, and at least moderate tolerance to nutrient loads[10]. Where possible, water level fluctuation should be controlled to minimize excessive inundation during the first growing season, particularly after seed installation[11]. This may be accomplished by delaying the installation of the restrictor until the seeded material has established through a growing season. Delayed installation of the restrictor will require coordination with construction schedules related to installation of impervious cover and may need approval by the regulatory body.

Generally, three to four planting zones can be created based on slope, NWL, and anticipated water level fluctuations. The following tables illustrate water depth planting zones. The given elevation ranges are generalized; the actual design

elevation ranges should consider the proposed water fluctuations for the specific stormwater facility, in particular, the 2-year stage elevation. It is not uncommon to have some species overlap between zones as they sort out to those areas that provide their optimal growing conditions. And as previously discussed, gradual slopes will provide more microclimate conditions that will favor vegetation establishment and a diversity of vegetation habitats. Given the typically unnatural conditions of a stormwater facility, it is recommended to limit plant species to those that are known to grow in such conditions, are native to Kane County, and are considered less conservative (i.e. those species with a coefficient of conservatism (C value) of 5 or less as described in Plants of the Chicago Region. It is recommended to also refer to the Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois and Plants for Stormwater Design Species Selection for the Upper Midwest for selection of species and placement within the stormwater facility (see also References at the end of this Section).

Zone	Elevation Range
Submergent	3 – 6 feet below NWL
Deeper Emergent	NWL – 6-inches below NWL
Shallow Emergent	2” above NWL – 2” below NWL
Wetland Fringe	12” above NWL – NWL
Mesic Prairie	> 12” above NWL

Table 8 - General Planting Zones and Water Depth Elevation Ranges

Submergent Zone:

The following are two recommendations for planting within a submergent zone: Coontail (Ceratophyllum demersum) and Sago Pondweed (Potamogeton pectinatus). Other submergent species, however, may volunteer. Most of the available plant nursery species that are appropriate for a submergent zone are fairly conservative (C value ≥ 6) and may not be conducive to a stormwater facility environment.

Emergent Zone:

The following are recommendations for planting within an emergent zone. Some species are tolerant of deeper water conditions, e.g., 6-12 inches below NWL; these have been identified in the Deeper Emergent category. Although most of these identified species will tolerate deeper water depths than indicated, these emergent species generally should be planted in water depths no greater than 6-inches. As they become established, many will migrate into deeper water depths. Other emergent species prefer shallower water depths, e.g., 2- to 3-inches to mudflat conditions; these species have been identified in the Shallow Emergent category.

Those portions of the emergent zone that are below the NWL should be plugged rather than seeded. The shallow emergent zone above the NWL can be plugged and/or seeded and protected with an erosion blanket. Plugging rates may vary depending on budget constraints. The minimum installation rate should be approximately 2-foot on centers. Some species, however, have a slow rate of spread and therefore should be planted at a higher frequency rate. The following table provides several recommended species for the emergent planting zones.

Typical Planting Zone Water Depths	Scientific Name	Common Name
Deeper Emergent: NWL – 6-inches below nwl	Polygonium amphibium	Marsh Smartweed
	Sagittaria latifolia	Common Arrowhead
	Scirpus fluviatilis	River Bulrush
	Scirpus validus creber	Great Bulrush
Other species that can tolerate this water depth, but are less tolerant of nutrient and/or siltation loads and considered more conservative (C value ≥ 6)	Acorus calamus	Sweet Flag
	Carex lacustris	Common Lake Sedge
	Pontederia cordata	Pickerel Weed
	Scirpus acutus	Hard-stem Bulrush
	Sparganium eurycarpum	Common Bur Reed
Typical Planting Zone	Scientific Name	Common Name

Water Depths		
Shallow Emergent: 2" above NWL – 2" below NWL	Alisma subcordatum	Common Water Plantain
	Bidens cernua	Nodding Bur Marigold
	Carex hystericina	Porcupine Sedge
	Carex pellita	Wooly Sedge
	Carex stricta	Tussock Sedge
	Carex vulpinoidea	Brown Fox Sedge
	Eleocharis obtusa	Blunt Spike Rush
	Iris virginica shrevei	Blue Flag
	Scirpus atrovirens	Dark Green Rush
	Scirpus pungens	Chairmaker's Rush
	Spartina pectinata	Prairie Cord Grass
Other species that can tolerate this water depth, but are less tolerant of nutrient and/or siltation loads and are considered more conservative (C value ≥ 6)	Acorus calamus	Sweet Flag
	Calamagrostis canadensis	Blue Joint Grass
	Carex comosa	Bristly Sedge
	Eupatorium maculatum	Spotted Joe Pye Weed
	Glyceria striata	Fowl Manna Grass
	Juncus effusus	Common Rush

Table 9 - Recommended Species for Emergent Planting Zones

Wetland Fringe Zone:

The wetland fringe zone can be installed as a combination of plug and seed material. This zone should be seeded with a cover crop and protected with an erosion blanket. Table 3 provides a list of recommended species for the wetland fringe zone. The specific species identified to be installed within this zone as well as the elevation of the zone will depend on the proposed water fluctuations for the designed stormwater facility. A variety of species that are tolerant of periodic wetness as well as mesic conditions should usually be considered for this fringe zone. If, however, the designed slope for the wetland fringe zone is too steep (3:1 or more), and/or the proposed water fluctuation for the 2-year storm event is greater than 2-feet, an alternative planting scheme may be necessary. Designed planting plans, for these conditions or others that pose severe growing conditions, should focus on usage of a few species that may grow under these constraints. An example would be to seed Creeping Bent as the dominant species within a wetland fringe zone, along with typical annual species, such as Bidens, Rice Cut Grass, and

other species typically found along mudflats or eroded slope habitats such as Common Water Horehound, Spike rushes, etc.

Typical Planting Zone Water Depths	Scientific Name	Common Name
Wetland Fringe: 12” above NWL - NWL	Actinomeris alternifolia	Wingstem
	Agrostis alba palustris	Creeping Bent
	Asclepias incarnata	Swamp Milkweed
	Aster novae-angliae	New England Aster
	Aster simplex	Panicled Aster
	Bidens cernua	Nodding Bur Marigold
	Carex cristatella	Crested Oval Sedge
	Carex stipata	Common Fox Sedge
	Elymus virginicus	Virginia Wild Rye
	Eupatorium perfoliatum	Common Boneset
	Helenium autumnale	Sneezeweed
	Helianthus grosseserratus	Sawtooth Sunflower
	Juncus dudleyi	Dudley’s Rush
	Juncus torreyi	Torrey Rush
	Leersia oryzoides	Rice Cut Grass
	Lycopus americanus	Common Water Horehound
	Penthorum sedoides	Ditch Stonecrop
	Rudbeckia laciniata	Wild Golden Glow
	Silphium perfoliatum	Cup Plant
	Spartina pectinata	Prairie Cord Grass
	Thalictrum dasycarpum	Tall Meadow Rue
	Verbena hastata	Blue Vervain
	Vernonia fasciculata	Ironweed

Typical Planting Zone Water Depths	Scientific Name	Common Name

Other species that can tolerate this water depth, but less tolerant of nutrient and/or siltation loads and are considered more conservative species (C value ≥ 6)	Calamagrostis canadensis	Blue Joint Grass
	Liatris pycnostachya	Prairie Blazing Star
	Liatris spicata	Marsh Blazing Star
	Lobelia siphilitica	Great Blue Lobelia
	Lythrum alatum	Winged Loosestrife
	Mimulus ringens	Monkey Flower
	Panicum virgatum	Switch Grass
	Physostegia virginiana	Obedient Plant
	Pycnanthemum virginianum	Common Mountain Mint
	Rudbeckia subtomentosa	Sweet Black-eyed Susan
	Scirpus cyperinus	Wool Grass
	Scirpus pendulus	Red Bulrush
	Solidago graminifolia	Grass-leaved Goldenrod
	Solidago riddellii	Riddell's Goldenrod
	Veronicastrum virginicum	Culver's Root
	Zizia aurea	Golden Alexanders

Table 10 - Recommended Species for Wetland Fringe Planting Zone

Mesic Prairie Zone:

A prairie zone should be established for the remaining slope of the naturalized stormwater basin. The prairie zone will provide additional habitat value, as well as stabilization and filtration functions. The prairie area should also be established using native vegetation. Typically, a mesic prairie seed mix is used for this zone as is provided below in Table 11. The mesic prairie zone should be seeded at rates standard for the native landscape industry – usually, grasses seeded at 8- to 10-pounds per acre, forbs seeded at 2- to 3-pounds per acre. Applicable cover crop rates should be used based on whether it is installed during the growing season or as a dormant seed installation.

Mesic Prairie	Scientific Name	Common Name
>12" above NWL	Andropogon gerardii	Big Bluestem Grass
	Andropogon scoparius	Little Bluestem Grass
	Aster azureus	Sky-blue Aster
	Aster laevis	Smooth Blue Aster
	Aster novae-angliae	New England Aster
	Astragalus canadensis	Canada Milk Vetch
	Baptisia leucantha	White Wild Indigo
	Bouteloua curtipendula	Side-oats Grama
	Coreopsis palmata	Prairie Coreopsis
	Desmodium canadense	Showy Tick Trefoil
	Echinacea purpurea	Broad-leaved Purple Coneflower
	Elymus canadensis	Canada Wild Rye
	Heliopsis helianthoides	False Sunflower
	Lespedeza capitata	Round-headed Bush Clover
	Monarda fistulosa	Wild Bergamot
	Panicum virgatum	Switch Grass
	Parthenium integrifolium	Wild Quinine
	Penstemon digitalis	Foxglove Beard Tongue
	Petalostemum purpureum	Purple Prairie Clover
	Ratibida pinnata	Yellow Coneflower
	Rudbeckia hirta	Black-eyed Susan
	Silphium integrifolium deamii	Deam's Rosin Weed
	Silphium laciniatum	Compass Plant
	Silphium terebinthinaceum	Prairie Dock
	Solidago rigida	Stiff Goldenrod
	Sorghastrum nutans	Indian Grass
	Veronicastrum virginicum	Culver's Root
	Zizia aurea	Golden Alexanders

Table 11 - Recommended Species for Mesic Prairie Planting Zone

Burn/No Burn Management:

The vegetation recommendations above are predicated on the assumption that the area will be maintained via burn management as the primary long-term maintenance activity. If burn management is not or cannot be used, the planting palette should be modified to incorporate a matrix of species that will provide better slope stabilization than standard turf grass but will persist in the absence of fire. The following table provides a list of species that may be used for the planting zones above NWL.

Typical Planting Zone Water Depths	Scientific Name	Common Name
2-yr Stage Elevation – NWL:	Agrostis alba palustris	Creeping Bent
Above 2-yr Stage Elevation: Meadow Mix	Dactylis glomerata	Orchard Grass
	Festuca rubra	Red Fescue
	Lolium perenne	Perennial Rye Grass
	Phleum pratense	Timothy Grass
	Poa pratensis	Kentucky Blue Grass
	Trifolium pratense	Red Clover
	Trifolium repens	White Clover

Table 12 - Recommended Species When Burn Management Will NOT Be Used

The emergent zone should be planted with the hardiest of species – River Bulrush, Great Bulrush, etc. The area may revert to cattails over time.

