IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
WESTERN DIVISION

THE UNITED STATES OF AMERICA and THE STATE OF ILLINOIS Plaintiffs, v. THE CITY OF ROCKFORD, ILLINOIS, Defendant.	)	Civil Action No. 3:15cv50250

CONSENT DECREE
APPENDIX H

THE CITY OF ROCKFORD ILLINOIS, USA

INDUSTRIAL HIGH RISK RUNOFF FACILITY INSPECTION PROGRAM

STANDARD OPERATING PROCEDURES

June 2015

1.0 General

The goal of this standard operating procedure is to reduce the amount of polluted runoff from industrial and commercial facilities entering the City of Rockford's MS4. This industrial high risk runoff inspection program complies with Part II, A, 9 of the City of Rockford's NPDES Storm Water Permit (ILS000001). This document addresses how industrial facilities are identified for inspections and the procedures for performing them.

2.0 Legal Authority

Legal authority for the Industrial High Risk Runoff Inspection program is found in the City of Rockford's Code of Ordinances Chapter 109, Article 12. This Chapter of the City of Rockford Code provides City staff the authority to access properties for inspections.

3.0 Staffing

Staff from the Department of Public Works shall be responsible for performing inspections at industrial, commercial and other high risk facilities to ensure that these facilities are in compliance with the City of Rockford's Code of Ordinances Chapter 109, Article 12. Each team member shall be trained to perform the inspections as referenced in the ILR00 industrial stormwater permit and shall be familiar with this document. The primary public works staff trained to perform industrial inspections shall be the following positions: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Project Manager, Stormwater Coordinator and designated project Managers and Engineering Techs. Each shall be trained in performing industrial inspections from in-house and external training sources as approved by the Engineering Operations Manager and the Stormwater Program Manager(s). Project Managers and Engineering Technicians can perform inspections provided they have the above training and are approved to perform inspections by the Engineering Operations Manager and the Stormwater Program Manager(s).

All training shall be in accordance with the Standard Operating Procedures for Stormwater and Environmental Education.

The following equipment may be utilized when performing inspections: a copy of the SWPPP and SPCC for the site if available (if copies cannot be obtained beforehand they shall be reviewed onsite), clipboard, inspection form, camera, sampling supplies, personal protection equipment. Personal protection equipment shall include:

- Hard hats – as required by the industrial facility.
- Safety vests – as required by the industrial facility
- Work boots
- Safety glasses - as required by the industrial facility

Safety while doing any inspection is a top priority. Staff should always be aware of their surroundings as well as the location of equipment operating in the area.

4.0 Inspection Frequency and Priority

Inspections may be scheduled in advance or without prior notice. Inspections shall be prioritized based on the following:

Inspection Priority		Approx. # of Facilities	Priority Ranking
Citizen Complaints and Staff Observations			High
Flows recorded during outfall Inspections & tracked to an industrial facility & past compliance concerns within the past 3 years.			High
Municipal Facilities (see attachment B for list of municipally owned facilities and priority ranking)	List categories of high priority facilities (e.g., vehicle maintenance)	2	High
	List categories of medium priority facilities	2	Medium
	List categories of low priority facilities (e.g., municipal buildings)	80	Low
Facilities requiring an IEPA industrial Stormwater permit based on SIC and ILR00	Facilities with approved permit	57	Medium
	Unpermitted facilities - Food Manufacturing (SIC starting at 20)	17	Medium
	Unpermitted facilities - Textile & Apparel products & manufacturing (SIC starting at 22,23)	18	Low
	Unpermitted facilities – Wood & paper manufacturing facilities (SIC starting at 24, 25)	17	High
	Unpermitted facilities – Wood, paper & Printing facilities (SIC starting at 27)	52	Low
	Unpermitted facilities – Chemical & Petroleum related industries (SIC Starting at 28, 29)	32	High
	Unpermitted facilities – Rubber, leather & glass products. (SIC starting at 30, 31, 32)	32	Low
	Unpermitted facilities – Metal fabrication Industries (SIC starting at 33, 34, 35)	293	High
	Unpermitted facilities – Electronic & transportation equipment (SIC starting at 36, 37, 38)	46	Low
	Unpermitted facilities – Miscellaneous Manufacturing (SIC starting at 39)	27	Low
	Unpermitted facilities – Transportation and trucking services, USPS (SIC starting at 41, 42, 43)	153	Low
	Unpermitted facilities – Recycling Facilities (SIC starting at 5015, 5093	8	High
	Facilities with No Exposure Certifications	60	Low
Facilities that do not required an IEPA industrial Stormwater permit	Commercial Fueling Stations	66	Medium
	Laundry and dry cleaning facilities	20	Medium
	Car repair shops and car washes	159	Medium
	Retailers with lawn & garden centers	8	Medium
	Large & Small retailers	75	Low
	Landscapers	37	Low
	Restaurants	596	Low
	Other facilities as determined by the City	------	TBD

The City shall inspect 100% high priority facilities and 50% medium priority facilities once every permit term. The City shall continue to evaluate the database using desktop analysis to determine if a facility's Standard Industrial Classifications (SIC) are appropriate, if it is still operational and within City limits. Citizen complaint inspections will be in addition to the scheduled inspections. Low priority facilities shall not be inspected unless there is a complaint submitted or an issue referred by another public entity such as the County Health Department or the RRWRD. The facility inventory and prioritization will be evaluated annually and revised where appropriate based on inspection findings and desktop analysis. New facilities will be added when identified. Changes will be summarized each year in the Annual Report.

Once all high and medium priority facilities have been reviewed new inspections on the facilities shall commence.

Complaints from the public shall be recorded and investigated. The City has a citizen complaint program which includes a hotline (779-348-7300) for phone calls and the City's website (www.rockfordil.gov) to register a complaint. Calls to the hotline shall be forwarded to the Stormwater & Environmental Program Manager or the Stormwater Project Manager. The same positions are sent emails for online complaints.

Citizen complaints shall be followed up with a field inspection by City staff within 72 hours of the complaint being submitted. Citizen complaints may initially be investigated as an Illicit Discharge Investigation (see Illicit Discharge and Detection and Elimination Standard Operating Procedures. If an industrial inspection is warranted procedures in Section 6.0 shall be followed. Priority ranking and inspection frequency may be adjusted based on inspection results if necessary.

5.0 Identification of Industrial High Risk Runoff Facilities

The City utilizes the following resources to build and update their industrial facility database for performing inspections. Updated data shall be incorporated into the existing database and mapping. This database shall be updated annually and changes referenced in the annual report. Mapping of industrial facility locations shall be updated at the same time as the database. See Appendix A for contacts to the listed organizations

5.1 Rock River Water Reclamation District

The Rock River Water Reclamation District {RRWRD) requires that all significant industrial users that wish to connect to the Publicly-Owned Treatment Works (POTW} obtain a wastewater discharge permit prior to connecting or discharging to the POTW. This information is maintained by the RRWRD in their customer database.

5.2 NPDES Permitted Facilities

The Illinois Environmental Protection Agency (IEPA) issues NPDES permits to industrial facilities (based on SIC code) and maintains information on permitted sites on their website. The City will work with the local office of the Illinois Environmental Protection Agency to review its list of permitted sites or utilize the website below to make sure all NPDES permitted sites have obtained the proper City of Rockford approvals. This website shall be reviewed quarterly and the database updated as needed. (http://dataservices.epa.illinois.gov/NoticesofIntent/IndustrialQuickSearch.aspx)

Since IEPA does not list "No Exposure" certifications on their website the City shall request an updated list annually from IEPA.

5.3 Sara Title III and EPCRA Reporting (Toxic Release Inventory)

The City reviews the USEPA's Toxic Release Inventory (TRI), which requires facilities to submit data annually. This inventory shall be reviewed to determine what facilities within Rockford City limits have submitted reports and to add them to the database if necessary. (http://www.epa.gov/tri/index.htm).

5.4 City of Rockford Fire Department

The City of Rockford Fire Department maintains a database of industrial facilities with hazardous materials (Tier II reporting to Illinois Emergency Management Agency). An updated copy of this shall be requested annually and the database updated as needed.

5.5 City of Rockford Water Division

That City of Rockford Water Division shall provide a list of non-residential (more than one unit) users annually. This list can be used to determine existing facilities using water and further to identify any industrial activity not otherwise captured for prioritization. This list shall be updated annually.

5.6 Winnebago County Health Department

The Winnebago County Health Department maintains a list of permanent food establishments in Winnebago County. The City shall request an updated copy annually and update its database as needed.

5.7 Illinois Department of Agriculture – Motor Fuel Dispenser Information for Businesses

The City utilizes the Illinois Department of Agriculture's database to determine the locations of licensed fueling stations within City limits. This report is updated annually. (http://www.agr.state.il.us/programs/consumer/w&m/index.html)

5.8 City Owned Facilities

The database shall include City owned facilities which use or store pollutants or implement activities that may pose a threat to water quality. These facilities shall include, but are not limited to: city yards including vehicle storage and maintenance facilities, well houses, pesticide storage facilities, the compost facility, publicity owned parking lots, and City owned public buildings. While IEPA has confirmed that stormwater discharges from the city yards do not require authorization under a NPDES permit, the City shall develop a stormwater plan establishing best management practices for that site and shall evaluate that plan annually for potential improvements to best management practices and efficiencies to operations. Changes to the plan shall be summarized in the Annual Report. All other facilities shall maintain Stormwater Pollution Prevention Plans or Spill Prevention Control and Countermeasure plans if required through state or federal requirements.

Well houses are inspected daily by the Water Division for chemical leaks and other issues per Water EPA requirements. All other City owned facilities shall be inspected based on their priority rank. See Appendix B for a list of City owned facilities and their priority ranking.

6.0 Performing Industrial High Risk Runoff Inspections

The Industrial Survey Storm Water Compliance form (Appendix C) shall be completed during the inspection and any noticeable issues addressed with the facility supervisor during an exit interview. The inspector should review all areas of a facility that could impact water quality through stormwater runoff or illicit discharges. During the inspection, City inspectors shall complete the following steps:

1) For facilities requiring NPDES Industrial stormwater permitting, an appointment shall be made with the site representative. This is to ensure the appropriate person is onsite and available. For facilities that do not require an industrial stormwater permit unscheduled inspections are preferred.
2) If scheduling, obtain a copy of the facilities Stormwater Pollution Prevention Plan (SWPPP) for review in advance of the inspection. If it is not available the SWPPP shall be reviewed during the inspection.
    a. Review the facilities standard industrial classification (SIC) and confirm a SWPPP or No Exposure certification is required.
    b. If permitting is required confirm SWPPP is up to date and/or confirm the facility qualifies for the No Exposure certification.
    c. Review required inspection reports.
    d. If a facility does not have a permit/SWPPP as required discuss with site manager the permit requirements and determine a timeframe to develop a SWPPP. These facilities shall be referred to the IEPA in a timely manner.

3) Review the interior and/or exterior of the facility as needed utilizing the attached inspection report (Appendix C).
    a. Any items in the visual survey section of the inspection report marked "no" shall be reviewed with the site manager with possible corrective actions discussed.
    b. Photos may be taken if possible and not against the facility's policy.
    c. Review the facilities discharge point(s) as indicated on the SWPPP. If the discharge point is not indicated the inspector shall determine the discharge point (i.e. storm drain inlets, where the facilities storm sewer enters the City's right-of-way, an adjacent drainageway, property perimeter etc.). See Table 1 for common discharges produced at generating sites.
    d. Ensure floor drains are not connected to the stormsewer system.
4) Indicators of potential illicit discharges from a facility include:
    a. Odors (gas, sewer, rancid/sour, etc.)
    b. Deposit/stains (oily, flowline, paint, etc.)
    c. Pipe Benthic growth
    d. Dry weather discharges from the facility to the storm sewer system
    e. Other potential indicators can be found in the Illicit Discharge and Elimination standard operating procedures.
5) If an indicator of illicit discharges is present the City may:
    a. If sampling of the questionable discharge is required by the facility's NDPES permit, verify that sampling is being completed and request test results.
    b. If sampling is not required or being completed for the particular discharge in question, or the City questions the accuracy of the facility's test results, the City can request additional sampling to confirm tests. Inspectors shall observe sampling to verify location of sample taken.
    c. Utilize the City's field testing equipment and follow the monitoring standard operating procedures. Sample types shall be based on the type of facility.
        i. Sampling may need to be completed upstream of the site to verify the source of suspected illicit discharge.
        ii. If an illicit discharge is not from the facility, initiate an illicit discharge investigation as detailed in the Illicit Discharge Detection and Elimination standard operating procedures.
    d. If test results indicate presence of contaminants including exceedances of NDPES permit limits, contact IEPA and City legal department to discuss enforcement.
    e. Require facility to implement temporary and/or permanent best management practices based on their response plans and as approved by the City to control or eliminate the contaminant.
    f. Perform subsequent field test to confirm that discharge has been managed appropriately.
    g. All documents, sampling results and conversations shall be saved as indicated later in this document.
6) Letters shall be sent to all NPDES permitted facilities detailing inspection findings and timeframes for performing corrective actions (see sample letter in Appendix D). A copy of this letter shall also be emailed to the Illinois EPA Rockford office (see Appendix A for contact information). For facilities that do not require NPDES permitting, letters shall only be sent if there are corrective actions.