§ T1606(f)(10) Outlet control structure and outlet protection:

There are various outlet control structures that may be used. A submerged orifice outlet located within a wet basin or, for a constructed wetland within a permanent pool, will provide clog protection, an important issue that must be considered in the design. A permanent pool or micropool at the outlet should be at least 4-feet deep[12]. A deeper micropool at the outlet may provide for cooler water discharges that may help to alleviate downstream impacts to temperature sensitive aquatic life[13]. The restrictor, which controls the flow rate, should be located at least 1-foot below the NWL.

The outlet pipe that controls the NWL, should be set above the normal groundwater table elevation to prevent continuous flow through the naturalized stormwater basin. Continuous flow through the basin significantly reduces the residence time and pollutant removal performance[14].

Outlet protection must be provided for detention discharges to prevent scour. Discharges from a basin that are directed to a stream, lake, or wetland should be directed to the buffer adjacent to the water body rather than to the water body itself[15]. The discharge to the buffer must be distributed and the velocity dissipated using a level spreader (see Section § T1605) or other BMP's (Section § T1603(f)(6)).

§ T1606(f)(11) Maintenance access:

Maintenance access to the forebay, safety shelf (if applicable), and outflow structure should be provided. Any access routes located on top of berms used to impound the detention volume must be designed and constructed to carry the load associated with maintenance equipment (e.g. small backhoe and dump truck).

§ T1606(g) Construction Considerations

Soil Preparation:

Topsoil should be stripped and stockpiled prior to grading. If invasive species or weed seed are expected to be an issue, the top 2-inches of surface soil should be removed/scrapped to remove primary weed seed source prior to stripping of topsoil. The topsoil should be a silt loam based on the U.S.D.A. classification system; uniformly obtained from the A-horizon of the soil profile without admixture of subsoil.

Soil compaction should be kept to a minimum within the areas to be planted. If soil compaction occurs or if the soils have a high clay content, the area(s) should be deep disked prior to placement of topsoil.

Stockpiling of topsoil should be kept to a minimum. The longer topsoil is stockpiled, the greater the loss of organic carbon, which is needed for soil fertility and friability. Topsoil should contain 6-10% organic content. At the time of placement, topsoil should be tested for organic content and amended with additional organic matter if the content is less than 6%. The loss of organic carbon will diminish the quality of the topsoil as a growing medium and will affect its ability to absorb runoff.

Topsoil should be spread to a minimum thickness of 6-inches over the entire area to be planted. The topsoil should be blended with the top 2-inches of subsoil to avoid creation of a potential root barrier and to prevent potential slope failure due to slippage at the subsoil/topsoil interface.

Timing of Planting/Seeding:

To provide optimal growing conditions and allow the roots to become established prior to warmer and drier conditions, live plantings should be installed in spring prior to June 1st. Planting can occur later, until August 1st, if provisions are made for adequate watering to ensure plant and root establishment.

Seeding may occur in spring, March 1st (or when the soil thaws) through May 31st. Many of the native seeds require moist, cool conditions for germination, which is generally the condition during this time period. A late fall/winter dormant seeding, however, may also be done. A dormant seeding should not occur prior to November 1st, but prior to frozen ground or snow cover conditions. A dormant seeding is more appropriate for those portions of the naturalized stormwater basin that are unlikely to flood and flush the seed from the basin[16].

Erosion and sedimentation control:

Immediately following seed installation of the wetland fringe and mesic prairie zones, a biodegradable erosion blanket should be installed. It is recommended that a double net erosion blanket with a 100% straw matrix, (e.g. North American Green (NAG) S150 or equivalent) be used from the NWL up to the 2-year stage elevation. A single net erosion blanket with a 100% straw matrix (e.g. NAG S75 or equivalent) may be used from the 2-year stage elevation up to the top of slope. Clean straw mulch applied at a 2000 lbs/acre rate and crimped in place may be used instead of an erosion blanket above the 2-year stage elevation. The usage of an erosion blanket or straw mulch has been noted to have benefits that typically outweigh the additional cost factor. These benefits include increased slope stabilization until vegetation is established, seed protection, and enhancement of seedling development.

Predation protection:

Most newly planted areas will need some type of predation protection. Various herbivore predation protection methods are readily available and should be incorporated into the design.

§ T1606(h) Operation and Maintenance

Annual inspections:

The naturalized stormwater basin should be inspected, at a minimum, twice a year for the first three years after construction, and once a year thereafter. The following items should be noted during each inspection:

Presence of erosion rills and gullies, as well as sedimentation deposits.

Sediment accumulation within forebay. When the portion of the forebay volume allocated to sediment accumulation is full (typically corresponds to a sediment depth of approximately one foot), removal of sediment is necessary.

Vegetation species distribution/survival that includes dominant plant species; presence of installed species within the intended zones and if their aerial coverage has increased; what volunteer species have established and are they considered invasive; and what percent of the naturalized stormwater basin remains unvegetated, excluding designed open water areas.

Determine if the depth zones and microtopographic features are still persistent[17].

Inspect the condition of outlet structure – removal of debris or trash that may cause blockages.

From these inspections, various activities may be warranted such as erosion repair through various stabilization methods, clean out debris and trash that may clog the outlet structure, vegetation management of invasive species, removal of accumulated sediments, repair herbivore predation exclosures, etc.

Accumulated sediment removal:

The frequency of removal of accumulated sediments will depend on the adequacy of soil erosion and sediment control during construction and on the presence of BMP's within the upstream watershed[18]. If adequate controls are present, sediment removal may not be necessary for 10 years or longer depending upon the designed sediment storage volume. Sediments should be tested prior to removal to determine the appropriate method of disposal.

Vegetation maintenance:

Native vegetation maintenance should include mow management for the first 2 growing seasons following installation. Mowing should be limited to that portion of the side slope that is less frequently inundated. Mowing frequency and blade height should be adjusted to optimize control of annual and biennial weeds and minimize impact to native perennial species. Generally, mowing for the first full growing season after installation should begin early May and continue through the growing season at approximately 4- to 6-week intervals. The blade height should generally be set at 6- to 8-inches above the ground.

A non-native meadow installation should also be mowed the first growing season following installation at the frequency and blade height specified for the native vegetation. Beginning the second growing season, however, a meadow area should only be mowed once a year after approximately July 15th to a height of 4- to 6-inches.

Other weed control methods, including spot herbicide treatment and hand weeding, should be employed as necessary to control invasive species. Herbicide treatment should only be performed by a licensed applicator.

Burn management should be implemented as a maintenance activity generally after the third full growing season or as soon as an adequate fuel source is present. Burn management should be used as the primary maintenance activity for the long-term care of the naturalized stormwater basin. Although there are varying opinions as to the recommended frequency of a burn, annual burning will typically remove trash and burnable debris within the facility and reduce the intensity of the fire (potentially less damaging) relative to burns conducted every three to four years (minimum frequency).

Reinforcement plantings:

Reinforcement plantings should be planned and budgeted for implementation after the second or third growing season. Regardless of the care taken during the early stages of development, it is likely that various portions of the initial plantings will not survive. This may be caused by various factors such as predation, drought, various changes in water levels, or other unforeseen factors[19]. The selection of the reinforcement species should be based on information obtained during the site inspections. Species should include those that have persisted and increased in aerial coverage.

§ T1606(i) Easement

The Kane County Stormwater Ordinance requires that stormwater features (such as naturalized stormwater basins) be protected by an easement. All naturalized stormwater basin areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If naturalized stormwater basins are not part of the permitted stormwater management system, such as those installed by a homeowner on his or her own accord, they are exempt from the easement requirement.

§ T1606(j) Typical Detail

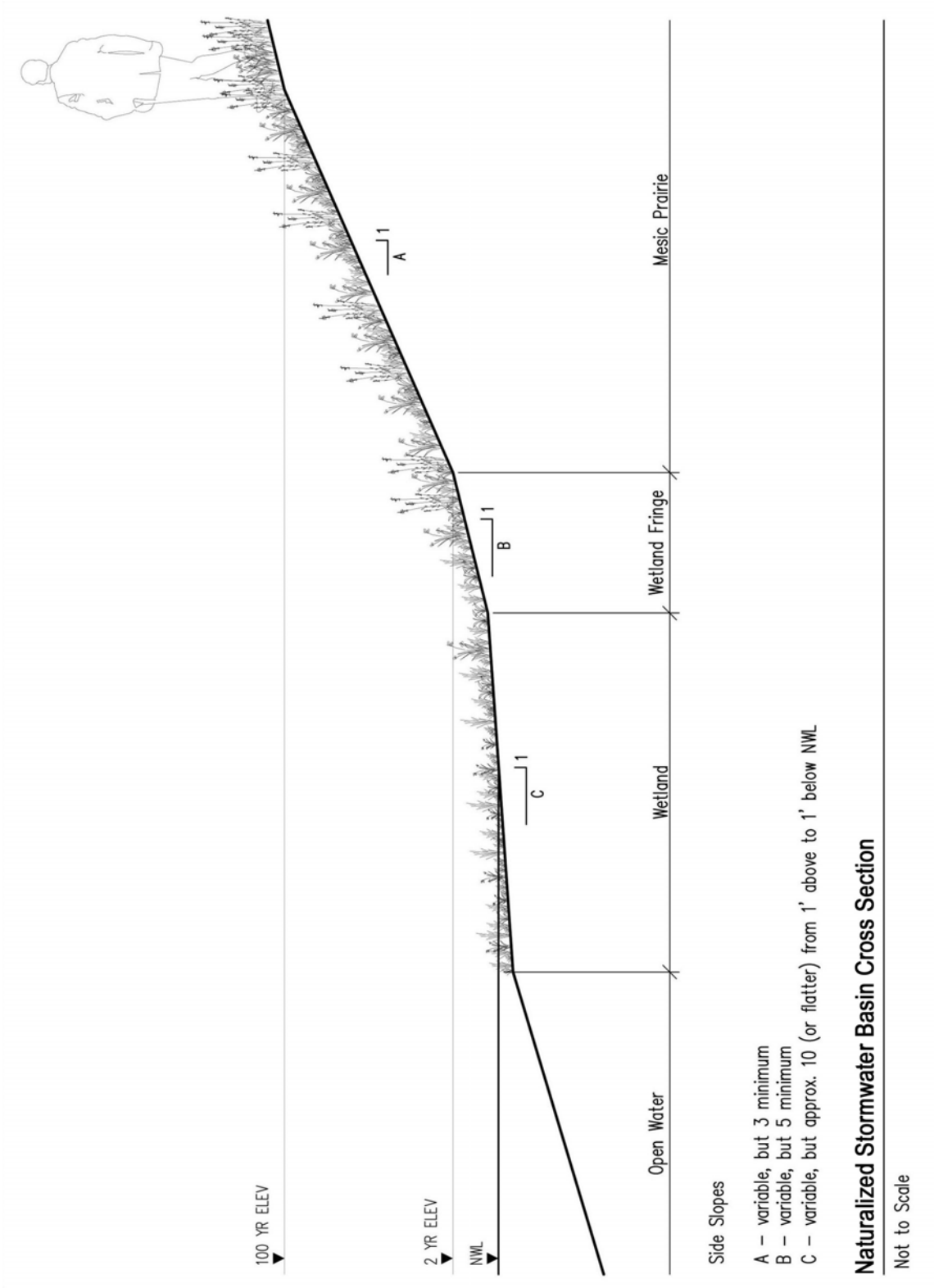


Figure 16 – Naturalized Stormwater Basin Cross Section

[1] Barr Engineering Company (2001)
[2] MA Department of Environmental Protection (1997); Barr Engineering Company (2001); Schueler (1992)
[3] NIPC (2000)
[4] MA Department of Environmental Protection (1997); Barr Engineering Company (2001); Schueler (1992)
[5] EPA (1999)
[6] EPA (1999)
[7] MA Department of Environmental Protection (1997); NIPC (2000)
[8] Soil & Water Conservation Society of Metro Halifax (2004)
[9] NIPC (2000)
[10] MA Department of Environmental Protection (1997); Barr Engineering Company (2001)
[11] NIPC (2000)
[12] Barr Engineering Company (2001)
[13] EPA (1999)
[14] NIPC (2000)
[15] NIPC (2000)
[16] NIPC (2000)
[17] Schueler (1992)
[18] NIPC (2000)
[19] Schueler (1992)

Barr Engineering Company (2001), Minnesota Urban Small Sites BMP Manual Stormwater Best Management Practices for Cold Climates, Metropolitan Council Environmental Services.
EPA (1999) Storm Water Technology Fact Sheet Storm Water Wetlands.
MA Department of Environmental Protection (1997), Stormwater Management, Volume Two: Stormwater Technical Handbook.
Northeastern Illinois Planning Commission (2000) Urban Stormwater Best Management Practices for Northeastern Illinois.
Schueler, T.R. (1992), Design of Stormwater Wetland Systems, Anacostia Research Team, Department of Environmental Programs, Metropolitan Washington Council of Governments, Washington, D.C.
Soil & Water Conservation Society of Metro Halifax (2004), Stormwater Treatment.

Appendix A – Falling Head Percolation Test Procedure[127]

Number and Location of Tests

Commonly a minimum of three percolation tests are performed within the area proposed for an absorption system. They are spaced uniformly throughout the area. If soil conditions are highly variable, more tests may be required.

Preparation of Test Hole

The diameter of each test hole is 6-inches, dug or bored to the proposed depths at the infiltration systems or to the most limiting soil horizon. To expose a natural soil surface, the sides of the hole are scratched with a sharp pointed instrument and the loose material is removed from the bottom of the test hole. Two-inches of ½- to ¾-inch gravel are placed in the hole to protect the bottom for scouring action when the water is added.

Soaking Period

The hole is carefully filled with at least 12-inches of clear water. This depth of water should be maintained for at least 4-hours and preferably overnight if clay soils are present. A funnel with and attached hose or similar device may be used to prevent water from washing down the sides of the hole. Automatic siphons of float valves may be employed to automatically maintain the water level during the soaking period. It is extremely important that the soil be allowed to soak for a sufficiently long period of time to allow the soil to swell if accurate results are to be obtained.

In sandy soils with little or no clay, soaking is not necessary. If, after filling the hole twice with 12-inches of water, the water seeps completely away in less than 10-minutes, the test can proceed immediately.

Measurement of the Percolation Rate

Except for sandy soils, percolation rate measurements are made 15-hours but not more than 30-hours after the soaking period began. Any soil that sloughed into the hole during the soaking period is removed and the water level is adjusted to 6-inches above the gravel (or 8-inches above the bottom of the hole). At no time during the test is the water level allowed to rise more than 6-inches above the gravel.

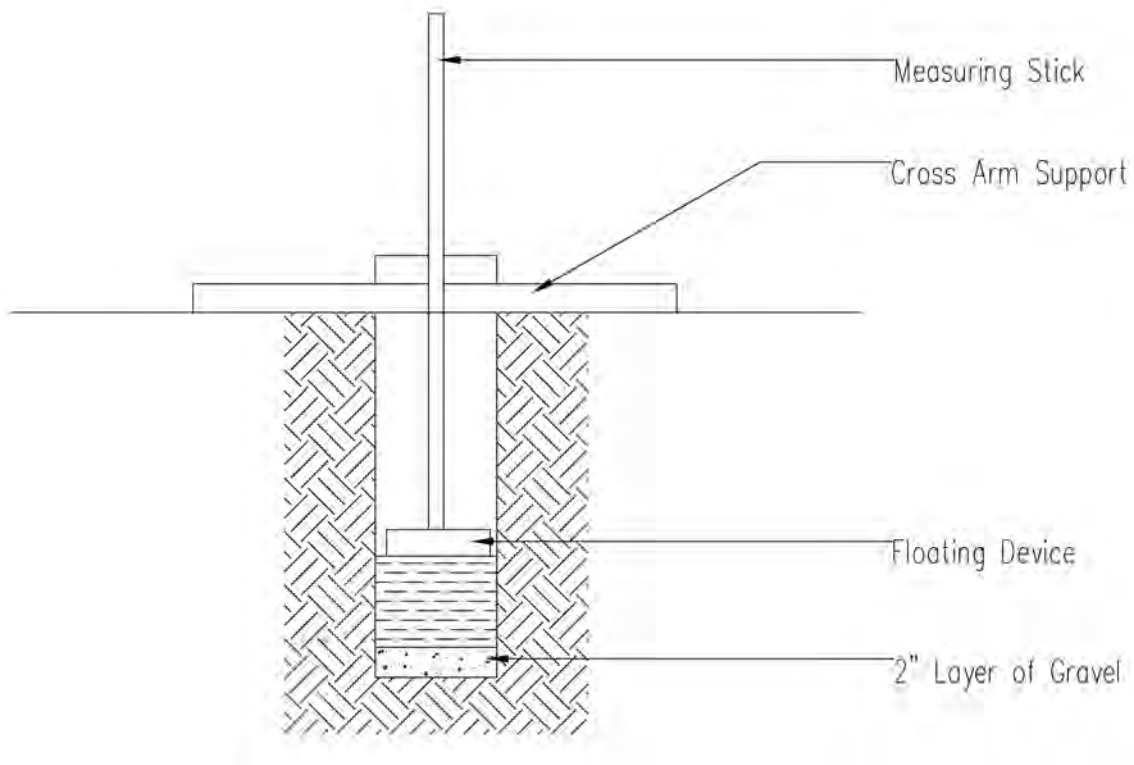
After each measurement, the water level is readjusted to the 6-inches level. The last water level drop is used to calculate the percolation rate.

In sandy soils or soils in which the first 6-inches of water added after the soaking period seep away in less than 30-minutes, water level measurements are made at 10-minute intervals for a 1-hour period. The last water level drop is used to calculate the percolation rate.

Calculation of the Percolation Rate

The percolation rate is calculated for each test hole by dividing the time interval used between measurements by the magnitude of the last water level drop. This calculation results in a percolation rate in terms of minutes/inch. To determine the percolation rate for the area, the rates obtained from each hole are averaged. (if tests in the area vary by more than 20-minutes/inch variations in soil type are indicated. Under these circumstances, percolation rates should not be averaged.)

Example: if the last measurement drop in water level after 30-minutes is 5/8-inch the percolation rate = (30-minutes)/(5/8-inch)= 48-minutes/inch.



[127] Design Manual – Onsite Wastewater Treatment and Disposal System, EPA, 1980

Percolation Test Data Form

Location:	
Test hole #:	

Depth to bottom of hole:		Diameter of hole:	

Depth, inches	Soil texture

Percolation test by:	
Date of test:	

Time	Time intervals, minutes	Measurement, inches	Drop in water level, inches	Percolation rate, minutes per inch	Remarks

Percolation rate =		minutes per inch

Appendix B – Species Guide

The following species may be included in a seed / plant list. Suggested seed rates may need to be adjusted based on the specific site conditions. Further more, each list will have to be modified based upon the specific site conditions and circumstances that are associated with a project. As a general rule of thumb, species with a C-Value (level of conservatism[128]) equal to or greater than 6 may be difficult to establish from seed and are generally more successfully introduced as live material (i.e. plugs). It is strongly recommended to develop a seed / plant list on a project-by-project basis and to consult a Landscape Architect, Botanist, or Ecologist knowledgeable on the specifics of selecting and establishing native vegetation in stormwater systems. The last column provides the designated wetland category for each species. The wetland category expresses each plant's preference of wetness (OBL) to dryness (UPL).

Species	Common Name	Seed Qty. Lbs/Acre	C-value	Wetland Category
COVER CROP				
Agrostis alba	Red Top	10.0		NA
Avena sativa	Seed Oats	20.0		NA
Lolium multiflorum	Annual Rye Grass	20.0		NA
TOTAL LBS/ACRE OF COVER CROP SEED		50.0		

Table 13 – Cover crop list

Species	Common Name	Seed Qty. Lbs/Acre	C-value	Wetland Category
GRASSES				
Andropogon gerardii	Big Bluestem Grass	1.0	5	FAC-
Andropogon scoparius	Little Bluestem Grass	2.0	5	FACU-
Bouteloua curtipendula	Side-oats Gramma	2.0	8	UPL
Carex bicknellii	Copper-shouldered Oval Sedge	plug	10	UPL
Carex pensylvanica	Common Oak Sedge	plug	5	UPL
Carex rosea	Curly-style Wood Sedge	plug	4	UPL
Carex sprengelii	Long-beaked Sedge	plug	9	FACU
Carex vulpinoidea	Brown Fox Sedge	0.25	2	OBL
Elymus canadensis	Canada Wild Rye	1.0	4	FAC-
Panicum virgatum	Switch Grass	1.0	5	FAC+

Sorghastrum nutans	Indian Grass	1.0	5	FACU+
TOTAL LBS/ACRE OF GRASS SEED		8.0		

Table 14 – Grass and sedge list

Species	Common Name	Seed Qty. Oz/Acre	C-value	Wetland Category
FORBS				
Allium cernuum	Nodding Wild Onion	2.0	7	FAC-
Aster ericoides	Heath Aster	1.0	5	FACU-
Aster laevis	Smooth Blue Aster	2.0	9	UPL
Aster novae-angliae	New England Aster	2.0	4	FACW
Astragalus canadensis	Canada Milk Vetch	2.0	10	UPL
Coreopsis lanceolata	Sand Coreopsis	3.0	5	FACU
Desmodium canadense	Showy Tick Trefoil	2.0	4	FAC-
Echinacea pallida	Pale Purple Coneflower	3.0	8	UPL
Echinacea purpurea	Broad-leaved Purple Coneflower	2.0	3	UPL
Helianthus mollis	Downy Sunflower	2.0	9	UPL
Heliopsis helianthoides	False Sunflower	3.0	5	UPL
Lespedeza capitata	Round-headed Bush Clover	3.0	4	FACU
Liatris spicata	Gay Feather	2.0	6	FAC
Monarda fistulosa	Wild Bergamot	3.0	4	FACU
Parthenium integrifolium	Wild Quinine	2.0	8	UPL
Penstemon digitalis	Foxglove Beard Tongue	1.0	4	FAC-
Petalostemum purpureum	Purple Prairie Clover	2.0	9	UPL
Physostegia virginiana	Obedient Plant	2.0	6	OBL
Pycnanthemum virginianum	Common Mountain Mint	2.0	5	FACW+
Ratibida pinnata	Yellow Coneflower	3.0	4	UPL
Rudbeckia hirta	Black-eyed Susan	3.0	1	FACU