Table 1: Common Discharges Produced at Generating Sites	
Generating Site	**Activity Generating the Discharge**
Vehicle Operations (Maintenance, Repair, Fueling, Washing, Storage)	• Improper disposal of fluids down shop and storm drains • Spilled fuel, leaks and drips from wrecked vehicles • Hosing of outdoor work areas • Wash water from cleaning • Spills
Outdoor Materials (Loading/Unloading, Outdoor Storage)	• Liquid spills at loading areas • Hosing/washing of loading areas into shop storm drains • Leaks and spills of liquid stored outside
Waste Management (Spill prevention and response, Dumpster management	• Spills and leaks of liquids • Dumping into storm drains • Leaking dumpsters
Physical Plant Maintenance (Building repair, Remodeling and maintenance, Parking lot maintenance)	• Discharges from power washing steam cleaning • Rinse Water and wash water discharges during clean up • Runoff from degreasing and re-surfacing
Turf and Landscaping (Turf Management Landscaping/rounds care)	• Non-target irrigation • Improper rinsing of fertilizer/pesticide applicators
Unique Hotspot Operations (pools, Golf Courses, Marinas, Construction, restaurants, Hobby Farms)	• Discharge of chlorinated water from pools • Dumping of sewage and grease.

7.0 Enforcement

Enforcement measures shall be in accordance with Chapter 109, Article 13 and the City of Rockford Storm Water Division Enforcement Response Plan for corrective actions not remedied within the required timeframe.

8.0 Documentation and Record Management

Hard copies of site data (inspection reports and letters) will be filed by address in file folders. In addition, digitized copies will also be saved in the Stormwater Drive on the City of Rockford computer system. Digitized information may include: SWPPP, inspection reports/checklists, letters, photos, correspondence, etc. These files will be saved as follows:

1) Open the Stormwater Drive (note: this drive has limited access for people who perform duties directly related to the City's stormwater program),
2) Open the IHRRI folder,
3) Open the IHRI Inspections folder,
4) Open the inspection folder for the current year,
5) Inspections shall be saved by address and facility name.
6) If a folder for a site is already created open it and save the data. Inspection reports should be saved by date. If it is a new site create a new folder.

Any industrial facility site where inspections carry over to the next year shall have the entire digitized inspection folder copied and pasted to the next year. All hard copy inspections shall be saved in the same file.

An excel spreadsheet for all inspections has also been created. This spreadsheet can be found in the Stormwater Drive in the folder entitled ***Inspection and Sampling Logs***. All spreadsheets are saved by year for easy tracking. Data includes: date, facility name and address, SIC number, NPDES permit # (if applicable), type of follow-up needed, date of follow-up and whether corrective actions have been addressed. Notes about the inspection can also be included.

Appendix A

Database Contacts

Company	Name	Phone #	Email	Website
Rock River Water Reclamation District	Barb LeMoine	815-387-7636	BLeMoine@rrwrd.dst.il.us	
City of Rockford Fire Department	Ken Eitenmiller – Hazardous Materials Chief	779-348-7171	Ken.eitenmiller@rockfordil.gov	
	Matt Knott – Division Chief	779-500-6537	Matt.knott@rockfordil.gov	
City of Rockford Water Division	Tim Holdeman	779-348-7355	Tim.holdeman@rockfordil.gov	
Illinois EPA	Melissa Parrott (Springfield)	217-782-0610	Melissa.Parrott@Illinois.gov	http://dataservices.epa.illinois.gov/NoticesofIntent/IndustrialQuickSearch.aspx
	Thomas Williams (Rockford)	815-987-7760	Thomas.williams@Illinois.gov	
Winnebago County Health Department (may need to submit FOIA)	Lisa Sprecher	815-720-4117	lsprecher@wchd.org	
Sara Title III and EPCRA Reporting	List only			http://www.epa.gov/tri/index.htm
Illinois Department of Agriculture	List only			http://www.agr.state.il.us/programs/consumer/w&m/index.html

Appendix B

PROPERTIES OWNED BY CITY OF ROCKFORD, ILLINOIS

Name	Type	Address	Priority Ranking
Armory	Vacant Development Prop	613 N Main Street	Low
Shopstead	Leased Retail Space	1012 S Main Street	Low
City Yards Admin	City Operations Location	523 S Central Ave	Low
City Yards Shop	Mechanic Shop	523 S Central Ave	High
City Yards Traffic	City Operations Location	523 S Central Ave	High
Water Division	Water Operations Location	1111 Cedar Street	Medium
City Hall	City Operations Location	425 E State Street	Low
Fire Administration/911	City Operations Location	201 S 1ST Street	Low
Fire Station 1	Fire station	528 Woodlawn Avenue	Low
Fire Station 2	Fire station	1004 7th Street	Low
Fire Station 3	Fire station	1520 S. Main Street	Low
Fire Station 4	Fire station	2959 Shaw Woods	Low
Fire Station 5	Fire station	391 Trainer Road	Low
Fire Station 6	Fire station	3329 W State Street	Low
Fire Station 7	Fire station	4979 Falcon Road	Low
Fire Station 8	Fire station	505 Sherman	Low
Fire Station 9	Fire station	2416 Halstead	Low
Fire Station 10	Fire station	3407 Rural	Low
Fire Station 11	Fire station	2117 Calgary	Low
Coronado Theater	Theater	312-314 N Main Street	Low
Ingersoll	Vacant Development Prop	301 S Water Street	Low
Fire Repair Shop	Mechanic Shop	2323 Sawyer Road	Medium
Human Services	City Operations Location	625 N Church Street	Low
PSB Overnight Parking	Open Lot Vehicles	420 W State Street	Low
Concourse Overnight Parking	Open Lot Vehicles	322 S Church	Low
Yards Overnight Parking	Open Lot Vehicles	400 S Independence	Low
Plant		Stanley St. south of Preston	Low
Group 1	Group well-no bldg	Cedar & Tay St's	Low
Group 2	Group well-no bldg	Cedar & Stanley St's	Low
Group 5	Group well-no bldg	Preston & Tay St's	Low
Group 6	Group well-no bldg	Chestnut & Tay St's	Low
Well 3	Base Well	1404 Riverbluff Blvd.	Low
Well 4	Land to be sold	801 Marchesano Dr.	Low
Well 5 - 5A	Treatment plant	2526 Pelham Rd.	Low
Well 6	Base Well	2604 19th Ave.	Low
Well 9A	Secondary Well	2708 Crosby St.	Low
Well 10	Treatment plant	4316 Newburg Rd.	Low
Well 11	Land to be sold	1218 7th Ave.	Low
Well 12	Land to be sold	1022 Benton St.	Low
Well 13	Treatment plant	4625 Skyline Dr.	Low
Well 15	Zone Control Valve	3030 Chestnut St.	Low
Well 16	Land to be sold	4550 Harrison Ave.	Low
Well 17	Secondary Well	3700 Brookview Rd.	Low
Well 18	Base Well	1409 S. Johnston Ave.	Low
Well 19	Used for storage only	1220 Lockheed Lane	Low
Well 20	Land to be sold	2434 N Central Ave,	Low
Well 21	Base Well	703 Daisyfield Rd.	Low

Well 22	Base Well	5110 Auburn St.	Low
Well 23	Secondary Well	1206 Elmwood Rd.	Low
Well 24	Base Well	6475 Cessna Dr.	Low
Well 25	Secondary Well	5602 Springcreek Rd.	Low
Well 26	Secondary Well	5516 E State St.	Low
Well 27	Land to be sold	5834 Guilford Rd.	Low
Well 28	Secondary Well	5400 Kishwaukee Rd.	Low
Well 29	Treatment plant	4750 Pepper Dr.	Low
Well 30	Treatment plant	6544 Palo Verde	Low
Well 31	Treatment plant	1780 Bell School Rd.	Low
Well 33	Used for storage only	930 Arthur Ave.	Low
Well 34	Base Well	3945 Dawes Rd.	Low
Well 35	Secondary Well	2944 Bildahl St.	Low
Well 36	Treatment plant	4141 Samuelson Rd.	Low
Well 37	Base Well	2100 Huffman Blvd.	Low
Well 39	Secondary Well	7423 Springbrook Rd.	Low
Well 40	Treatment plant	788 Lyford Rd.	Low
Well 42	Treatment plant	6733 Newburg Rd.	Low
Well 43	Treatment plant	3447 Publishers Dr.	Low
Well 44	Base Well	5250 Owen Center Rd.	Low
Well 45	Base Well	1141 Cedar St.	Low
Tank T-02	Elevated Tank	2310 Wentworth Ave	Low
Tank T-05	Elevated Tank	Christopher Drive	Low
Zone Control Valve-01	Zone Control Valve	Spring Creek & Springdale	Low
Zone Control Valve-02	Zone Control Valve	5701 Strathmoor Dr	Low
ZCV-03	Zone Control Valve	N Mulford & Mulford Village Dr	Low
ZCV-04	Zone Control Valve	738 Lyford Rd	Low
ZCV-05	Zone Control Valve	Highcrest & Spring Creek	Low
ZCV-06	Zone Control Valve	Crosby St & Dawson Ave	Low
ZCV-07	Zone Control Valve	Harrison Ave & 22nd St	Low
ZCV-09	Zone Control Valve	3030 Chestnut St.	Low
	Inter-zone booster station	Guilford & Fairview	Low
	Inter-zone booster station	Alpine & E State	Low
	Inter-zone booster station	Broadway & Eastgate Pkwy	Low
	Inter-zone booster station	Sandy Hollow & 20th St	Low
	Inter-zone booster station	Elmwood Rd	Low
	Inter-zone booster station	Samuelson Rd	Low

Appendix C

Industrial Survey
Storm Water Compliance Form

COMPANY NAME			DATE
TELEPHONE		FAX	
ADDRESS		CITY, ZIP	
MAILING ADDRESS (if different from site address)		MAILING CITY, ZIP	
CONTACT		TITLE	EMAIL/PHONE NUMBER
FACILITY #	SIC CODE	Does the facility have a NPDES industrial storm water permit or a 'No Exposure' Exemption? (circle one) Yes No	
DAYS OF WEEK FACILITY CONDUCTS BUSINESS (CIRCLE): Sun Mon Tues Wed Thurs Fri Sat Hours of Operation: _____		Is the SWPPP available or review? Yes No NA	

Weather Conditions: ☐ Clear ☐ Cloudy ☐ Rain ☐ Sleet ☐ Fog ☐ Snowing ☐ High Winds ☐ Other:
Temperature:

Briefly describe the principal activities that occur on-site including all manufacturing and/or services provided.

Are any vehicles serviced or washed/cleaned at this facility? (circle one) Yes No
If yes, is this performed indoors or outdoors?

Does the waste drain to (circle one): Rockford sanitary sewer Dry well Storm sewer
100% recycled Collected for off-site disposal

Are any materials/products stored outdoors (i.e. chemicals, equipment, tanks, drums, barrels, etc.)? If Yes what is the material? _____, Where is it stored? _____
How is it stored? (pallets, undercover, etc.)