Silphium integrifolium	Rosin Weed	2.0	5	UPL
Silphium laciniatum	Compass Plant	2.0	5	UPL
Silphium terebinthinaceum	Prairie Dock	2.0	5	FACU
Solidago graminifolia	Grass-leaved Goldenrod	2.0	3	FACW-
Solidago rigida	Stiff Goldenrod	3.0	4	FACU-
Verbena hastata	Blue Vervain	2.0	4	FACW+
Vernonia fasciculata	Common Ironweed	2.0	7	FACW
Veronicastrum virginicum	Culver's Root	2.0	7	FAC
Zizia aurea	Golden Alexanders	2.0	7	FAC+

Table 15 – Forb list

[128] Swink, F., and Wilhelm, G. (1994), Plants of the Chicago Region. Indiana Academy of Science.

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Shaw, D. and Schmidt, R. (2003), Plants for Stormwater Design, Species Selection for the Upper Midwest. Minnesota Pollution Control Agency.

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Notes:

KANE COUNTY STORMWATER ADMINISTRATIVE GUIDE MANUAL

			Page No.
INTRODUCTION			
	Purpose		1
	Organization		1
ARTICLE 5 – REQUIRED SUBMITALS FOR STORMWATER MANAGEMENT PERMITS			
§	T511	Terms of the Permit/Denial-Appeal	2
ARTICLE 8 – GENERAL PROVISIONS			
	Exempt (or Grandfathered) Projects		3
	Scope of Regulation		4
	Choice of Planning Jurisdiction		5
ARTICLE 9 – VARIANCES			6
ARTICLE 10 – ADMINISTRATION			
§	T1000	Responsibility for Administration	8
§	T1001	Duties of the Director	9
§	T1002	Duties of the Administrator	9
§	T1003	Representative Capacity	11
§	T1004	Oversight Committee	11
ARTICLE 11 – CERTIFIED COMMUNITY ENFORCEMENT			12
ARTICLE 12 – PERFORMANCE SECURITY			13
ARTICLE 14 – QUALIFIED REVIEW SPECIALISTS			
§	T1400	General	14
§	T1401	Requirements for Qualified Review Specialist	14
§	T1402	Requirements for Qualified Wetland Review Specialist	14
§	T1403		15
§	T1404	Review Specialist Qualification Committee	15
PART 2 – FORMS			

INTRODUCTION

The Kane County Stormwater Administrative Guidance Manual (Manual) is, as the name suggests, an administrative guide to provide County and Certified Community Officials assistance in implementing the administrative requirements of a stormwater permit application and the record keeping that is required.

Purpose

The purpose of the Administrative Guidance Manual is to supplement the Kane County Stormwater Ordinance (Ordinance) by providing background and intent of the technical requirements in the Ordinance. This manual contains extended discussion on the topics found in the Ordinance.

The Manual links directly to the Kane County Stormwater Ordinance by using the same Section numbers as those contained in the Ordinance with a "T" added to the number.

The Manual facilitates implementation and provides guidance necessary to achieve the objectives and standards of the Ordinance. This document has no authority to mandate new criteria.

Organization

The Manual is comprised of two parts:

- **Part 1** – Administrative guidance covering exempt and grandfathered projects, variances, Ordinance administration, performance security certified community enforcement and qualified review specialists; and

- **Part 2** – Forms pertinent to the administration of the Ordinance.

ARTICLE 5 – REQUIRED SUBMITTALS FOR STORMWATER MANAGEMENT PERMITS

§ T511 Terms of the Permit/Denial-Appeal

This section outlines a permit applicant's requirements for filing an appeal of either a permit denial or any special conditions attached to the permit approval. The Oversight Committee is the body responsible for conducting a hearing and taking evidence. The Applicant can appeal the decision of the Oversight Committee to the decision making authority. Further appeal is through the court under the Illinois Administrative Review Law.

ARTICLE 8 – GENERAL PROVISIONS

Exempt (or Grandfathered) Projects

Projects which are "in-process" at the time of the Countywide Stormwater Ordinance adoption and effective date pose a particular dilemma. Vast amounts of time and resources go into developing a good site plan both from the developer and their consultants and from a municipality or a county's staff review.

There are also often extensive legal negotiations which go on in regard to the annexation which create a "contract" of sorts between the community and the developer. Many communities in Kane County already have in place stormwater management standards and these projects are generally in conformance with those standards. However, those standards may not be fully in accordance with the provisions of this ordinance. Therefore, we create a classification of projects which we call "exempt" or "grandfathered", from strict application of this ordinance.

The responsibility for final determination of the status of a project as exempt from the provisions of the stormwater ordinance is ultimately up to the Stormwater Committee.

The process starts by action of the community. The community must recognize a project as being far enough along in whatever development process they have in place in order to place the project on their "list of exempt developments". To be considered exempt, the plan for the project must identify how stormwater from the project is to be managed and the communities review authority must concur that sufficient engineering has been performed to show that the plan is viable. For master-planned sites, this can take the form of review and approval (or substantial approval) of a stormwater management master plan.

Legally binding contracts, entered into by the community and developer in good faith that address stormwater management, will also be honored provided that they have been entered into prior to January 1, 2001.

The community should also note the requirement for posting signs on exempt properties and publishing notice of the list of exempt developments.

Each community's list is submitted with their application to become a certified community and must be submitted with the Application for Certification on or before January 1, 2002. The lists are then reviewed by the Stormwater Committee. The committee is made up of an equal number of municipal and county government representatives divided into representative zones. The municipal or county representatives within each zone have the right to "remove" a project from the list which falls within their zone. Removal from the list means the project will be reviewed individually. Otherwise, all other projects on the list are passed, unless a majority of the Stormwater Committee approves the removal of a project from the

list. The list is passed and these projects are considered as exempt. The projects which are removed from the list are then considered individually and if the provisions outlined in the ordinance in Section 802B apply then the projects may still be found to be exempt.

For the most part, projects are not actually exempt from all stormwater requirements, but are just exempt from strict application of the new Stormwater Ordinance.

Projects which have not filled or dredged wetlands prior to the effective date of the Ordinance, are not exempt from mitigation requirements regardless of any previous jurisdictional determinations by other agencies. Mitigation will be required in accordance with Article 15.

Scope of Regulation

This Ordinance for stormwater is equally applicable to all units of local government projects, even those that have not previously had to obtain permits from the unincorporated county or communities. School districts and local road projects are typical examples of a unit of local government which can develop a property without obtaining permits from a village or county who will now be required to obtain a stormwater management permit from either a certified community or the County.

A certified community can permit their own projects provided that they obtain all required state and federal permits for the project and that they follow the same procedures as all other applicants in their permitting, including the use of Qualified Review Specialists to review the application. They must, however, obtain a Kane County Wetland Permit when Applicable.

The recent (January, 2001) ruling by the United States Supreme Court highlighted the potential problems of relying on wetland protection at the Federal level, and Kane County will assume the responsibility for implementing protection of wetlands at a local level, when a development involves dredging or filling wetlands that do not fall under the USACOE jurisdiction or are subject to NRCS Administered programs.

The County is delegating their authority under this ordinance to certified Communities, except for the review of mitigation plans. Projects which include dredging of filling of Wetlands not regulated by the Corps of Engineers must obtain a permit from Kane County, which will review the wetland impacted to verify that an adequate and appropriate mitigation plan has been submitted. Further, Kane county will collect permit review fees for mitigation plans and administer Fee-in-lieu of wetland mitigation programs.

When requested by the Community, the County will also review wetlands subject to regulation by the Community under Article 4. Note that it is possible to have as many as three agencies issuing permits for wetlands on a development: The

USACOE 404 permit, the Stormwater Permit by the Municipality and a Wetland Permit by the County.

When the development des not include the dredging or fill of wetlands or the wetlands impacted are all regulated by the USACOE, then a permit from Kane County is not required. The Certified Communities Stormwater Permit will cover any wetlands remaining on-site.

Choice of Planning Jurisdiction

The enabling legislation of this ordinance allows communities whose borders straddle more than one county to opt that all property within their boundaries be included within one or the other counties planning jurisdictions. In order to use this option, the county which is an alternative to Kane County must have it's own stormwater management committee and plan in place. Certain communities in Kane County, then, have an option of electing to have all of the land within their borders utilize the rules and requirements of McHenry County, DuPage County, or Will County. The State's Attorney's Office should be contacted to determine if this is a viable option for a community to consider.

The County Board authority, however, stops at the County line. Communities who have land within their borders that are outside of Kane County may opt into Kane County for their entire corporate limits. However, the Counties authority does not extend past the County line to enforce this ordinance except by intergovernmental agreements. Communities were given the choice of opting out of the Ordinance in January, 1997 and therefore, no longer can opt out if they didn't choose to do so at that time.

ARTICLE 9 – VARIANCES

Regulators can not always anticipate every development scenario. In a few unique situations, some performance standards may not seem appropriate considering the goals of the Ordinance. In those unique situations, the applicant may request a variance. There are some performance standards that may not be varied because of State or Federal law. If a certified community is repeatedly issuing variances for the same performance standard, it is appropriate to request that the Stormwater Committee review and consider amending the Ordinance. A variance request shall only be made after a stormwater management permit application has been filed.

The burden of demonstrating why it is impracticable or impossible to meet the performance standards of the Ordinance rests with the applicant. Table 901 outlines the information required as part of the application for variance. Included in the requirements are statements by the applicant as to 1) what exactly is requested to be varied; 2) why can the Ordinance not be met; 3) what is the impact of the variance (for example – will there be greater risk of flood damage to downstream-upstream properties); 4) demonstrate that the minimum variance is being applied for; and 5) standards in § 904 of the Ordinance are being satisfied. The applicant for a variance request should meet with local officials prior to submitting the variance requests to determine how appropriate the request is and how to best support the request.

A public hearing will be required to discuss the variance request and allow public input. All property owners within 250 feet of the development must be notified. The public notice should state:

1. The specific location of the development, referencing nearby landmarks, streets, the Township, Section, Range and Quarter Section.

2. The name of any impacted waterway or wetland or appropriate designation if no name applies.

3. The name and mailing address of the permit applicant.

4. The name and mailing address of the permit applicant's agent.

5. A description of the development.

6. A statement of what performance standard is requested to be varied.

7. A statement of the proposed variance to the performance standard and what degree of compliance is being achieved in lieu of the full performance standard.

8. A location where plans and supporting documents for the proposed project may be viewed.

9. The effective date and the closing date of the public notice, and the name and mailing address of the person and organization to whom comments should be sent. The Administrator should be the individual to receive and respond to public comments.

The Administrator shall make a written opinion regarding the variance request, which will be given to the Oversight Committee at the public hearing. Therefore, it is important that the applicant meet with the Administrator prior to filing a variance request. All correspondence concerning a variance shall be copied to the Director and every Administrator within the watershed(s) within which the development is occurring.

The Oversight Committee and decision-making authority are both established by the Corporate Authorities of a community at the time they apply for Certification.

Variances of the Provisions of Article 15 on Wetlands may only be granted by the County.

ARTICLE 10 – ADMINISTRATION

§ T1000 Responsibility for Administration

The Ordinance creates two responsibilities for implementing the ordinance. Overseeing enforcement of this Ordinance is the duty of the Oversight Committee. The administration of the Ordinance is the duty of the Director and the Administrator. In a certified community, only the position of Administrator is created. The Director is a County employee, responsible for the overall implementation throughout the County and is anticipated to be separate from the Administrator in the unincorporated county.

It is important to note that each community will remain responsible for their own standing in the National Flood Insurance Program (NFIP). The NFIP requires certain record keeping and certain rules and procedures be followed that are compatible with this ordinance, but a separate responsibility. The duties of the Administrator do not specifically cover those duties that are required to maintain standing in the NFIP. This Ordinance is not intended to repeal any of those ordinances adopted specifically to maintain or establish initial standing in the NFIP.

Amendment of the Ordinance requires notification to a number of agencies. It is not intended that the Countywide Ordinance will be amended except as amended by the Stormwater Committee and the County Board and then adopted by Certified Communities. Communities may adopt standards more stringent than those contained in this Ordinance. The Ordinance creates two separate roles in its' implementation. One is that of the Oversight Committee and the other is the Director and Administrator. The Oversight Committee is charged with overseeing enforcement of the Ordinance. The Administrator is the one to administer the day to day requirements of the Ordinance, such as permitting and record keeping, site inspections and other tasks that are required on an on-going basis. The Director is a separate position in Kane County and the duties are to oversee the implementation of the Ordinance countywide. Because of the Director's responsibility for review of the implementation by Certified Communities, the Unincorporated County has a separate Administrator. Specific duties and responsibilities may be delegated to other individuals or outside firms as necessary to bring the required expertise to bare on any particular issue.

This Ordinance is not intended to maintain individual community standing in the NFIP. While it is compatible and consistent with those requirements, it does not require the same documentation and reporting as the NFIP and therefore, any ordinances adopted specifically for the purpose of maintaining standing in the NFIP are not repealed by this Ordinance. Amendment of the countywide ordinance can only be done through the SMC and is adopted by the County Board. Individual Communities may adopt more restrictive

requirements on their own, which may be considered then in addition to the minimum requirements set forth in this ordinance. The Community must however, notify the Director of these amendments.

§ T1001 Duties of the Director

The position of the Director is created by Kane County for the purpose of day to day administration of the entire countywide ordinance program and issuing permits for wetland impacts on those wetlands not regulated by the Corps of Engineers or in agriculture. His/Her services are also available for the review of complex stormwater management permits when requested by a Certified Community.

The Director shall also review the implementation of the countywide ordinance by each Certified Community. This review is to ensure that all communities are enforcing the minimum standards set forth in the ordinance.

The Director is responsible for maintaining the list of Qualified Review Specialist's and Qualified Wetland Review Specialist's. The Director will maintain a list of those so qualified.

§ T1002 Duties of the Administrator

The Administrator is a position appointed by each Certified Community. They are charged with the day to day tasks involved in an ordinance and permitting program. The duties are listed in the Ordinance and each one will be considered here individually. For communities with a Public Works Director or a Village Administrator, it is encouraged that a municipal employee take on the duties of the Stormwater Administrator. For communities without a Public Works Director or Village Administrator, it is expected that the duties of the Stormwater Administrator will be carried out by a consultant.

Stormwater permits often overlap jurisdictions of other agencies, such as State Floodway construction permitting and the Federal United States Army Corps of Engineers 404 Wetland Permitting. Duplication of permit review has been minimized in the Ordinance. However, each Administrator must recognize that a stormwater plan's compliance with the Ordinance may depend on the ultimate review and approval and permit issuance by an outside agency. It is common for a project to want to begin construction before permits are issued by other agencies. The Ordinance does not prohibit the issuance of a permit for work outside the area so affected, however, it will be the Administrator's responsibility to see that the work permitted and allowed to begin construction is a "stand-alone project" which will still meet the minimum standards of the Ordinance, even if the other agency permits are ultimately denied.

Special Management areas which consist of wetlands, floodplains, and floodways must be delineated for each sight individually and there absence or presence ascertained. The Administrator is responsible for reviewing the submittal and seeing that such special management areas have been properly identified and appropriate actions taken with regard to meeting the Ordinance requirements for those areas. The Administrator issues permits for projects with on-site wetlands that are not to be dredged of filled.

A Stormwater Permit cannot be issued unless a Qualified Review Specialist has reviewed the permit application and made recommendations with regard to granting or denying the permit. The Administrator is responsible for permit issuance, however, he/she must consider carefully the recommendations made by the qualified review specialist and determine whether or not modification to the plan is required or whether the plan meets the minimum standards of the Ordinance.

The Administrators also performs those tasks related to variances, such as, providing notice to the Director and other communities. The Administrator should also advise the applicant that issuance of the variance can result in increased rates for flood insurance, depending on rulings made by the Federal Emergency Management Agency (FEMA), in regard to the NFIP.

When a project submitted involves a Conditional Letter of Map Revision (CLOMR) or Letter of Map Revision (LOMR) the Administrator should forward a copy of the submittal to the Director.

The Administrator is responsible for seeing that inspections of the development occur so that an opinion can be rendered with regard to whether or not the as-built condition is in compliance with the Ordinance. The Administrator can develop his/her own permit inspection program and forms. Suggested forms and inspection times have been included in this Technical Reference Manual as an aid in development of the communities inspection requirements.

The Administrator is charged with investigation of complaints of violations of this Ordinance. Complaints can be filed by anyone, against a permitted project or can be brought against individuals that are performing acts, which are believed by the complainant to require permits. Along with the responsibility of investigation comes the responsibility to initiate any other legal proceedings required to obtain relief and to enforce this Ordinance including stoppage of work and requesting that legal proceedings be initiated.

The Administrator must also maintain documentation for the purpose of ascertaining whether or not the community is implementing the provisions of the countywide ordinance. This includes copies of applications and submittals

for other Federal and State permits, as well as variances. Other records which must be maintained include the cost information necessary to determine when a substantial improvement to a structure has occurred.

§ T1003 Representative Capacity

This section states that neither the Director or Administrator can be held personally liable for actions taken with regard to enforcement of the Ordinance.

§ T1004 Oversight Committee

The corporate authorities will establish an Oversight Committee for each respective community. The duties of the Oversight Committee include hearing variances, and other duties as assigned by the corporate authorities. It is intentionally flexible as to who the Oversight Committee will be so that the program can utilize the people in each community who are used to hearing technical evidence submitted such as Planning Commissions and Zoning Board of Appeals, but is also the corporate authorities themselves, who are assigned these responsibilities.

It will be the Oversight Committee's responsibility to interpret the Ordinance for situations where there is a dispute between the Administrator and the developer/applicant. There is no direct relationship between the developer/applicant and the Qualified Review Specialist. When the Qualified Review Specialist prepares comments for a development, the comments are forwarded to the Administrator who then decides which comments to forward to the developer/applicant. The review comments received by the developer/applicant are the Administrator's comments, therefore there is no direct relationship between the developer/applicant and the Qualified Review Specialist.

ARTICLE 11 – CERTIFIED COMMUNITY ENFORCEMENT

Certified Community refers to any city, village or the County, which has received the approval of the Stormwater Committee for delegation of authority for enforcement of Article 1-Article 14 of the Ordinance. A Certified Community receives all permitting authority that the Ordinance may delegate which excludes permitting wetland impacts. Certified Communities review, issue and enforce all aspects of the Ordinance. If the development is located in a Certified Community (other than the Unincorporated County) in good standing with the KCSMC and there are no wetlands being impacted, no permit review by the County is required. If wetlands are impacted, and the impacted wetlands are regulated by the USACOE, then no permit from the County is required either. Communities must petition the Committee to request a Certified Community status and follow the criteria outlined in §1102. The Petition For Certification is due within 90 days of the adoption of the Ordinance, and in June of subsequent years.

The Committee reviews and approves Petitions for Certification within 60 days of filing.

Certified Communities must keep certain records from the time they are granted the certification. For example, all projects which are issued a Stormwater Management Permit shall be logged and a copy of the "as-built" plans shall be kept. In addition, Certified Communities shall prepare an annual report to the Director regarding all Stormwater Management Permits issued in the preceding year. To assist the Certified Community in the annual report, Form 7 has been developed and should be used for project correspondence with the Director.

When complaints are brought against a Certified Community, or on the initiative of the Director, the Community is expected to cooperate in resolving the matter. Most complaint investigations will necessitate a review of the submittals and community correspondence and field inspections of sites under construction. The Administrator will often have to make interpretations, and the purpose of an investigation is not to second guess the Administrator's judgement. Where the Ordinance has clearly stated criteria, following this criteria is required unless a variance is issued. Where approval is explicitly in the hands of the Administrator, his approval will be considered final unless clearly in violation of the spirit and intent of the Ordinance.

ARTICLE 12 – PERFORMANCE SECURITY

The developer is required to post a performance security before construction begins. The form of the securities required is a decision that may be made by the Administrator although in general a letter of credit is preferred. When considering accepting the bonds posted by a contractor to the developer the community should also consider whether they have the right to draw on those bonds to be sure that they are adequately protected.

Prior to issuance of a stormwater permit the developer must submit a cost estimate for the construction costs of stormwater facilities. These stormwater facilities generally include mass grading, storm sewers, culverts, curb and gutter, stormwater structures related to the conveyance of and storage of run off. They also include the cost of sub-surface drainage systems for water table control but do not include the portions of actual structures related to stormwater run off such as down spouts, sump pumps, or similar improvements. They also do not include the costs of paving and landscaping other than provided under the sediment and erosion control security. The cost estimate shall be prepared by either the developers engineer or the developer, and shall be subject to the review and acceptance by the Administrator. The Administrator may require back-up information and documentation of the costs submitted by the developer.

Cost estimates are preferred over actual bids as there is no assurance that the contractual arrangement that the developer has entered into may be obtained by the Village for completion of any facilities due to the failure of the developer. The estimates shall be multiplied by a factor 1.1 and this total cost shall then be the dollar amount for which the security must be posted. This additional increment is to cover such additional costs as engineering and field supervision and administration should the developer default on his obligations under the permit.