Do you use or store liquid chemicals in quantities of 25 pounds or more? (circle one) Yes No
If yes, is this indoor or outdoor storage? If outdoors, where and how? _____

If Yes what is the chemical? _____ Is there secondary containment? (circle one) Yes No

Proximity to water bodies, drainageways and inlets?

Do you use or store dry chemicals in quantities of 500 pounds or more? (circle one) Yes No
If yes, is this indoor or outdoor storage?

If Yes what is the chemical?

Does the facility generate *any* wastewater excluding domestic wastewater? (circle one) Yes No
If yes, please describe the wastewater. (circle all that apply)

Boiler blowdown Noncontact cooling water Process water Remediation water

Cooling tower blowdown Wash water (vehicle, equipment, etc.)

Other _____

Is this wastewater discharged to the Rockford sewer system? (circle one) Yes No Unknown

VISUAL SURVEY	YES	NO	N/A
GENERAL – Are regular housekeeping practices carried out? Are good housekeeping procedures and reminders posted in appropriate locations?			
SPILL CONTAINMENT - Are appropriate spill containment and cleanup materials kept on-site and in convenient locations and are staff familiar with these locations and use of the material?			
EQUIPMENT - Is exposed piping and process equipment regularly inspected and/or tested to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters?			
OUTSIDE AREAS (Free of staining & debris; exhibits good housekeeping; maintained in a manner to prevent runoff)			
CHEMICAL STORAGE – The outside storage area is kept to minimize the possibility of a release. Chemicals/materials are protected from precipitation/storm water runoff and the containers show no signs of leaking.			
DUMPSTERS – No liquids are leaking from the dumpster; surrounding area is free of trash. Distance from water bodies, inlet and drainageways. _____			
ABOVEGROUND STORAGE TANKS – No ground staining, no spillage observed and no discharge to storm drain. Tanks are maintained to minimize the possibility of a release (secondary containment).			
ONSITE STORM DRAIN – Protected from accidental discharge other than water.			
POWER WASH OR STEAM CLEAN - (discharge to sewer) Drains to oil/water separator connected to a sanitary sewer and not a septic system. Steam cleaning not discharged to parking lot, storm drain or soil.			
PARKING LOT/DRIVEWAY – Free of excess trash, chemical staining or liquids other than water.			
Indicators are not present to suspect an illicit discharges or connections? If answered "no" list indicators:			
MOP WATER TO SANITARY SEWER VIA CLARIFIER – Mop water is not dumped to the soil, parking lot, gutter, or other areas susceptible to storm water drainage.			
OTHER – Non-storm water discharge (i.e. non-hazardous process discharge)			
OVERALL EVALUATION/COMMENTS:			

Inspector Signature: _____ Date: _____

Form developed from the following sources: *Hazardous waste/Hazardous materials Facility Storm Water Compliance Survey* form for Riverside, CA, and *Industrial and Commercial Environmental Survey*, for Portland,

Appendix D

Timothy Hanson
Director
Public Works Department

July 8, 2013

(Insert name & address of
Permit holder contact)

RE: Industrial Inspection at (insert facility name) (ILR00 insert permit # if applicable)

Dear Mr. /Ms. ;

An industrial inspection for stormwater compliance was conducted on (insert date) by the City of Rockford. The purpose of the inspection was to determine if stormwater pollution prevention measures are adequate for the site and to determine if the site was in compliance with the City of Rockford's Code of Ordinances.

The inspection identified the following items needing corrections to comply with your IEPA Industrial Stormwater Permit and Chapter 109 of the City of Rockford Code of Ordinances:

1.
2.

I have included a copy of the IEPA industrial stormwater permit for your review and implementation. I have also included a link to the IEPA website which details the industrial permitting requirements as well as sample SWPPP's. (http://www.epa.state.il.us/water/permits/storm-water/industrial.html)

Please update the City via phone or email within 30 days to review your progress in completing the above items. Failure to contact the City shall result in enforcement measures as indicated in Chapter 109 and the City's Stormwater Division Enforcement Response Plan.

If you have any questions regarding this inspection please contact our Storm Water and Environmental Program Manager, Brad Holcomb, at (815) 967-7061 or email at brad.holcomb@rockfordil.gov.

Sincerely,

Matthew Vitner, P.E.
City Engineer

Timothy Hanson
Director
Public Works Department

Industrial Stormwater Inspection at (insert facility name) (ILR10 insert permit #)

Photo #1

Picture description

Photo #2

Picture description

Photo #3

Picture description

Note: Approval may be needed from the facility prior to taking photos.

Note: the attached photos indicate examples of corrective actions observed on this construction site. When performing maintenance as indicated in the photos, check the entire site for other areas with similar maintenance needs.

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CONSENT DECREE
APPENDIX I

THE CITY OF ROCKFORD ILLINOIS, USA

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE) PROGRAM

STANDARD OPERATING PROCEDURES

June 2015

1.0 General

The purpose of this standard operating procedure for Illicit Discharge Detection and Elimination program is to comply with Part II, A.7 of the City of Rockford's NPDES Stormwater Permit (ILS000001). This document outlines how to detect and investigate a potential illicit discharge.

Additional guidance can be found in: *Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments* by the Center for Watershed Protection.

2.0 Legal Authority

The City has the authority to investigate all reports of illicit connections or illegal dumping within its City limits. Legal authority for the City's Illicit Discharge Detection and Elimination Program can be found in the City of Rockford's Code of Ordinances in Chapter 109, Article 12.

3.0 Definition of Illicit Discharges

An illicit discharge is defined as any discharge that enters the MS4 (municipal separate storm sewer system) that is not composed entirely of stormwater, except discharges pursuant to a National Pollutant Discharge Elimination System (NPDES) permit.

3.1 Allowable Non-stormwater discharges

Illicit discharges are considered "illicit" because storm sewer systems, unlike sanitary sewer systems, are not designed to accept, treat, or discharge non-stormwater wastes. Unless identified by the City of Rockford or Illinois EPA as significant sources of pollutants to waters of the state, Table 1 indicates non-stormwater discharges that shall not be prohibited from entering the MS4 though they should be investigated to confirm they are the only source:

Table 1. Allowable Non Stormwater Discharges	
Waterline Flushing	Foundation drains
Landscape Irrigation	Air conditioning condensate
Diverted stream flows	Irrigation water
Rising ground waters	Springs
Uncontaminated pumped groundwater	Water from crawl space pumps
Discharges from potable water sources	Footing drains
Individual residential car washing	Lawn Watering
Dechlorinated swimming pool discharges	Street wash waters
Flows from riparian habitats and wetlands	Discharges or flows from emergency firefighting activities
Uncontaminated groundwater infiltration (as defined at 40 CFR 35.2005(b)(20)) to separate storm sewers	

3.2 Categories of Illicit discharges

1) TRANSIENT – Short in duration, lasting only a short time and then disappearing.
    a. Examples of potential Direct transient illicit discharges include:
        i. Intermittent discharges of wash water or process water to the storm sewer through a straight pipe connection from an industrial facility
        ii. Discharges of non-stormwater to a floor drain that is connected to the storm sewer.
        iii. Discharges of contaminated stormwater including discharges from industrial facilities that have, but are not in compliance with, a stormwater NDPES permit.

    b. Examples of potential Indirect transient illicit discharges include:
        i. Materials that have been dumped into a storm drain inlet or catch basin (Figure 1),
        ii. An old or damaged sanitary sewer line that is leaking fluids into groundwater that then seeps into a storm sewer line or drainage way, and
        iii. A failing septic system that is leaking into a cracked storm sewer line.

2) CONTINUOUS – Continuing without changing, stopping, or being interrupted. Examples include:
    a. Sanitary wastewater piping that is cross-connected from a building or sanitary sewer line to the storm sewer,
    b. A broken sanitary line resulting in discharge of sanitary waste into the storm sewer system(Figure 2), and
    c. A discharge of process wastewater or other non-stormwater from an industrial facility to the storm sewer system.

3.3 Illicit Discharge Indicators

The following are indicators of potential illicit discharges/connections. An investigation shall be initiated should any of the following be observed:

- Flowing water when there has been 3 days without precipitation
- Discolored water (cloudy, sheen on water, etc.)
- Sediment laden water
- Foul smelling water (i.e. fats, oil, grease from restaurants, sewage)
- Dead fish or animals near water bodies
- Blockages in storm system
- Sanitary sewer overflows
- Basement back-ups
- Floatables
- Staining indicating flows (oily, rust, etc.)

4.0 Staffing

The primary staff from the Stormwater Environmental Team (SWET) responsible for performing illicit discharge investigations shall be the following positions: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and a designated project manager and Engineering Techs.

The following staff from the following City of Rockford departments shall receive annual training for detecting and initiating illicit discharge investigations:

- Community and Economic Development – Inspectors, Enforcement Specialists
- Public Works Streets & Engineering Division, (Engineers, Managers, Technicians, Street Maintenance & supervisors)

When a potential illicit discharge has been observed the bubble chart in Appendix A shall be followed through the investigation process. Staff from the Department of Public Works Stormwater Environmental Team (SWET) shall be responsible for performing outfall inspections and review of illicit discharge complaints and/or observations. Each team member shall be familiar with this document and be trained to recognize potential illicit discharges and the process to initiate an investigation. Project Managers and Senior Engineering Techs can perform inspections provided they are current in their training and are approved to perform inspections by the Engineering Operations Manager and the Stormwater Program Manager(s).

Equipment to perform the investigation can include but not limited to: the field observation or appropriate inspection form, map of the storm system, camera, sample bottles, sampling equipment and personal protection equipment.

Under no circumstances should anyone perform an investigation that could cause bodily harm to themselves or others. In those cases the proper authorities. (i.e. the Fire Department) should be contacted for direction and assistance.

4.1 Safety Procedures

The field activities described in this guide could include sampling of potentially contaminated water and, as such, have some associated risk. As with any field procedures, appropriate precautions should be taken to ensure the safety of field crews. General and specific suggested safety procedures are provided below.

General suggestions:

- While performing field work activities, use appropriate caution, make an effort to recognize potentially dangerous situations while performing field work, and take the proper steps to avoid or minimize them.
- Field work activities should not be performed alone.
- A list of team member and emergency contact numbers should be kept with each field team.
- Long pants and close-toed shoes are required.
- Carry adequate water, sunscreen, and bug repellent if needed.

- Employees should use their judgment to ensure their safety while working during inclement weather. It may be necessary to suspend and/or reschedule field work if the weather will not permit safe and effective completion of the activities. Recommended precautions include:

  - Severe heat or cold: Dress appropriately, take breaks as needed to warm up or cool down, and stay hydrated.
  - Thunderstorms: Stop working, get out of the water, if applicable, and take shelter if there is a threat of lightning strikes.
  - Snowstorms, flooding, tornadoes, and other dangerous weather: Field work should be stopped or canceled if dangerous weather arises or is predicted.

- Each field work team should have a functioning mobile phone and a fully-stocked first aid kit.

Public roadways

- Whenever work will be performed in or near a public roadway, wear a high-visibility safety vest.

Manholes and similar structures

If a manhole cover or similar structure must be removed (in order to determine sewer line configuration, for example):

- Safety-toe footwear (steel-toed shoes) should be worn.
- Lifting manhole covers should be done with the proper tools and technique so as to avoid injury.
- The open cover should only remain open as long as necessary to gather the required information, and should never be left unattended.
- Due to the potential dangers of confined spaces, do not enter a manhole or put your head below the rim of the opening without the proper training.

Stream walks and illicit discharges

- Properly fitting waders with high-traction soles should be worn when walking in a stream.
- Rubber gloves should be worn if contact with polluted water is expected.
- Skin contact with suspected illicit discharges should be avoided.
- Hand sanitizer and/or careful hand washing should be employed after potential contact with polluted water.
- High-visibility orange or yellow vests should be worn.
- Wear safety goggles when performing any chemical tests.
- Reagents and other chemicals should be used and disposed of properly by following the guidance on the MSDS safety sheets.

5.0 Identification of Illicit Discharges

5.1 NPDES Permitted Facilities

During the process of performing industrial and construction inspections these sites will also be checked for illicit discharges and connections pursuant to the Standard Operating Procedures governing the City's Industrial High Risk Runoff Facility Inspection Program and its Erosion & Sediment Control Plan Review and Regulatory Inspections. The Illinois Environmental Protection Agency (IEPA) issues NPDES permits to construction sites and industrial facilities and maintains limited information on permitted sites on their website. This website shall be reviewed as detailed in those standard operating procedures to ensure all NPDES permitted sites identified have obtained the proper City of Rockford approvals.

5.2 Non-Routine Inspections

If an employee observes evidence of an illicit discharge during an informal or non-routine inspection, he/she shall complete the Field Observation Form (Appendix B) and provide it to a supervisor who shall inform a member of SWET by the end of the business day for further follow-up. SWET shall initiate an investigation within 3 business days. While it may not be reasonable to expect all City employees to have copies of the forms at all times, there are other ways to collect the information:

- The person observing the discharge can provide the information verbally to dispatch, the supervisor, or a member of SWET who can then complete the field observation form.
- The person can log information onto the form upon returning to the office based on their recollection and any field notes; or
- A member of SWET dedicated to inspecting and tracing illicit discharges can be sent to the location as soon as possible where the potential illicit discharge was observed to collect the necessary information directly on the form.

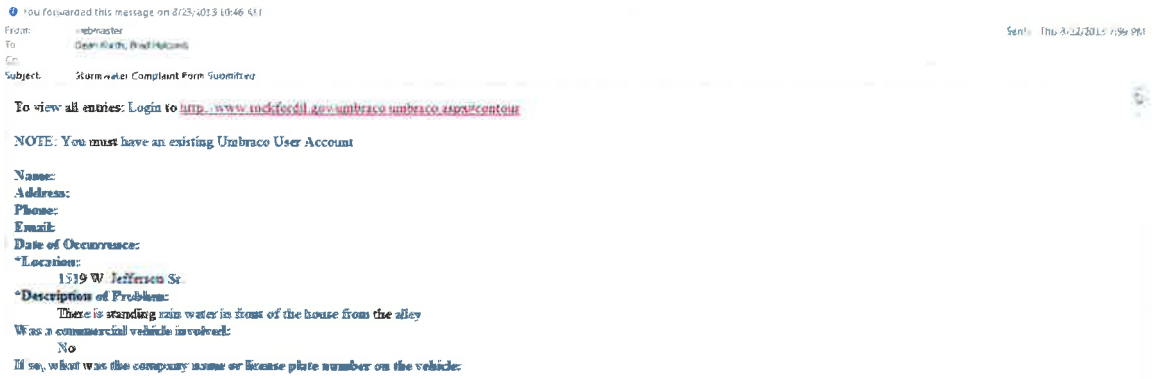
It is important to collect as much information as possible at the time of initial observation because of the likelihood that a discharge may be transitory or intermittent. Initial identification of the likely or potential sources of the discharge is also very important.

5.3 Submitted Complaints (i.e. citizens, staff, etc.)

Citizen complaints are a high priority for the City of Rockford. The City has an existing compliance program under which citizens can either call a hotline (779-348-7300) or report an illicit discharge/connection online (www.rockfordil.gov). All complaints from the public will be followed-up with the field inspection by City staff within 3 business days.

Reports to the hotline during normal business hours shall be forwarded directly to a member of SWET. Reports after hours shall be sent to Ocean Remote, a 24 hour service which will have instructions to notify the on-call supervisor. The supervisor shall send a crew to investigate and a field observation form (Appendix B) shall be filled out and provided to a member of the Storm Water & Environmental Team for further investigation.

Complaints submitted online shall be emailed directly to SWET who shall initiate an investigation within 3 business days. See sample below.



You forwarded this message on 8/23/2013 10:46 AM

From: webmaster
To: Dean Kieth, Brad Hutcomb
Cc:
Subject: Stormwater Complaint Form Submitted
Sent: Thu 8/22/2013 7:59 PM

To view all entries: Login to http://www.rockfordil.gov/umbraco/umbraco.aspx?content

NOTE: You must have an existing Umbraco User Account

Name:
Address:
Phone:
Email:
Date of Occurrence:
*Location:
1519 W Jefferson St
*Description of Problem:
There is standing rain water in front of the house from the alley
Was a commercial vehicle involved:
No
If so, what was the company name or license plate number on the vehicle:

5.4 Dry Weather Screening of Outfalls

Screening of stormwater outfalls is conducted during dry weather to identify potential illicit discharges (i.e., flowing outfalls, staining or other evidence of illicit discharge) and is followed by indicator monitoring to characterize flow types to aid in finding sources. The field screening can also be used to develop a systematic outfall inventory and map of the MS4 (Table 2). Regular inspections of outfalls are a primary part of an effective IDDE program.

Table 2. Outfalls to Include in the Screening

Outfalls to Screen	Features Not to Screen
• Both large and small diameter pipes that are, or appear to be part of the storm drain infrastructure. • Outfalls that appear to be piped headwater streams. • Field connections to culverts. • Submerged or partially submerged culverts • Outfalls blocked with debris or sediment • Pipes that appear to be outfalls from stormwater treatment practices • Small ductile iron pipes • Pipes that appear to only drain roof downspouts but are subsurface to prevent definitive confirmation.	• Drop inlets from roads in culverts (unless evidence of illegal dumping) • Cross-drainage culverts in transportation right-of-way (i.e. can see daylight at other end) • Weep holes • Flexible HDPE pipes that are known to serve as slope drains • Pipes that are clearly connected to roof downspouts via above ground connections

The inspections shall primarily rely on visual observations and the use of portable instrumentation during dry weather to complete a thorough inspection of the City's outfalls. See Table 1 on the Monitoring Standard Operating Procedures for a list of common indicator parameters used to detect illicit discharges. The protocol is applicable to most typical storm sewer systems; however, modifications to materials and methods may be required to address situations such as open channels, piped stream networks, systems impacted by sanitary sewer overflows, or situations where groundwater or backwater conditions preclude or confound adequate inspection. The primary focus of the protocol is sanitary waste, however, toxic and nuisance discharges may also be identified.

5.4.1 When to conduct an outfall survey?

- To maintain a regular schedule of long-term inspections for outfalls the City shall inspect all known outfalls every even year. The outfall database shall be updated following the even year inspections. Newly located outfalls shall be inspected in the years the City became aware of them.
- Late Fall/Early Spring- outfalls are easiest to spot during leaf-off conditions; however, it may require field work outside of the leaf-off time frame.
- After a dry period of at least 72 hours (trace rainfall activity may be acceptable depending on the size of the watershed).
- Early Morning/Late Afternoon- though not always possible, checking outfalls when people are home may increase the chances of catching an illicit connection.
- Avoid conditions during snow melt and/or if salt has been applied to the road system draining to the outfalls. Also note that some field tests (e.g. ammonia, chlorine) are affected by cold temperatures or confounded by the presence of salt (detergents).

5.4.2 Mapping

The first step to successful field work is to have a map with the necessary information. Data that shall be considered for inclusion on mapping for either outfall screenings or illicit discharge investigation is detailed in Table 3. Which data layers shall be dependent on the scale of the map and the type of illicit discharge reported. See appendix F for a sample map.

Table 3. Map Preparation

Desired Data layers Outfall Screenings	Desired Data layers Illicit Discharge Investigation
Roads	Roads
Streams	Streams
Outfall Locations	Outfall Locations
City Boundaries	Jurisdictional Boundaries
Aerial Photography	Aerial Photography
	Industrial facilities
	Storm System (inlets, manholes, pipes)
	Water mains
	Sanitary mains

5.4.3 Outfall screening procedures

The primary field screening tool shall be the Stormwater Inspection Outfall form (Appendix C). The basic procedure at each outfall is to take a picture of the outfall and, if the outfall is not already in the City's mapping system, mark the location on the printed map (record location on ArcGIS once back in the office). Next, a Stormwater Inspection Outfall form is completed, which includes recording a description of the outfall (e.g., pipe material, diameter), a description of physical indicators of potential illicit discharges for both flowing and non-flowing outfalls.

If the outfall has dry weather flow, an illicit discharge investigation shall be implemented.

6.0 Illicit Discharge Investigations.

An illicit discharge investigation shall be initiated when one of the identification measures indicates a potential illicit discharge or connection and the source has not been identified.

An illicit discharge source investigation is conducted to isolate the source of the pollution. There are two types of source investigations: Drainage Area Investigations and Storm Drain Investigations. An illicit discharge that is determined to be likely transient in frequency, entering the storm drain system directly through dumping or spills from the landscape shall follow the procedure for a Drainage Area Investigation. A continuous or intermittent discharge that likely occurs from direct or indirect entry into the storm drain system from the interaction of pipes underground shall follow the procedure for a Storm Drain Investigation. Either investigation should be conducted during dry weather. Regardless of the type of investigation the Illicit Discharge Investigation form (Appendix D) shall be utilized.

A rapid windshield survey of the drainage area may be used to find the potential discharger or generating sites if the discharge observed at an outfall has distinct or unique characteristics that allow crews to quickly ascertain the probable operation or business that is generating it. Discharges with a unique color, smell, or off-the-chart indicator sample reading may point to a specific industrial or commercial source.

A rapid windshield survey works well in small drainage areas, particularly if field crews are already familiar with its business operations. Field crews can match the characteristics of the discharge to the most likely type of generating site, and then inspect all of the sites of the same type within the drainage area until the source is found. For example, if fuel is observed at an outfall, crews might quickly check every business operation in the catchment that stores or dispenses fuel.

In larger or more complex drainage areas, GIS data can be analyzed to pinpoint the source of a discharge. If only general land use data exist, maps can at least highlight suspected industrial areas. If more detailed Standard Industrial Classification (SIC) code data are available digitally, GIS may be used to pull up specific hotspot operations or generating sites that could be potential dischargers.

In a Storm Drain Investigation, field crews strategically inspect manholes within the storm drain network system to observe flows or measure chemical or physical indicators that can isolate discharges to a specific segment of the network. Once the pipe segment has been identified, on-site investigations are used to find the specific discharge or improper connection. This method involves progressive screening at select manholes in the storm drain network to narrow the discharge to an isolated pipe segment between two manholes. Field crews need to make two key decisions when conducting a storm drain network investigation—where to start screening in the network and what indicators will be used to determine whether a manhole is considered clean or dirty.

6.1 Illicit Discharge Investigation Procedures

The field crew can sample the pipe network in one of three ways:

- Crews can work progressively up the trunk from the outfall and test manholes along the way.
- Crews can split the trunk into equal segments and test manholes at strategic junctions in the storm drain system.
- Crews can work progressively down from the upper parts of the storm drain network toward the problem outfall.

During a manhole inspection, manholes are opened and inspected for visual evidence of contamination. Where flow is observed, and determined to be contaminated through visual indicators or field monitoring, the upstream tributary storm sewer system is isolated for investigation (e.g. further flow inspection, dye testing, CCTV). No additional downstream manhole inspections are performed unless the observed flow is determined to be uncontaminated or until all upstream illicit connections are identified and removed. Where flow is not observed but an intermittent discharge is suspected in a junction manhole, select inlets to the structure are partially dammed for the next 48 hours when no precipitation is forecasted. Inlets are dammed by blocking a minimal percentage of the pipe diameter at the invert using sandbags, caulking, weirs/plates, or other temporary barriers. The manholes are thereafter re-inspected (prior to any precipitation or snow melt) for the capture of periodic or intermittent flows behind any of the inlet dams. The same visual observations and field testing is completed on any captured flow, and where contamination is identified, abatement is completed prior to inspecting downstream manholes. In addition to documenting investigative efforts in written and photographic form, it is recommended that information and observations regarding the construction, condition, and operation of the structures also be compiled.

Where flow is observed and does not demonstrate obvious indicators of contamination, samples are collected and analyzed and then compared with established benchmark values to determine the likely prominent source of the flow. This information facilitates the investigation of the upstream storm sewer system. Benchmark values may be refined over the course of investigations when compared with the actual incidences of observed flow sources. In those manholes where periodic or intermittent flow is captured through damming inlets, additional laboratory testing (e.g. toxicity, metals, etc.) should be considered where an industrial discharge is suspected. See Monitoring Standard Operating Procedures for guidance on how to collect and analyze samples.