The sediment and erosion control security shall be posted to assure that the sediment and erosion control plan contained in the permit drawings is implemented. The Administrator shall review the sediment and erosion control cost estimate and shall approve the cost estimate for the purposes of establishing a sediment and erosion control security. Failure of the developer to implement an adequate sediment and erosion control plan in a timely manner shall be cause for the Administrator to draw on the security to have a sediment and erosion control plan implemented.

Forms 8 and 9, in Part 2, have been provided as examples of the statements required under §1201(1.c & d), and 1202(1.b).

When the County must issue a permit for a wetland impact, an additional security is required when the mitigation option chosen is at a wetland mitigation facility. This security remains in effect until the wetland mitigation facility meets performance criteria, or may be drawn upon to meet mitigation for non-performance.

ARTICLE 14 – QUALIFIED REVIEW SPECIALISTS

§ T1400 General

The use of qualified reviewers for both stormwater submittals and wetland reviews shall occur as part of the stormwater permit application process. The reviewer is responsible for recommending to the Administrator whether or not the plans submitted comply with the ordinance. It is expected that dialogue between the designer, reviewer, and Administrator will resolve ordinance compliance issues. The Director of the Kane County Department of Environmental Management will maintain a list of Qualified Review Specialist and Qualified Wetland Review Specialists. The review of wetland submittals may be waived if a COE permit is required.

§ T1401 Requirements for Qualified Review Specialist – Stormwater Planning

A Qualified Review Specialist shall meet the following minimum requirements or the identified experience.

- Registered Professional Engineer (Illinois License)
- Expertise by training and/or education
- Design and permitting of stormwater management facilities
- Experience with the identification of floodplains and floodways including familiarity with FEMA and IDNR-OWR maps, policies and procedures
- Erosion and sediment control practices and procedures
- Construction practices and inspection procedures
- Complete sign and seal the Qualified Review Specialist Statement
- File the Qualified Review Specialist Statement form with the Kane County Department of Environmental Management, 719 S. Batavia Avenue, Geneva, Illinois 60134
- Pay the current fee as set in the County Code

§ T1402 Requirements for Qualified Wetland Review Specialist

A Qualified Wetland Review Specialist shall meet the following minimum requirements.

- Completed an approved wetland delineation course.
- Have a Bachelors degree in an earth science, biological science or engineering together with at least one of the following types of experience in the Upper Midwest.
- Personnel involvement in the design of at least ten wetland mitigation areas.

- 3 years full time experience consulting on wetland projects.
- Completion of at least 100 wetland delineations.

- 300 hours of field review of wetland indicators or 6 years full time experience consulting on wetland projects.
- Complete, sign and professionally seal the Qualified Wetland Review Specialist Statement.
- Pay the current fee as set in the County Code.
- File the Qualified Wetland Review Specialist Statement form with the Director.

§ T1403

The Director shall notify the applicant of his or her inclusion on the list within 30 days of filing. Applicants who are not included (approved) for the list may appeal the decision to the Review Specialist Qualification Committee within 30 days of receiving notice of disqualification. Disqualified applicants shall receive a hearing in accordance with § 1407 and 1408 of the ordinance.

Applicants should prepare a thorough explanation of experience which includes the following information:

- Education, Highest Degree, Granting Institution
- Work experience – All relevant work experience including employers name, address, phone number, length of employment and positions held.
- Professional experience – detail types of work activities performed, professional licenses, certifications, and continuing education credits
- References who can verify length of employment, types of works, quality of work

§ T1404 Review Specialist Qualification Committee

The Chairman of the County Board shall appoint a Review Specialist Qualification Committee that shall be approved by the County Board. The primary responsibilities of this committee will be to:

- Hear appeals of disqualified applicants for appointment to the Qualified Review or Qualified Wetland Review Specialist list.
- Hear complaints from the Director concerning investigations of failure of the specialist to discharge the duties properly.
- Serve copies of complaint reports upon the specialist and all communities for whom the specialist has done reviews.
- Decide whether or not to suspend or revoke the certification of the specialist based upon the findings of the hearing.

PART 2 – FORMS

PART 2 – FORMS

FORMS

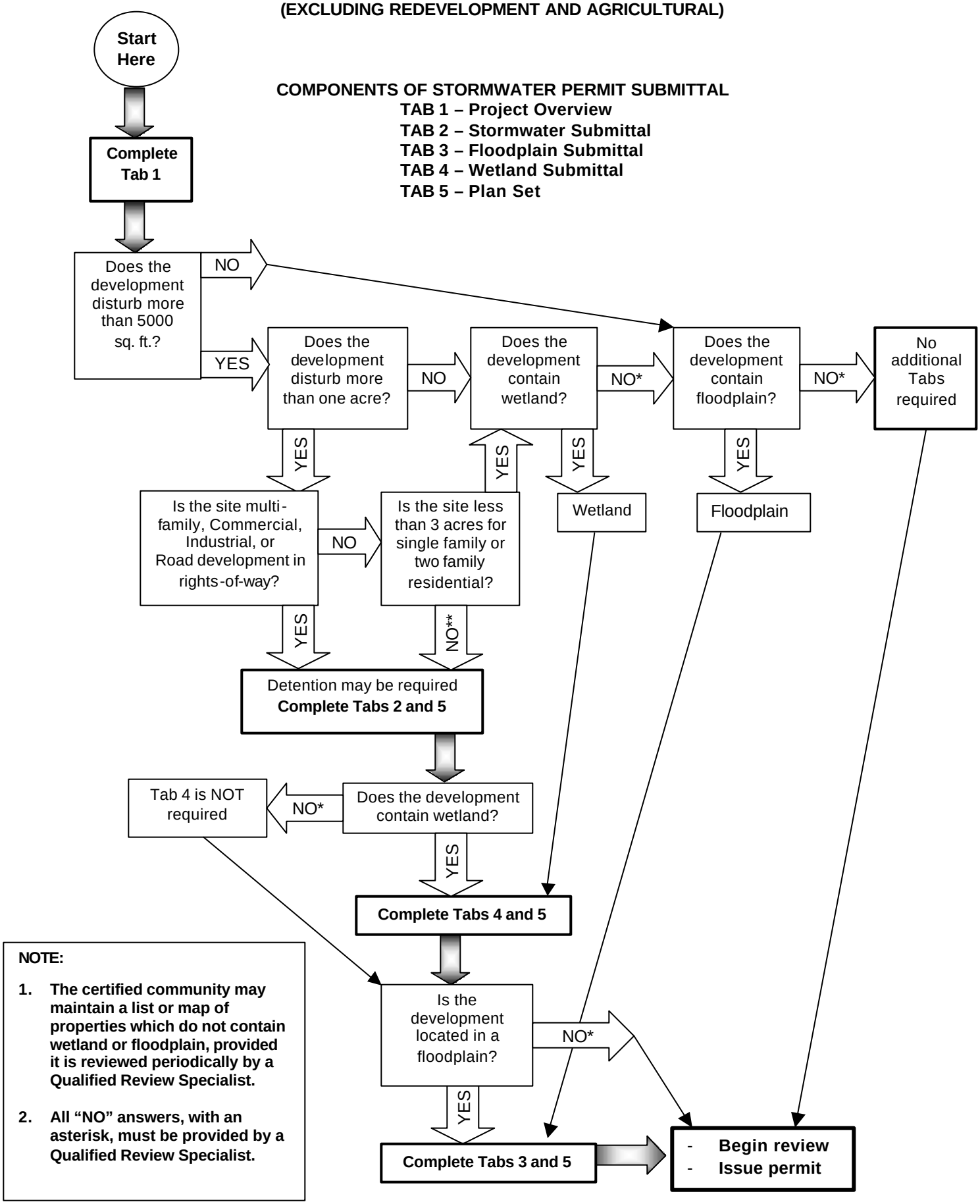
The following sheets contain forms that are meant to be copied and used by either the developer/applicant, community official or review engineer. The forms contained in this section are listed below.

FORM NO.

1. Kane County Stormwater Management Typical Permit Submittal Flowchart
2. Kane County Stormwater Management Permit Application
3. Kane County Stormwater Management Submittal Checklist
4. Community Certification Status Report
5. Community Contact For Stormwater Management Questions
6. Certified Community Form For Exempt Project
7. Certified Community Annual Form For Project Status
8. Inspection Checklist During Construction
9. Inspection Checklist After Construction
10. Developers Statements – Right to Draw on Securities
11. FEMA Community Acknowledgement Form
12. Erosion and Sediment Control Inspection Report

FORM 1

KANE COUNTY STORMWATER MANAGEMENT TYPICAL PERMIT SUBMITTAL FLOWCHART
(EXCLUDING REDEVELOPMENT AND AGRICULTURAL)



COMPONENTS OF STORMWATER PERMIT SUBMITTAL
TAB 1 – Project Overview
TAB 2 – Stormwater Submittal
TAB 3 – Floodplain Submittal
TAB 4 – Wetland Submittal
TAB 5 – Plan Set

NOTE:

1. **The certified community may maintain a list or map of properties which do not contain wetland or floodplain, provided it is reviewed periodically by a Qualified Review Specialist.**
2. **All "NO" answers, with an asterisk, must be provided by a Qualified Review Specialist.**

REVISION DATE: 10/21/00

FORM 2

KANE COUNTY STORMWATER MANAGEMENT PERMIT APPLICATION

Date Application Received:	Date Permit Issued:

Name & Address of Applicant: Name & Address of Owner(s): Name & Address of Developer:

_____ _____ _____

_____ _____ _____

_____ _____ _____

Title:_____

Telephone no. during business hours: Telephone no. during business hours
A/C( )_____-_____ A/C( )_____-_____

Indicate which Submittals apply to application* (see flowchart):

? Stormwater Submittal

? Flood Plain Submittal

? Wetland Submittal

? No special management areas encroach the development

*Must be identified by qualified review specialist

Names, addresses and telephone numbers of all adjoining property owners within 250 feet of the development (use additional sheets if necessary):

Common Address of Development:

_____
Street address

_____
Community

_____
Name of local governing authority

_____
Watershed planning area and tributary

Legal Description (attach):

_____
¼, Section, Township, Range

_____
P.I.N.

Is any portion of this project now complete? _____ Yes _____ No, If "yes," explain in description portion.

I hereby certify that all information presented in this application is true and accurate to the best of my knowledge. I have read and understand the Kane County Stormwater Management Ordinance, and fully intend to comply with those provisions.

_____ _____
Signature of Developer Date

I have read and understand the Kane County Stormwater Management Ordinance, and fully intend to comply with those provisions.

_____ _____
Signature of Owner Date

Kane County Stormwater Management Submittal Checklist FORM 3

Applicant:	Reviewer:	Stormwater Permit No.:

The following tables contain a checklist of the requirements before a review for a Stormwater submittal will be accepted. The flow chart on the previous page shall be completed prior to completing the following tables. The flow chart identifies which Tab(s) need to be completed for a particular submittal. Not all requirements pertain to every stormwater submittal. For those requirements that you believe do not pertain to the this submittal, please give the reasons in the comment box.