Adequate storm and sanitary sewer mapping is a prerequisite to properly execute a storm drain investigation. As necessary and to the extent possible, infrastructure mapping should be verified in the field and corrected prior to investigations. This effort affords an opportunity to collect additional information such as latitude and longitude coordinates using a global position system (GPS) unit if so desired. To facilitate subsequent investigations, tributary area delineations should be confirmed and junction manholes should be identified during this process.

To facilitate investigations, storm drain infrastructure should be evaluated for the need to be cleaned to remove debris or blockages that could compromise investigations. Such

material should be removed to the extent possible prior to investigations, however, some cleaning may occur concurrently as problems manifest themselves.

Where field monitoring has identified storm sewer systems to be influenced by sanitary flows or washwaters, the tributary area is isolated for implementation of more detailed investigations. Additional manholes along the tributary are inspected to refine the longitudinal location of potential contamination sources (e.g. individual or blocks of homes). Targeted internal plumbing inspections, dye testing, smoke testing or CCTV inspections are then employed to more efficiently confirm discrete flow sources. Consulting services shall be utilized to perform these tests.

6.2 Eliminating Illicit Discharges

Once the source of an illicit discharge has been identified, steps should be taken to eliminate the discharge. Four questions should be answered for each individual illicit discharge to determine how to proceed; the answers will usually vary depending on the source of the discharge.

1) Who is responsible?
2) What methods will be used to repair?
3) How long will the repair take?
4) How will removal be confirmed?

Financial responsibility for source removal will typically fall on property owners, the City, or a combination of the two. Methods for removing illicit discharges usually involve a combination of education and enforcement. A process for addressing illicit discharges that focuses on identifying the responsible party and enforcement procedures is presented in Figure 1, while Table 4 presents potential sources of illicit discharges. Additional guidance can be found in Chapter 14 of the Illicit Discharge Detection and Elimination Guidance Manual.

Investigators should use judgment in exercising the right mix of compliance assistance and enforcement with approval of the Stormwater Administrator. Voluntary compliance should be used for first-time, minor offenders. Often, property owners are not even aware of a problem, and are willing to eliminate it when educated. More serious violations or continued non-compliance may warrant a more aggressive, enforcement oriented approach provided it is consistent with Chapter 109 and the City of Rockford Stormwater Division Enforcement Response Plan.

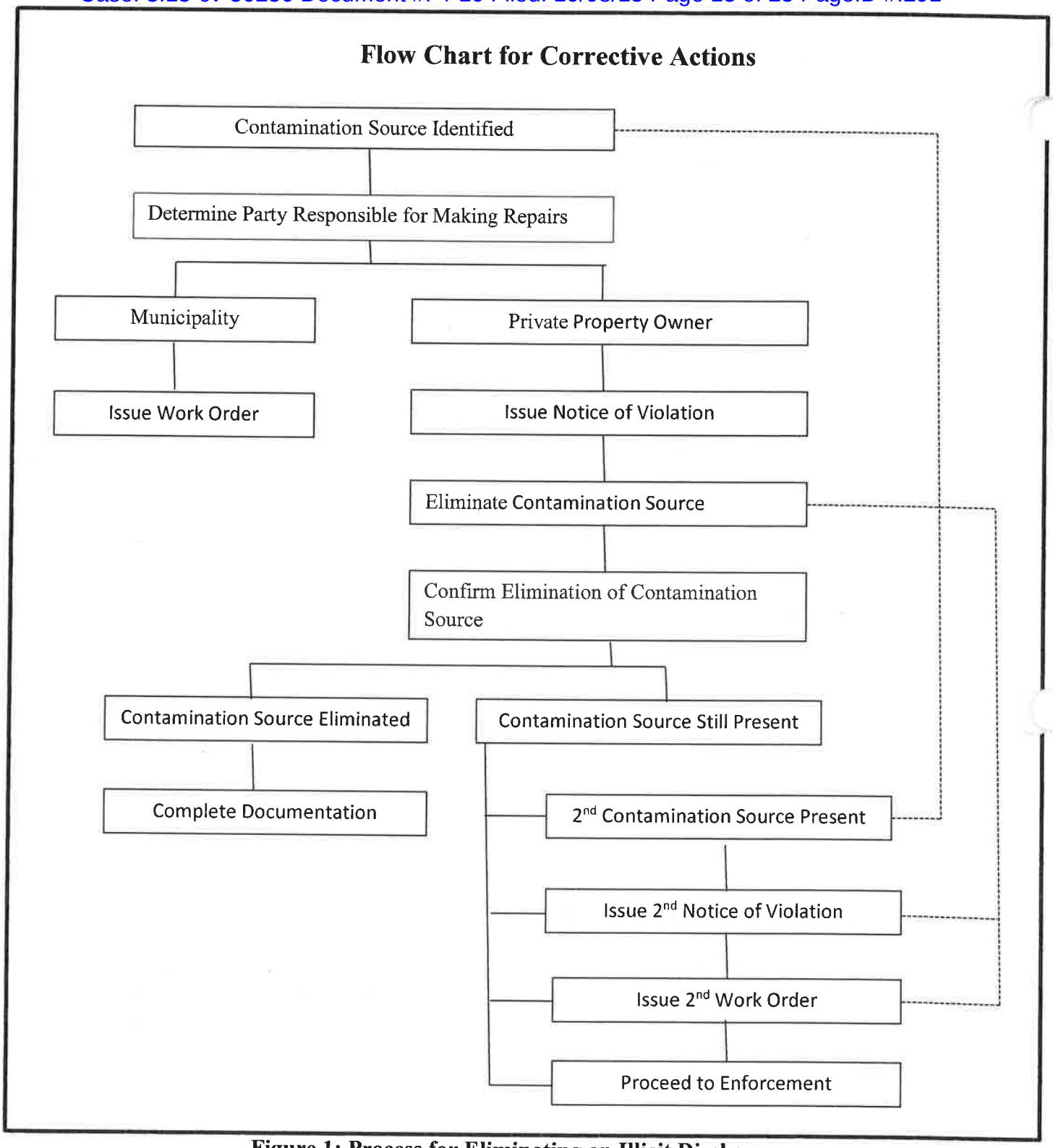


Figure 1: Process for Eliminating an Illicit Discharge

Table 4: Sources of Illicit Discharges	
Type of Discharge	**Source**
Sewage	Break in right-of-way
	Commercial or industrial direct connection
	Residential direct connection
	Infrequent discharge (e.g., RV dumping)
	Straight pipes/septic
Wash Water	Commercial or industrial direct connection
	Residential direct connection
	Power wash/car wash (commercial)
	Commercial wash down
	Residential car wash or household maintenance related activities
Liquid Wastes	Professional oil change/car maintenance
	Heating oil/solvent dumping
	Homeowner oil change and other liquid waste disposal (e.g., paint)
	Spill (trucking)
	Other industrial wastes

6.3 Post-Removal Confirmation

As the sources of illicit discharges are confirmed, measures to correct them must be taken, working with the property owner or other responsible party. The exact type of repair needed will depend on the type of discharge and mode of transmission.

After completing the removal of illicit discharges from a subdrainage area, it is re-inspected to verify corrections and documented as detailed in in Section 9.0. Depending on the extent and timing of corrections, verification monitoring can be done at the initial junction manhole or the closest downstream manhole to each correction. Verification is accomplished by using the same visual inspection, field monitoring, and damming techniques as described above.

7.0 Illinois Environmental Protection Agency (IEPA) Notifications

IEPA shall be notified within 24 hours should an illicit discharge meet the requirements of the Illinois Emergency Management Agency Emergency Release Notifications (Appendix E). A member of SWET shall perform this notification.

8.0 Enforcement

Enforcement measures will be in accordance with Chapter 109, Article 13 and the City of Rockford Storm Water Division Enforcement Response Plan for corrective actions not remedied within the required timeframe.

9.0 Documentation and Record Management

All outfalls and illicit discharge complaints shall be mapped on the City's GIS system and be hyperlinked to their specific files. This will aid in tracking potential illicit discharges and also allow us to determine problem areas where we may consider focusing education efforts.

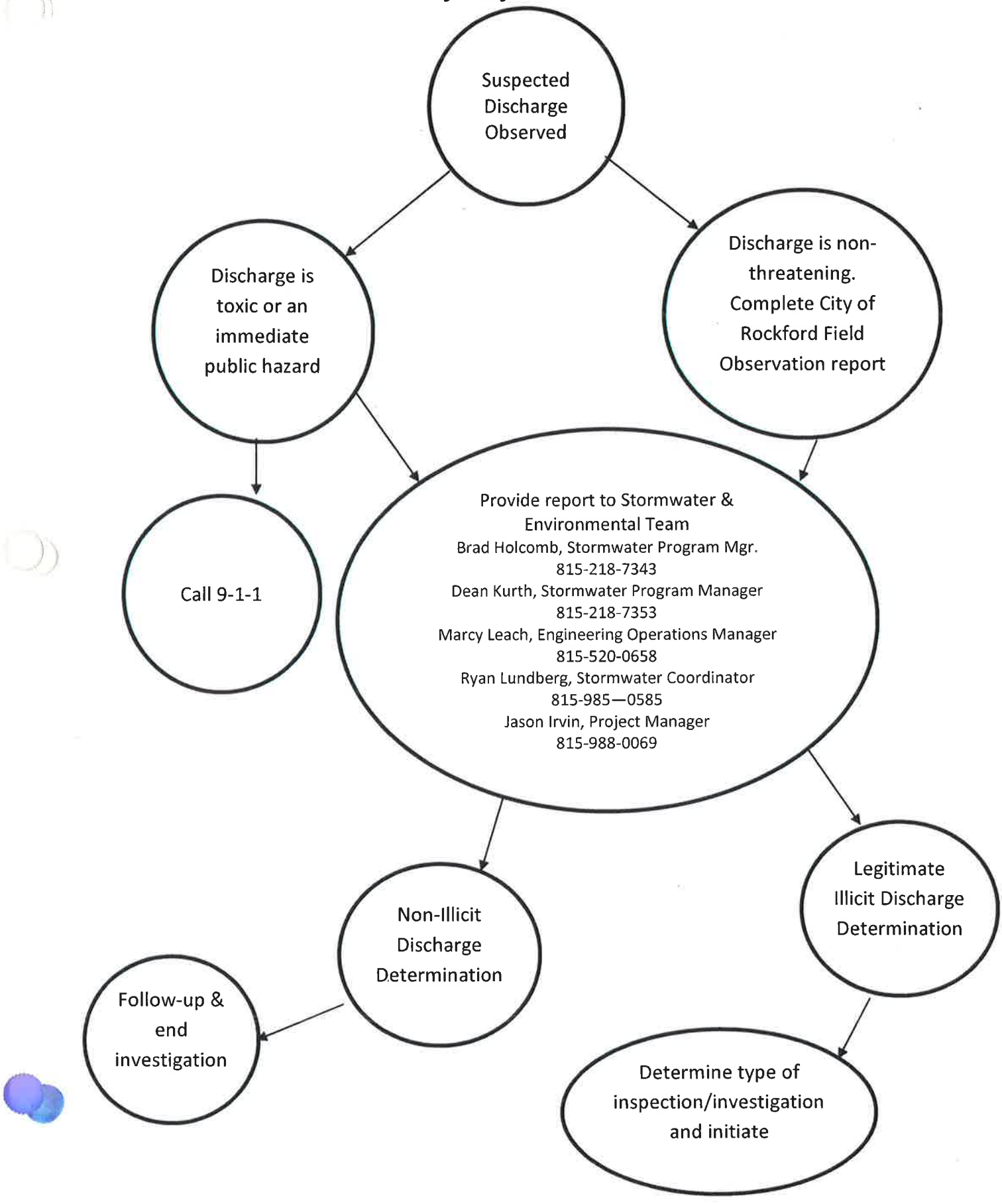
All illicit discharge complaints/investigations (inspection reports and letters) will be filed by address to help track repeat offenders. In addition, digitized copies will also be saved in the Storm Water Drive on the City of Rockford computer system. Digitized information can include: initial observation report, investigation report, photos, correspondence and any other pertinent information. These files will be saved as follows:

1) Open the Storm Water Drive (note: this drive has limited access for people who perform duties directly related to the City's storm water program),
2) Open the IDDE folder,
3) Open the folder for the current year,
4) Create a folder with the address and save all data in that folder.

An excel spreadsheet for all investigations has also been created. This inspection and sampling log is saved by year. All complaints/ investigations for that year are saved on this spreadsheet for easy tracking. Data includes: date, location, type of discharge, source (if determined), nature of follow-up and whether corrective actions have been addressed (if applicable). Notes about the investigation can also be included.

Appendix A

ILLICIT DISCHARGE REPORTING AND RESPONSE
By City of Rockford Staff



Appendix B

City of Rockford Field Observation

1. Person Making Observation: _____ Date: _____

2. Type of Observation (check all that apply):

_____ Drainageway	_____ Creek
_____ Citizen Complaint	_____ Industrial/Commercial Site
_____ Detention Basin	_____ Outfall Monitoring
_____ Construction Site	_____ Illicit Discharge (If the Illicit Discharge is active contact Brad Holcomb, Dean Kurth or Ryan Lundberg immediately)
_____ Inlet	_____ Other _____

3. Location/Project Name: _____

4. Is this a post rain event observation? _____ Yes _____ No

5. If yes: Date of Rainfall _____ Rainfall amount (inches) _____

6. Is a follow-up inspection required? _____ Yes _____ No

7. Is maintenance needed? _____ Yes _____ No

8. Comments (please be detailed and supply photos if necessary): _____

_____

_____

_____

_____

_____

Signature: _____ Date: _____

Provide Copies to one of the following:

Brad Holcomb, Stormwater Program Manager – Cell # 815-218-7343, brad.holcomb@ockfordil.gov,
Dean Kurth, Stormwater Program Manager – Cell # 815-218-7353, dean.kurth@rockfordil.gov
Ryan Lundberg, Stormwater Coordinator - Cell # 815-985-0585, ryan.lundberg@rockfordil.gov
Marcy Leach, Operations Manager – Cell – 815-520-0658, marcy.leach@rockfordil.gov
Jason Irvin, Project Manager – Cell – 815-988-0069, Jason.irvin@rockfordil.gov

Appendix C

ROCKFORD

S.W.E.T.

Stormwater & Environmental Team

Stormwater Outfall

Tributary/Watershed:		Date:	Assessed By:
Site ID #:	Time: AM/PM	Photo ID #:	
Location:		GPS ID:	

Bank: ☐ LT ☐ RT ☐ Head

Flow: ☐ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other: _____

Type: Material: Shape:

Submerged:

☐ Closed Pipe ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other: _____

☐ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other: _____

Diameter: ____(in)

☐ No ☐ Partially ☐ Fully

☐ Open Channel ☐ Concrete ☐ Earthen ☐ Other: _____

☐ Trapezoid ☐ Parabolic ☐ Other: _____

Depth: ____(in)
Width (Top): ____(in)
Width (Bot): ____(in)

Condition: ☐ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other: _____

Odor: ☐ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other: _____

Deposits/Stains ☐ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other: _____

Veggie Density: ☐ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other: _____

Pipe Benthic Growth: ☐ None ☐ Brown ☐ Orange ☐ Green ☐ Other: _____

Pool Quality: ☐ No Pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other: _____

For Flowing Only

Color: ☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____

Turbidity: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

Floatables: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other: _____

Other Concerns:

☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other: _____

Notes / Sketch:

Revision: October 2013

Signature: _____ Date: _____

Appendix D

Illicit Discharge Investigation Form

Responder Information *(for hotline incidents only)*	
Call taken by:	Call date:
Reporter Information	
Incident time:	Incident date:
	Precipitation (inches) in past 24-48 hrs:
Caller contact information *(optional)*:	
Incident Location *(complete one or more below)*	
Latitude & longitude:	
Stream address or outfall #:	
Closest street address:	
Nearby landmark:	

Primary Location Description	**Secondary Location Description:**		
☐ Stream corridor *(In or adjacent to stream)*	☐ Outfall	☐ In-stream flow	☐ Along banks
☐ Upland area *(Land not adjacent to stream)*	☐ Near storm drain	☐ Near other water source (storm water pond, wetland, etc.):	
Narrative description of location:			

Upland Problem Indicator		
☐ Dumping	☐ Oil/solvents/chemicals	☐ Sewage
☐ Wash water, suds, etc.	☐ Other: _____	

Stream Corridor Problem Indicator Description				
Odor	☐ None	☐ Sewage	☐ Rancid/Sour	☐ Petroleum (gas)
	☐ Sulfide (rotten eggs); natural gas	☐ Other: Describe in "Narrative" section		
Appearance	☐ "Normal"	☐ Oil sheen	☐ Cloudy	☐ Suds
	☐ Other: Describe in "Narrative" section			
Floatables	☐ None	☐ Sewage (toilet paper, etc.)	☐ Algae	☐ Dead fish
	☐ Other: Describe in "Narrative" section			
Narrative description of problem indicators:				
Suspected Violator (name, personal or vehicle description, license plate #, etc.):				

Data Collection	
Sample collected for testing? ☐ Yes ☐ No	
Sample collected from? ☐ Flow ☐ Pool ☐ Other	
Sample result indicated: ☐ No Pollutants ☐ Presence of pollutants	
Investigation Notes	
Initial investigation date:	Investigators:
☐ No investigation made	Reason:
☐ Referred to different department/agency:	Department/Agency:
☐ Investigated: No action necessary	
☐ Investigated: Requires Action	Description of actions:
Hours between call and investigation:	
Notification and Enforcement Actions (if any):	
Date case closed:	
Notes:	

Investigator: (sign & print name)_____

Date of Investigation: _____

Appendix E

IEMA
Illinois Emergency Management Agency

Jonathon E. Monken, Director

EMERGENCY RELEASE NOTIFICATION FACT SHEET

A. Immediate telephone notification shall be given by the owner or operator of a facility when a release equal to or exceeding the reportable quantity of an extremely hazardous substance[1] or a CERCLA hazardous substance[2] occurs at the facility.

In such incidents, notifications are to be made to the following:

1. **Illinois Emergency Management Agency (IEMA) State Emergency Response Commission (SERC)** at **1-800-782-7860** (within state) or **(217) 782-7860** (when calling from out-of-state).
2. **Local Emergency Planning Committee (LEPC)** that is likely to be affected by the release. The telephone number(s) can be obtained from IEMA.
3. **National Response Center (NRC)** at **1-800-424-8802** (if the substance is a CERCLA hazardous substance)

Please Note: *Transportation-related incidents only require 9-1-1 notification.*

B. Immediate telephone notification is also required if an incident or accident involving a hazardous material[3] occurs which results in:

1) a member of the general public is killed;
2) a member of the general public receives injuries requiring hospitalization;
3) an authorized official of an emergency agency recommends an evacuation of an area by the general public;
4) a motor vehicle has overturned on a public highway;
5) Fire, breakage, release or suspected contamination occurs involving an etiologic agent;
6) Any release of petroleum (or oil) that produces a sheen on nearby surface water[4] and or threatens navigable waters;
7) Any spill or overfill of petroleum that results in a release to the environment that exceeds 25 gallons.[4]

In such incidents, notification shall be made as noted in Paragraph A, above, except no notification is required to the NRC, except items 6 and 7 (oil that impacts water and overfills).

At a minimum, notification shall include:

1) the chemical name or identity of any substance involved in the release;
2) an indication of whether the substance is an extremely hazardous substance;
3) an estimate of the quantity in pounds of any such substance that was released into the environment;
4) the time and duration of the release;
5) the specific location of the release;
6) the medium or media (air, land, water) into which the release occurred;
7) any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals;
8) proper precautions to take as a result of the release, including evacuations;
9) the name and telephone number of the person or persons to be contacted for further information.

WRITTEN FOLLOW-UP NOTICE IS REQUIRED WITH RESPECT TO INCIDENTS AS DESCRIBED IN PARAGRAPH A, ABOVE. As soon as practicable after such release (within 30 days), the owner or operator shall provide a written follow-up emergency notice (or notices, as more information becomes available) to the SERC and the LEPC, updating the information provided in the immediate notification and including additional information with respect to:

1) Actions taken to respond to and contain the release,
2) Any known or anticipated acute or chronic health risks associated with the release,
3) Where appropriate, advice regarding medical attention necessary for exposed individuals.

[1] See 40 CFR 355 for a listing of extremely hazardous substances (EHS).
[2] See 40 CFR 302.4 for a listing of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substances.
[3] See 49 CFR 172.101 for a list of hazardous materials.
[4] See 41 IAC 176.340 Reporting and Cleanup of Spills and Overfills.

(These rules are compiled in 29 IAC 430 and 29 IAC 620)

Last Updated 2/2011


Legend
Storm Manholes
Storm Inlet
Storm Pipe
LifeCycleStatus
Abandoned
Active
Culvert
Rockford Creeks
Major Arterials
Minor Arterials
Local Streets
Ramps, Other
WinStreets Labels
Rockford Streets
Outfalls
City Limits
ORTHOS2011
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
Sample Outfall Screening Map
1 inch = 526 feet
0 270 540 1,080 1,620
Feet
City of Rockford
Public Works
Engineering Division
By: XXX
Produced: 00/00/0000
Facilities Management Section
Harrison Ave
Alton Ave
Reed Ave
Laude Dr
Congress Dr
Senate Dr
Stere Ave
Rudeen Clos
26TH ST
25th St
24th St
23rd St
22nd St
21st St
20th St
19th St
18th St
17th St
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Appendix F

Timothy Hanson
Director
Public Works Department

June 28, 2013

(Insert address)

Rockford, IL

Notice of Ordinance Violation

Address where violation occurred: , Rockford, IL

It has been brought to the attention of the City of Rockford that automotive waste has been dumped into the City's sewer system by the occupier of the above address. The following ordinance was found to be in violation:

Sec. 26-11.1 Non-Storm Water and Industrial Storm Water Discharge

Non-storm water and industrial storm water discharge is prohibited to the City right-of-way and waters of the State, creeks, streams and rivers except as:

a) Authorized and in compliance with a separate NPDES permit.
b) Authorized and in compliance with the City's MS4 NPDES permit.
c) As permitted and in compliance with the City's Storm Water Ordinance.

Any persons or property found in violation of this section shall be subject to a fine as set forth by the City Council and shall perform remediation to eliminate the discharge.

Sec. 26-11.2. - Depositing refuse in streets and sidewalks

No person shall discharge or dispose of used motor vehicle fluids (including, but not limited to, oil and antifreeze), tires, hazard materials (including, but not limited to, paint, solvents, pesticides and herbicides), refuse or garbage, grass clippings, leaf litter, dirt and animal wastes in or upon any street, alley, sidewalk, storm sewer or other public place except as provided in this Code. Any persons or property found in violation of this section shall be subject to a fine as set forth by city council and shall immediately remove the refuse.

Sec. 109-23 Discharge Prohibitions

a) **Prohibition of illegal discharges**. No person shall discharge or cause to be discharged into the Storm Drain System or water course any materials including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards, other than storm water.

Timothy Hanson
Director
Public Works Department

The area in question must be cleaned up within seven (7) days of the date of this letter and automotive fluids must be properly disposed of. Failure for clean up the site in the required timeframe or any future violations will result in fines and site clean-up.

If you have any questions regarding this violation, please contact our Storm Water and Environmental Program Manager, Brad Holcomb at 815-967-7061 or by email at Brad.Holcomb@rockfordil.gov .

Sincerely,

Matthew Vitner
City Engineer

Timothy Hanson
Director
Public Works Department

Notice of Ordinance Violation, (insert address)

Photo #1

Picture description

Photo #2

Picture description

Photo #3

Picture description

Note: the attached photos indicate examples of corrective actions observed on this construction site. When performing maintenance as indicated in the photos, check the entire site for other areas with similar maintenance needs.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
WESTERN DIVISION

THE UNITED STATES OF AMERICA and THE STATE OF ILLINOIS Plaintiffs, v. THE CITY OF ROCKFORD, ILLINOIS, Defendant.	)	Civil Action No. 3:15cv50250

CONSENT DECREE
APPENDIX J

THE CITY OF ROCKFORD ILLINOIS, USA

MONITORING AND SAMPLING PROGRAM

STANDARD OPERATING PROCEDURES

June 2015

1.0 General

The purpose of this standard operating procedure (SOP) for the Monitoring Program is to comply with Part II, A.7 & 9 and Part V, A & B of the City of Rockford's NPDES Storm Water Permit (ILS000001). This document addresses the procedures for the collection of water quality samples in varying conditions and locations for Representative Monitoring, Industrial High Risk Runoff and Illicit Discharge Detection & Elimination Monitoring. The City shall follow the NPDES Permit terms should there be any conflict or deviation with any portion of this SOP.