TAB 1 – PROJECT OVERVIEW

Identifier	Requirement	Section	Comments
1A	Completed Stormwater Permit Application	503(b)	
1B	Copy of a completed Joint Application form with transmittal letters to the appropriate agencies (wetland or floodplain submittal).	503(b)	
1C	Copies of other relevant permits or approvals (include applications if permits have not been issued)	503(b)	
1D	Narrative description of development, existing and proposed conditions, and project planning principles considered, including BMPs utilized.	503(b)	
1E	Subsurface drainage investigation report	503(b)	

Name of Applicant: _____ Name of Reviewer: _____

Signature of Applicant: _____ Signature of Reviewer: _____

Date: _____ Date: _____

PROJECT INFORMATION:

Project Name: _____

Site Location: _____

Township, Range: _____

Site Area (acres): _____

Please check the following activities that apply (from the flow chart):

Type of development: ? Residential ? Commercial ? Industrial ? Agricultural ? Other

The site has the following constraints:

Floodplain	Floodway	Wetlands
? YES	? YES	? YES
? NO _____	? NO _____	? NO _____
Qualified Review Specialist Signature	Qualified Review Specialist Signature	Qualified Wetland Review Specialist
_____	_____	_____
Print Name	Print Name	Print Name

Note: Please attach a narrative project description to this Tab, if Applicant is not completing Tab 2.

Kane County Stormwater Management Submittal Checklist

TAB 2 – STORMWATER SUBMITTAL

Identifier	Requirement	Section	Comments
2A	Narrative description of the existing and proposed site conditions. Include description of off-site conditions.		
2B	Schedule for implementation of the site stormwater plan.		
	Site runoff calculations:		
2C	Documentation of the procedures/assumptions used to calculate hydrologic and hydraulic conditions for sizing major and minor systems.	202.3, 202.4, 202.8	
2D	Cross-section data for open channels.	203.14	
2E	Hydraulic grade line and water surface elevations under design conditions.		
2F	Hydraulic grade line and water surface elevations under base flood conditions		
	Site Runoff and Storage Calculations:		
2G	Calculation of hydraulically connected impervious area and corresponding retention volume.	203.7	
2H	Documentation of the procedures/assumptions used to calculate hydrologic and hydraulic conditions for determining the allowable release rate.	203.2, 203.4	
2I	Documentation of the procedures/assumptions used to calculate on-site depressional storage.	201.8	
2J	Documentation of the procedures/assumptions used to calculate hydrologic and hydraulic conditions for determining the storage volume.	203.7, 203.8	
2K	Elevation-area-storage data.		
2L	Elevation-discharge data.	203.5	

Kane County Stormwater Management Submittal Checklist

TAB 3 – FLOODPLAIN SUBMITTAL

Identifier	Requirement	Section	Comments
3A	Regulatory floodplain boundary determination:	400	
3B	Provide source of flood profile information.	401.1.a, 402.6	
3C	Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations, and floodplain map revisions.	203.9, 203.10, 401.1	
3D	Floodway hydrologic and hydraulic analyses for the following conditions:		
3E	Existing conditions (land use and stream system).		
3F	Proposed conditions (land use and stream system).		
3G	Tabular summary of 100-year flood elevations and discharges for existing and proposed conditions.		
3H	Calculations used for model development.		
3I	Floodplain fill and compensatory storage calculations for below and above 10-year flood elevation:	401.7	
3J	Tabular summary for below and above 10-year flood elevation of fill, compensatory storage, and compensatory storage ratios provided in proposed plan.		
3K	Floodproofing Measures:	401.4	
3L	Narrative discussion of flood proofing measures including material specifications, calculations, design details, operation summary, etc.		
3M	Flood Easements when required by the countywide ordinance or local jurisdiction.		

Kane County Stormwater Management Submittal Checklist

TAB 4 – WETLAND SUBMITTAL

Identifier	Requirement	Section	Comments
4A	Wetland Delineation Report (COE format)		
4B	Calculation of required buffer (including width, size and vegetation quality)		
4C	Wetland Delineation Plan View Drawing:		
4C-1	Location of existing and proposed impacted or undisturbed wetlands.		
4C-2	Location of buffers.		
4C-3	Planting plan for buffer area.		
4C-4	Identify all required wetland management activities.		
4C-5	Submittal to the USACOE for permit application.		

Kane County Stormwater Management Submittal Checklist

TAB 5 – PLAN SET SUBMITTAL

Identifier	Requirement	Section	Comments
5A	All drawings should be signed and sealed by a P.E.		
5B	Site Topographic Map:		
5B-1	Map scales at 1 inch = 100 feet (or less) and accurate to +/- 0.5 feet.		
5B-2	Existing and proposed contours on-site and within 100 feet of site.		
5B-3	Existing and proposed drainage patterns and watershed boundaries.		
5B-4	Delineation of pre-development regulatory floodplain/floodway limits.		
5B-5	Delineation of post-development regulatory floodplain/floodway limits.		
5B-6	Location of cross-sections and any other modeled features.		
5B-7	Location of drain tiles.		
5B-8	Location of all wetlands, lakes, ponds, etc. with normal water elevation noted.		
5B-9	Location of all buildings on the site.		
5B-10	Nearest base flood elevations.		
5B-11	FEMA and Kane County Survey Control Network benchmark.		
5C	General Plan View Drawing (may be more than one drawing for clarity)		
5C-1	Map scales at 1 inch = 100 feet (or less) and accurate to +/- 0.5 feet contour interval.		
5C-2	Existing major and minor stormwater systems.		
5C-3	Proposed major and minor stormwater systems.		
5C-4	Design details for stormwater facilities (i.e. structure and outlet work detail drawings, etc.).		
5C-6	Scheduled maintenance program for permanent stormwater facilities including BMP measures.		
5C-7	Planned maintenance tasks and schedule.		
5C-8	Identification of persons responsible for maintenance.		
5C-9	Permanent public access maintenance easements granted or dedicated to, and accepted by, a government entity.		
5D	Sediment/Erosion Control Plan:		
5D-1	Sediment/erosion control installation measures.		
5D-2	Existing and proposed roadways, structures, parking lots, driveways, sidewalks and other impervious surfaces.		

Kane County Stormwater Management Submittal Checklist

Identifier	Requirement	Section	Comments
5D-3	Limits of clearing and grading.		
5D-4	Wetland location(s).		
5D-5	Proposed buffer location.		
5D-6	Existing soil types, vegetation and land cover conditions.		
5D-7	List of maintenance tasks and schedule for sediment/erosion control measures.		
5E	Vicinity Topographic Map:		
5E-1	Vicinity topographic map covering entire area upstream of the development site and downstream to a suitable hydraulic boundary condition.		
5E-2	A 2' contour map is preferred at a scale readable by the reviewer.		
5E-3	Watershed boundaries for areas draining through or from the development.		
5E-4	Soil types, vegetation and land cover affecting runoff upstream of the site for any area draining through the site.		
5E-5	Location of development site within the major watersheds.		

Kane County Stormwater Management Submittal Checklist

TAB 6 – SECURITY SUBMITTAL

Identifier	Requirement	Section	Comments
	Estimate of Probable Cost to construct stormwater facilities.		
	Development security:		
	Schedule for the completion of stormwater facilities.		
	Irrevocable letter of credit for 110% of estimated probable cost to construct the stormwater facilities.		
	Right to draw on the security statement - signed by the holder of the security.		
	Right to enter the development site to complete required work that is not completed according to schedule.		
	Indemnification statement - signed by developer.		
	Sediment and erosion control security:		
	Irrevocable letter of credit for 110% of estimated probable cost to install sediment and erosion control facilities.		
	Right to draw on the security statement - signed by the holder of the security.		
	Right to enter the development site to complete required work that is not installed and maintained according to schedule.		
	Letter of Credit Requirements:		
	Statement that indicates that the lending institution capital resources at least $10,000,000, or as authorized.		
	Lending institution has an office location within the Chicago Metropolitan Area.		
	Lending institution is insured by the Federal Deposit Insurance Corporation.		
	Allows Administrator to withdraw without consent of developer.		
	Allows Administrator to withdraw within 45 days of expiration date.		

Kane County Stormwater Management Submittal Checklist

TAB 7 – VARIANCE SUBMITTAL

Identifier	Requirement	Section	Comments
	Completed Stormwater Permit Application and all required submittals.		
	Completed variance petition including all information identified in Section 15-236.7.a.-l.		
	Statement as to how the variance sought satisfies the standards in Section 15-236.10. Address each condition separately.		

FORM 4

COMMUNITY CERTIFICATION STATUS REPORT
AS OF JANUARY 14, 2001

COMMUNITY	***CERTIFIED***	***RECEIVED PETITION***	***IN PROGRESS***	***NON-CERTIFIED***
Aurora (C)				
Algonquin (V)				
Barrington Hills (V)				
Bartlett (V)				
Batavia (C)				
Burlington (V)				
Carpentersville (V)				
East Dundee (V)				
Elburn (V)				
Elgin (C)				
Geneva (C)				
Gilberts (V)				
Hampshire (V)				
Hoffman Estates (V)				
Huntley (V)				
Lily Lake (V)				
Maple Park (V)				
Montgomery (V)				
North Aurora (V)				
Pingree Grove (V)				
St. Charles (C)				
Sleepy Hollow (V)				
South Elgin (V)				
Sugar Grove (V)				
Virgil (V)				
Wayne (V)				
West Dundee (V)				
Unincorporated County				

FORM 5

COMMUNITY CONTACT FOR STORMWATER MANAGEMENT PERMIT APPLICATION QUESTIONS
AS OF JANUARY 14, 2001

COMMUNITY	VILLAGE ENGINEER OR CONSULTING ENGINEER	ADDRESS	PHONE (FAX)	E-MAIL ADDRESS
Aurora	Peter Haurykiewicz	44 E. Downer Place Aurora, IL 60507	(630) 844-3620 (630) 892-0322	N/A
Algonquin	Scheflow Engineers Frank Cuda	1814 Grandstand Place Elgin, IL 60120	(847) 697-7095 (847) 697-7099	scheflow@foxvalley.net
Barrington Hills	Gewalt Hamilton Assoc. Inc. Don Matthews	850 Forest Edge Dr. Vernon Hills, IL 60061	(847) 478-9700 (847) 478-9701	Dmatthews@gha-engineers.com
Bartlett	Pavia Marting & Co. Dale Marting, Sr.	910 W. Lake St. Roselle, IL 60172	(630) 529-8000 (630) 894-4910	N/A
Batavia	Ted Bergeson	100 N. Island Ave. Batavia, IL 60510	(630) 879-1424 (630) 879-1012	Tbergeson@cityofbatavia.net
Burlington	Engineering Enterprises, Inc. John Whitehouse	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	Jwhitehouse@eeiweb.com
Carpentersville	Bill Emmerich	1200 LW Besinger Dr. Carpentersville, IL 60110	(847) 551-3480 (847) 426-0864	villeng@yahoo.com
East Dundee	Gerald Heinz	206 N. River East Dundee, IL 60118	(847) 426-4535 (847) 426-4584	Glheinzinc@aol.com
Elburn	Rempe-Sharpe & Assoc. Bill Gain	324 W. State St. Geneva, IL 60134	(630) 232-0827 (630) 232-1629	billgain@inil.com
Elgin	Joe Evers	150 Dexter Ct. Elgin, IL 60120	(847) 931-5955 (847) 931-5965	evers_j@cityofelgin.org
Geneva	Dan Dinges	1800 South St. Geneva, IL 60134	(630) 232-1501 (630) 208-1503	ddinges@geneva.il.us
Gilberts	Robert Anderson & Assoc. Tony Malone	220 W. River Drive St. Charles, IL 60174	(630) 584-3530 (630) 584-3047	tmalone@haengr.com
Hampshire	Engineering Enterprises, Inc. Pete Wallers / Brad Sanderson	52 Wheeler Rd. Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	pwallers@eeiweb.com bsanderson@eeiweb.com
Hoffman Estates	Gary Salavitch	1900 Hassell Rd. Hoffman Estates, IL 60195	(847) 781-2636 (847) 781-2664	gary.salavitch@hoffmanesstates.org