Additional guidance can be found in: *Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments* by the Center for Watershed Protection.

2.0 Legal Authority

Legal authority for the Monitoring Program is found in the City of Rockford's Code of Ordinances Chapter 109, Article 12.

3.0 Staffing

Positions of the City of Rockford's Stormwater Environmental Team (SWET) include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Project Managers and Engineering Techs.

Monitoring & sampling will be performed by the Public Works Engineering Division utilizing the following staff positions: Operations Manager(s), Program Manager(s), Project Manager(s), and Coordinator(s). These positions shall be trained to perform these functions according to the Standard Operating Procedures for Stormwater and Environmental Education and shall be familiar with this document.

Safety while completing any of these tasks is a top priority. Staff should always be aware of their surroundings and any potential hazards in the area.

4.0 Laboratory

The City shall use the Rock River Water Reclamation District (RRWRD) Laboratory (unless otherwise determined by the City) to analyze the samples collected. The laboratory hours are from 8:00 am – 4:30 pm on weekdays and are closed on weekends. Grab samples of fecal coliform are not accepted on Fridays or after 3:30 pm, Monday thru Thursday.

Field staff completing the sample collection should notify the lab contact or lab (typically by email) to inform them a delivery is forthcoming prior to the start of the sample collection operation.

Location
RRWRD Lab
3333 Kishwaukee Street
Rockford, Illinois 61109
(815) 387-7522
web_lab@rrwrd.dst.il.us

Lab Contact
Mary Johnson, Lab Supervisor
mjohnson@rrwrd.dst.il.us
(815) 387-7523

The field staff that collected the sample shall be the same person to deliver the sample to the lab. If this cannot be accomplished then it shall be documented when and to whom the sample was transferred to for delivery on the Sample Sheets. When delivering the sample the field staff must supply a City of Rockford employee identification card to the security guard at the entrance gate of the RRWRD complex. Staff will receive a gate opener to get to the laboratory and will return the opener and receive the identification back upon exiting the complex.

5.0 Representative Monitoring

The City's representative monitoring program includes in-stream sampling of tributaries to the Rock River and representative outfalls. Appendix A lists the Analytical Parameters to be sampled.

5.1 Tributary Monitoring

Tributary sites are analyzed for a suite of nutrient, heavy metal, and conventional water quality parameters, as noted in Appendix A.

5.1.1 Locations

Samples are collected at the following five (5) urban tributary locations:
(Refer to the site maps being Appendixes D-H for detailed locations)

Site ID	Locations
T1	North Kent Creek @ Fairgrounds Park
T2	South Kent Creek @ Tay & Corbin St.'s
T3	Keith Creek @ Tenth Avenue Park
T4	Keith Creek @ Dahlquist Park
T5	Spring Creek @ Starkweather Avenue

5.1.2 Frequency

Four dry weather samples will be collected on the second Monday in the months of February, May, August and November. A dry weather period is that which occurs at least 72 hours from a previously measurable (greater than 0.1 inch rainfall) storm event. The day of Monday was selected to complete these sample collections is based on an understanding with the RRWRD Lab and their workload. If weather conditions preclude collection of samples as scheduled, the sample collection shall be re-scheduled with the RRWRD Lab when and as conditions allow. Some conditions that may delay the collection of samples include but are not limited to: extreme temperatures, frozen flows, flooded conditions, high velocity flows and/or drought conditions.

5.1.3 Supplies and Equipment

The basic supplies and equipment needed to collect water quality samples from flowing tributaries includes:

- Safety vest
- Hip waders
- YSI 556 DO Meter
- Cooler (for storing and transporting samples)
- Ice (for preserving samples – obtained at the City Yards)
- Permanent marker (for labeling sample bottles)
- Tributary Sample Sheets, Appendix N
- Five (5) one-gallon plastic jugs (from the laboratory)
- Five (5) sterile six-ounce bottles (from the laboratory)
- Labels for the jugs and the sterile bottles (from the laboratory)

5.2 Representative Outfalls

The City of Rockford's NPDES Storm Water Permit No. ILS000001 (City's permit) details most of the criteria & requirements cited in this section. The City's permit identifies five representative outfall locations for monitoring.

5.2.1 Locations

Samples are collected at the following five (5) representative outfall locations:
(Refer to the site maps being Appendixes I-M for detailed locations

Source: Rockford Storm Water NPDES Permit No. ILS000001		
Outfall	**Location**	**Watershed Description**
Station R1	Paradise Boulevard	225 ac residential & open space
Station R2	Market St. & N. Water St.	50 ac commercial, offices & residential
Station R3	Fairview Blvd & Crosby St.	510 ac residential
Station R4	8th Street & Wills Avenue	780 ac industrial, commercial & residential
Station R5	Forest View Rd & 28th Ave	80 ac light industrial

These sites have been prepared for the installation of automatic samplers and tip-bucket rain gauges.

5.2.2 Frequency

Samples shall be collected in the spring and fall for a total of two sets of the required samples at each location (R1-R5) each year. Samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event.

5.2.3 Rain Event Data Collection

Data must be maintained for the following of each rain event:

- Date of event
- Duration of event (in hours)
- Rainfall measurements or estimates (in inches)
- Duration between event and end of previous event (in hours)
- Estimate of the total volume of the discharge sampled (in gallons)

The source of weather observation data to be used by Staff is from the National Weather Service website (http://w1.weather.gov/data/obhistory/KRFD.html) which reports the past 72 hours of weather data (including hourly rainfall data) from the Chicago Rockford International Airport. Copy and paste this data into the Rain Event data log spreadsheet found in the City's Storm Water directory.

5.2.4 Sampling Techniques for Representative Outfalls

The City's permit allows for grab samples and/or composite samples to be collected from the outfall sites. The use of automatic samplers is also allowed given proper programming of the unit. Appendix B denotes which technique to use, grab or composite, based on the type of sample to be collected.

5.2.4.1 Grab Sampling for Representative Outfall

Grab samples may be taken by hand or with the use of automatic samplers. Sampling consists of 3 grab samples; the first grab sample shall be taken within 2 hours after the commencement of the storm event. The second and third grab samples shall be taken at intervals of not less than 2 hours thereafter. Should the discharge cease before the 2nd and 3rd samples can be taken, Staff shall identify the approximate time that the discharge ceased.

5.2.4.2 Composite Sampling for Representative Outfall

Composite samples may be taken using automatic samplers that are triggered using either tipping-bucket rain gages programmed to initiate sampling after 0.1 inch of rain, or flow meters programmed to initiate sampling after 0.1 inches of runoff. Using automatic samplers to collect a composite sample is the preferred method.

5.2.4.3 Fecal Coliform Grab Sample for Representative Outfall

Staff will complete a grab sample to be tested for fecal coliform independent of the use of a composite or grab sampling technique. If possible, this grab sample will take place during the same storm event, but if this cannot be performed, these samples will be taken from separate events.

These samples should be collected directly from the discharge stream into the sterilized 6 oz Nalgene sample bottle with the sodium thiosulfate preservative. Do no overfill this bottle to ensure the proper amount of preservative remains with the sample.

5.2.5 Supplies and Equipment

The basic supplies and equipment needed to collect water quality samples from flowing tributaries includes:

- Safety vest
- Manhole hook
- YSI 556 DO Meter
- Cooler (for storing and transporting samples)
- Ice (for preserving samples – obtained at the City Yards)
- Permanent marker (for labeling sample bottles)
- Storm Sewer Sample Sheets, Appendix N
- Five (5) one-gallon plastic jugs (from the laboratory)
- Five (5) 1 liter glass sample bottle (from the laboratory)
- Five (5) sterilized, 6 oz. Nalgene sample bottle with sodium thiosulfate (Na2S2O3) preservative (from laboratory)
- Labels for the jugs and the sterile bottles (from the laboratory)
- ISCO automatic sampler (if necessary – pre-event setup required)
- Two-gallon polyethylene bottle (for use with automatic samplers).

Sample Bottles, Preservatives, and Maximum Holding Times
Field Technicians will deliver samples to the Laboratory within three hours of collection. Laboratory Analysts will split the sample needed for the analyses required and preserve accordingly.

5.3 Collection of Grab Samples

The laboratory will provide sample containers in accordance with Appendix B. The labeled uncapped bottle is submerged in the flow by hand, and allowed to fill without entraining surface or bottom debris. The sample is taken from a visibly flowing location that is deep enough to accommodate the sample container under these conditions. If there is no flow the samples should not be collected. Stagnant pools will not be sampled.

The filled containers are immediately placed in a cooler with water ice. The minimum information required on the label is the site identifier code, date and time, and sample designation (bottle type) as shown below. Laboratory issued stickers and/or tags may be used.

T-1 07-21-13 @ 1200 Fecal Coliform

5.4 Collection of Composite Samples

Composite samples are collected using the automatic samplers. Based on previous data, in order to collect the appropriate quantity for the required samples, the sampled rain event must produce 0.4 inches to 0.5 inches of total rainfall.

The samplers must be in-place prior to the start of a rain event. Installation and setup of the sampler is important for proper function. The following is a list of tasks to complete during this process:

- Install sampler before rain event
- Make sure battery for the sampler holds enough charge
- Verify the sampler is programmed properly (weather time or rain gauge weighted)
- Verify the intake tube is free of kinks and the line is clear of debris
- When using the tip bucket trigger, verify the connection is free of debris and moisture
- When using the tip bucket trigger, verify the tip bucket and screen is free of debris. A ladder will be required to complete this.
- Verify the program have been started before replacing the cover on the sampler

When staff returns for the collection of the sample, document the readout of the samplers display before completing other tasks. This data will provide rainfall totals registered by the sampler.

Pull the samplers internal bottle out and carefully fill the sample bottles provided by the laboratory. The filled containers are immediately placed in a cooler with water ice. The minimum information required on the label is the site identifier code, date and time, and sample designation (bottle type) as shown below. Laboratory issued stickers and/or tags may be used.

R-1
07-21-13 @ 1200
FOG

5.5 YSI 556 Meter – Field measurements

Field measurements of water quality (pH, DO, temperature, conductivity) are made in the same location following water sample collection. The meter must be properly calibrated according to the manufacturer's instructions for accurate measurements to be taken. Record this information on the Tributary or Storm Sewer Sample Sheet.

6.0 Illicit Discharge Detection and Elimination Indicator Monitoring

Illicit Discharge Detection & Elimination (IDDE) indicator monitoring is used to confirm illicit discharges, and provide clues about their source or origin when discovered though tributary, outfall monitoring or IDDE SOP. In addition, this monitoring can measure improvements in water quality during dry weather flow.

6.1 Where to Collect Samples

Indicator sampling normally occurs at three principle locations in the storm drain system to detect illicit discharges – at the outfall, in the stream, and within the storm drain pipe network.

Monitoring of dry weather flows from outfalls is the most common location for indicator sampling.

In-stream monitoring involves sample collection during dry weather flow conditions. Stream monitoring is less precise than outfall monitoring at detecting individual discharges. It can detect the most severe or high volume discharges, and measure progress over time in terms of changes in stream water quality.

In-pipe sampling is often needed to track down and isolate individual discharges once a potential discharge problem is encountered at an outfall.

6.2 When to Collect Samples

Indicator samples should be collected during dry weather periods to avoid flowing outfalls caused by storm water or groundwater infiltration. A dry weather period is that which occurs at least 72 hours from a previously measurable (greater than 0.1 inch rainfall) storm event. An exception to this is for response to reported active illicit discharges to which an investigation should occur immediately.

Time of day that sampling is conducted is particularly important when the suspected source is residential sewage. Peak water usage occurs in the morning and evening, therefore sampling in the early morning is recommended in these situations.