COMMUNITY	VILLAGE ENGINEER OR CONSULTING ENGINEER	ADDRESS	PHONE (FAX)	E-MAIL ADDRESS
Huntley	Baxter & Woodman Bill Blecke	8678 Ridgefield Rd. Crystal Lake, IL 60012	(815) 459-1260 (815) 455-0450	bblecke@baxwood.com
Lily Lake	Engineering Resource Assoc. Rod Beadle	214 W. Willow Ave. Wheaton, IL 60187	(630) 668-5995 (630) 668-0693	era@eraconsultants.com
Maple Park	Engineering Enterprises, Inc. Dave Burroughs	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	Dburroughs@eeiweb.com
Montgomery	Engineering Enterprises, Inc. Pete Wallers	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	pwallers@eeiweb.com
North Aurora	Rempe-Sharpe & Assoc. Jim Bibby	324 W. State St. Geneva, IL 60134	(630) 232-0827 (630) 232-1629	billgain@inil.com
Pingree Grove	Scheflow Engineers Frank Cuda	1814 Grandstand Place Elgin, IL 60120	(847) 697-7095 (847) 697-7099	scheflow@foxvalley.net
St. Charles	Greg Chismark	2 E. Main St. St. Charles, IL 60174	(630) 377-4486 (630) 584-6520	gchismark@ci.st-charles.il.us
Sleepy Hollow	Gerald Hines & Associates Joe Hines	206 N. River East Dundee, IL 60118	(847) 426-4535 (847) 426-4584	glheinzinc@aol.com
South Elgin	Baxter & Woodman Steve Larson	4845 W. 167th Street Oak Forest, IL 60452	(708) 560-7070 (708) 560-7556	slarson@baxwood.com
Sugar Grove	Engineering Enterprises, Inc. Dave Burroughs	52 Wheeler Road Sugar Grove, IL 60554	(630) 466-9350 (630) 466-9380	dburroughs@eeiweb.com
Virgil	Wendler Eng. & Surveying Inc. David Weber	444 E. Hillcrest Dekalb, IL 60115	(815) 756-7756 (815) 748-0961	davew@wendler.nu
Wayne	Christopher Burke Eng. Dan Lynch	9575 W. Higgins Rd. Suite 600 Rosemont, IL 60018	(847) 823-0500 (847) 823-0520	dlynch@cbbel.com
West Dundee	Christopher Burke Eng. Donald Dressel and Earth Tech Jay Kesson	9575 W. Higgins Rd. Suite 600 Rosemont, IL 60018 3121 Butterfield Rd. Oak Brook, IL 60521	(847) 823-0500 (847) 823-0520 (630) 574-2006 (630) 574-2007	ddressel@cbbel.com james_kessen@earthtech.com
Unincorporated County	Paul Schuch	719 Batavia Ave, Geneva, IL 60134	(630) 232-3497	schuchpaul@co.kane.il.us

FORM 6

CERTIFIED COMMUNITY FORM FOR EXEMPT PROJECT

Name of Community/Unincorporated Area applying for exemption _____

Name, Address, and Title of Submitter:

_____

_____

_____

Title: _____

Indicate reason for exemption:

? Substantial Development has commenced

? Stormwater Development Plan provides:

- minimum detention of 0.15 cfs/acre release rate
- designed conveyance system for flow rates up to base flood with no damage
- soil erosion and sediment control with Illinois Urban Manual

Description of Proposed Development (Describe in detail, including area of site, drainage area, project purpose and intended use, and estimated time until completion):

Location of Proposed Development:

_____
Name of waterway at development

_____
Street address or other descriptive location

Legal Description:

_____
¼, Section. Township, and Range

Review of this exemption is hereby made for authorization for the proposed development described herein. I certify that the information in this submission is true, complete, and accurate.

_____ _____
Signature of Submitter Date

Office Use Only

Municipal Approval	Date	Signature
Approved by Village/Council Board	_____	_____
Final Approval	Date	Signature
Director of Environmental Management	_____	_____
Special Conditions of Exemption:		

FORM 7

CERTIFIED COMMUNITY ANNUAL FORM FOR PROJECT STATUS

(This form shall be completed for each project)

Community _____ Date_____

Name, Address and Title of Submitter:
_____
_____
_____

Telephone no. during business hours:
A/C ( )_____ - _____
Fax no. (if applicable)
A/C ( )_____ - _____

PROJECT INFORMATION:
Project Name: _____
Site Location: _____
Section/Township/Range: _____

Check components that affect project:
? stormwater ? floodplain ? wetlands

Check Phase of Construction:
? pre-construction ? during construction ? post-construction

Please Describe Tasks completed during year:

Please Describe Tasks to be completed in the following year:

I hereby certify that all tasks completed during this year comply with the Kane County Stormwater Management Ordinance, and that all information presented in this submittal is true and accurate to the best of my knowledge.

_____ _____
Signature of Submitter Date

** A copy of every stormwater permit application (Form 2) shall be included with this form.*

FORM 8

INSPECTION CHECKLIST DURING CONSTRUCTION

1. Is the sediment an erosion control system as depicted on the plans installed?

2. Has the developer been maintaining the system after rain fall events?

3. Is there evidence of sediment being carried down stream from the development site at the project boundaries? If so, this is an indicator of an inadequate sediment erosion control plan and corrective action must be taken.

4. As construction progresses are there provisions for handling off site flows into the construction site without increasing upstream water surface elevations?

5. Is there adequate stormwater storage provided in sedimentation basins? Is there functional detention storage being provided for the development as it is being constructed? (In general some sort of detention basin must be in place prior to the construction of impervious surfaces).

6. Are existing wetlands to be preserved adequately protected during construction with fencing and other appropriate sediment and erosion control measures to limit both vehicle access and the impact of sediment from the construction site?

7. Is any required culvert or bridge being constructed in a manner to provide the least disturbance of the aquatic resource?

8. Are buffers delineated in the field and protected from intrusion by construction vehicles and other construction activities?

9. Are any required restrictor structures installed as soon as practicable on the conveyance system?

10. Are sediments being removed from basins and disposed of properly on site in a manner that does not promote their reintroduction into the stream system?

11. Are the limitations to the amount of area that can be worked being followed?

FORM 9

INSPECTION CHECKLIST AFTER CONSTRUCTION

1. Are required storm water detention/retention facilities in place and generally as they appear on the as-builts from the permitted plans?

2. Are any required restrictors in place and is the outlet control structure generally “clean”?

3. Are any required on site buffers around wetlands in place and free from prohibited activities?

4. Are there signs of failed construction?

    a. Settlement of berms.
    b. Slope instability.
    c. Accumulated sediment in detention/retention facilities.
    d. Questionable conditions at facilities related to retaining walls.
    e. Adequate stabilization of surfaces – i.e., stand of grass or other stabilizing means.

5. Have “record drawings” been submitted?

FORM 10

DEVELOPER'S STATEMENT

Right to Draw on Securities
Section 1201.1 (c & d) & 1202.1.b

I, _____, do hereby grant to the Administrator of _____
Developers Name County/Municipality
The right to draw on performance security posted in accordance with the Storm Water Permit _____ for the purpose of completing any and all
(Number/Description)
Stormwater Facilities and completing or maintaining Sediment and Erosion Control Measures included in the referenced permit. The decision to draw on the security shall be at the discretion of the Administrator. I further grant the right to enter the property for the purpose of performing the work to whoever the Administrator designates and agree to identify _____ against any increased costs
County/Community
attributable to concurrent activities or conflicts between the Administrators design's and any other contractors on site. I further warrant that I am a duly authorized representative of the developer with the authority to make this statement, and that this statement shall remain binding until final inspection and acceptance of all permitted Stormwater Facilities.

STATEMENT FOR: _____
Developer

BY: _____
Name and Signature

TITLE: _____

RELEASED BY FINAL ACCEPTANCE

FOR: _____
County/Community

BY: _____
Administrator

DATE: _____

FORM 12

EROSION AND SEDIMENT CONTROL INSPECTION REPORT

Project Name: _____ File No.: _____

Inspection Date: _____ Time: _____ Inspected By: _____

Stage of Construction

___ Pre-Construction Mtg. ___ Rough Grading ___ Finish Grading

___ Clearing & Grubbing ___ Building Construction ___ Final Stabilization

YES	NO	N/A	Inspection Checklist
__	___	__	1. Have all disturbed areas requiring temporary or permanent stabilization been stabilized? Seeded? Mulched? Graveled?
__	___	__	2. Are soil stockpiles adequately stabilized with seeding and/or sediment trapping measures?
__	___	__	3. Does permanent vegetation provide adequate stabilization?
__	___	__	4. Have sediment trapping facilities been constructed as a first step in disturbance activity?
__	___	__	5. For perimeter sediment trapping measures, are earthen structures stabilized?
__	___	__	6. Are sediment basins installed where needed?
__	___	__	7. Are finished cut and fill slopes adequately stabilized?
__	___	__	8. Are on-site channels and outlets adequately stabilized?
__	___	__	9. Do all operational storm sewer inlets have adequate inlet protection?
__	___	__	10. Are stormwater conveyance channels adequately stabilized with channel lining and/or outlet protection?
__	___	__	11. Is in-stream construction conducted using measures to minimize channel damage?
__	___	__	12. Are temporary stream crossings of non-erodible material installed where applicable?
__	___	__	13. Is necessary restabilization of in-stream construction complete?
__	___	__	14. Are utility trenches stabilized properly?
__	___	__	15. Are soil and mud kept off public roadways at intersections with site access roads?
__	___	__	16. Have all temporary control structures that are no longer needed been removed? Have all control structure repairs and sediment removal been performed?
__	___	__	17. Are properties and waterways downstream from development adequately protected from soil erosion and sediment deposition due to increases in peak stormwater runoff?