6.3 Supplies and Equipment

The basic supplies and equipment needed to collect water quality samples for IDDE includes:

- Safety vest
- Manhole hook
- YSI 556 DO Meter
- Hach DR 900 Colorimeter
- Hach 2100 Turbidity Meter
- Cooler (for storing and transporting samples)
- Ice (for preserving samples – obtained at the City Yards)
- Permanent marker (for labeling sample bottles)
- Storm Sewer or Tributary Sample Sheets
- One-gallon plastic jug per sample set (from the laboratory)
- One liter glass sample bottle per sample set (from the laboratory)
- Six oz. Nalgene sterilized sample bottle per sample set with sodium thiosulfate (Na2S2O3) preservative (from laboratory)
- Labels for the jugs and the sterile bottles (from the laboratory)
- ISCO automatic sampler (if necessary – pre-event setup required)
- Two-gallon polyethylene bottle (for use with automatic samplers).

Sample Bottles, Preservatives, and Maximum Holding Times
Field Technicians will deliver samples to the Laboratory within three hours of collection. Laboratory Analysts will split the sample needed for the analyses required and preserve accordingly.

6.4 Water Quality Indicators Used to Identify Illicit Discharges

Different water quality parameters can be used to confirm the presence or origin of an illicit discharge at a flowing storm drain outfall. These parameters, which are discussed in more detail in Appendix C, include:

- Ammonia
- Boron
- Chlorine
- Color
- Conductivity
- Detergents
- *E. Coli*, enterococci, or total coliform
- Fluoride
- Hardness
- pH
- Potassium
- Surfactants
- Turbidity

Table 1 summarizes these parameters, compares their ability to detect different flow types, and reviews some of the challenges that may be encountered when analyzing them in the lab or in the field.

Table 1: Water Quality Parameters Used to Identify Illicit Discharges

Parameter	Flow Types It Can Detect				Analytical Challenges
	Sewage	Wash Water	Tap Water	Industrial/ Commercial Waste	
Ammonia	●	◉	○	◉	Can change into other forms of nitrogen as flow travels to the outfall
Boron	◉	◉	○	N/A	
Chlorine	○	○	○	◉	High chlorine demand in natural systems limit usefulness to flow with very high chlorine concentrations
Color	◉	◉	○	◉	
Conductivity	◉	◉	○	◉	Not useful in natural systems with high salinities
Detergents	●	●	○	◉	Reagent is a hazardous waste
E. coli Enterococci Total coliform	◉	○	○	○	24-hour test procedure Need to modify standard analytical procedures to measure high bacteria concentrations
Fluoride*	○	○	●	◉	Regent is a hazardous waste
Hardness	◉	◉	◉	◉	
pH	○	◉	○	◉	
Potassium	◉	○	○	●	May need to use two separate analytical techniques, depending on the concentration
Surfactants	●	●	○	◉	Reagent is a hazardous waste
Turbidity	◉	◉	○	◉	

Key:
● Can almost always (i.e., > 80% of the time) distinguish this flow type from clean water (e.g., tap water, natural water). For tap water, can almost always distinguish tap water from natural water.
◉ Can sometimes (i.e., > 50% of the time) distinguish this flow type from clean water, depending on regional characteristics, or can be helpful when used with another parameter.
○ Poor indicator parameter. Cannot reliability distinguish an illicit discharge from clean water (e.g., tap water, natural water).
N/A Data are not available to assess the usefulness of this parameter in distinguishing this flow type from clean water (e.g., tap water, natural water).
* Fluoride is a poor indicator when used on its own. However, when it is used with other parameters, such as detergents, ammonia and potassium, it can almost always distinguish between sewage and wash water.

6.5 Selecting Indicator Parameters

As shown in Table 1, no single water quality parameter meets all of these criteria. However, in most cases, only a small subset of these parameters (e.g., three to five) is required to adequately confirm the presence of an illicit discharge. The CITY will use the parameters associated with the Flow Chart Method, as well as pH and chlorine, to confirm the presence of illicit discharges at flowing storm drain outfalls. Additional information about the Flow Chart Method is provided below.

6.6 Flow Chart Method

The primary data interpretation technique to be used to identify illicit discharges is the Flow Chart Method. The Flow Chart Method has been selected because it is a relatively simple interpretation technique that uses four basic water quality parameters to confirm the presence of an illicit discharge. The water quality parameters used in the Flow Chart Method can be used to distinguish amongst the four major flow types typically found in residential watersheds, including sewage and wash water, which are the most common types of illicit discharges found in urban communities.

The Flow Chart Method uses benchmark concentrations to identify and characterize illicit discharges. The benchmark concentrations were developed by CWP and Pitt (2004), Lalor (1994) and Pitt et al. (1993) from illicit discharge detection and elimination work conducted in Alabama and Maryland.

The basic decision points involved in the Flow Chart Method are shown in Figure 1 and described below.

6.6.1 Distinguish Clean Flow from Contaminated Flow Using Detergents

The first step in the Flow Chart Method is to determine whether the discharge is "clean" or is derived from either sewage or wash water, based on the presence of detergents. Surfactants and/or boron are used as the primary indicator of detergents, and values of surfactants or boron that exceed 0.25 mg/L or 0.35 mg/L, respectively, signal that the discharge is contaminated by either sewage or wash water.

6.6.2 Distinguish Wash Water from Sewage Using the Ammonia-to-Potassium Ratio

If the discharge contains detergents, the next step is to determine whether the discharge is derived from sewage or wash water, using the ammonia-to-potassium ratio. An ammonia-to-potassium ratio of greater than one suggests sewage contamination, while a ratio of less than one indicates wash water contamination.

6.6.3 Distinguish Tap Water from Natural Water

If the sample is free of detergents, the next step is to determine whether the flow is derived from natural sources (e.g., groundwater, springs) or from tap water. The indicator used in this analysis is fluoride, and values of fluoride that exceed 0.60 mg/L signal that tap water is the source. Fluoride concentrations of between 0.25 and 0.60 mg/L indicate that the source may be excess or non-target irrigation water. The purpose of determining the source of a relatively "clean" discharge is that it can identify water main breaks and identify where potable water is being used in a manner (e.g., non-target irrigation, vehicle rinsing, and building rinsing) that contributes polluted runoff to the storm drain system.

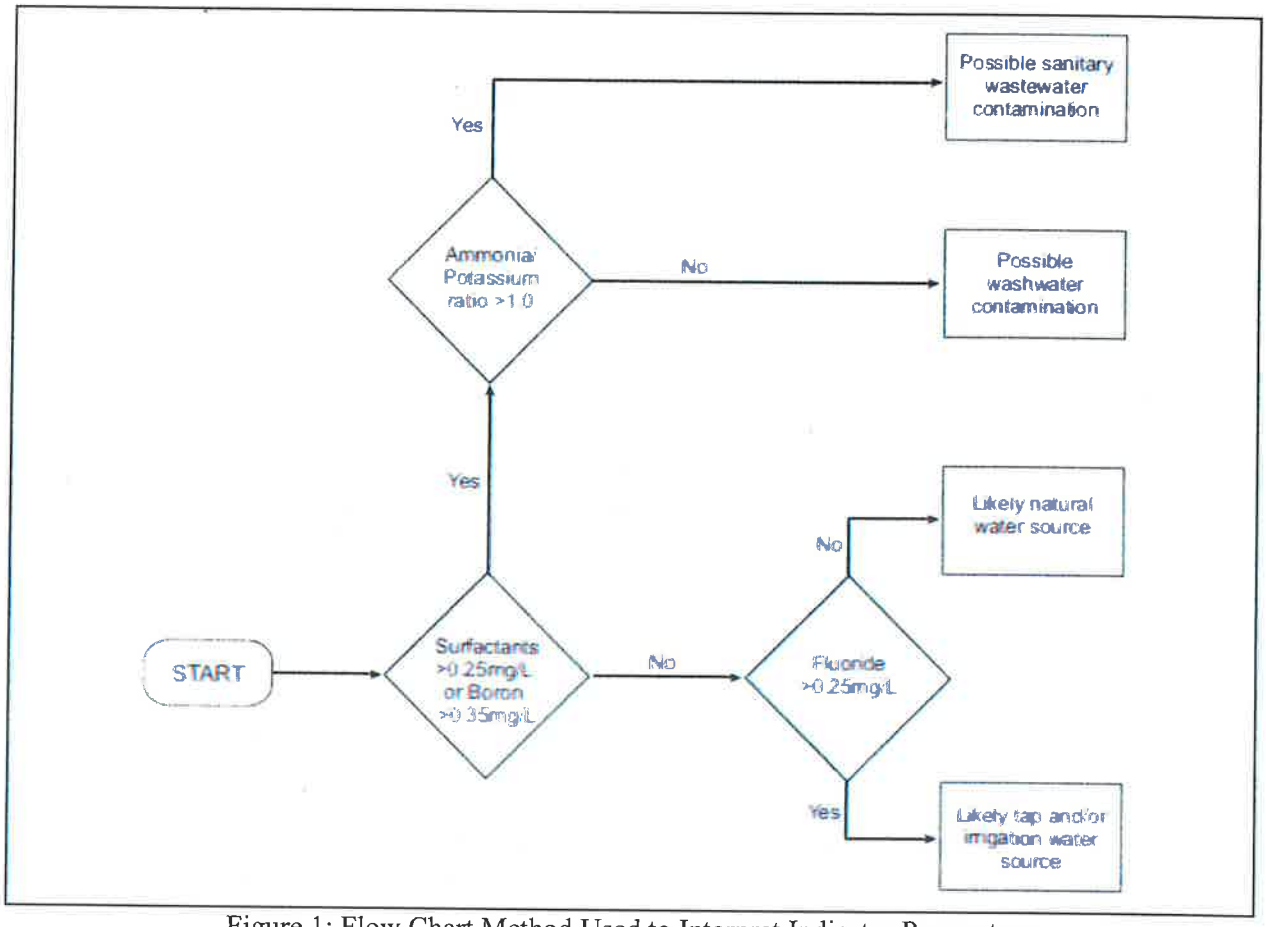


Figure 1: Flow Chart Method Used to Interpret Indicator Parameters

6.7 Interpreting Water Quality Data

This section provides information on three other techniques that the CITY may use to interpret water quality data with respect to illicit discharges. One or more of which the CITY may use to supplement the Flow Chart Method:

- Environmental Consultant – A consultant may be used when staff time is limited to analyze the test results or additional interpretation of the results is needed.
- Single Parameter Screening
- Industrial Flow Benchmarks

As with the Flow Chart Method, each of these techniques uses benchmark concentrations to identify and characterize illicit discharges. The benchmark concentrations were developed by CWP and Pitt (2004), Lalor (1994) and Pitt et al. (1993) from illicit discharge detection and elimination work conducted in Alabama and Maryland.

6.7.1 Single Parameter Screening

Research by Lalor (1994) suggests that a detergent is the best single parameter that can be used to detect the presence of the most common illicit discharges (i.e., sewage and wash water). However, ammonia is another parameter that has been used by some communities with widespread or severe sewage issues. While some communities have used a benchmark concentration as low as 0.30 mg/L, an ammonia concentration of greater than 1.0 mg/L is generally considered to be a positive indicator of sewage flow. Ammonia can be analyzed using a portable spectrophotometer, which provides fairly rapid results and allows investigators to begin tracking down and eliminating sources while they are still out in the field.

As a single indicator parameter, ammonia does have some limitations. First, ammonia, by itself, is not always capable of identifying sewage discharges, particularly if they have been diluted by "clean" flows. Second, while some wash waters and industrial wastes have relatively high ammonia concentrations, not all of them do. This increases the possibility of obtaining false negatives during outfall monitoring efforts. Third, other dry weather discharges, such as those caused by excess and non-target irrigation, can also have ammonia concentrations that exceed 1.0 mg/L. This may lead investigators to falsely assume that sewage is the source of a particular illicit discharge. Adding potassium as an indicator parameter and looking at the ammonia-to-potassium ratio is a simple adjustment to the single parameter approach that helps to more accurately and reliably characterize illicit discharges.

6.7.2 Industrial Flow Benchmarks

Commercial and industrial sites often produce illicit discharges that are not composed entirely of sewage or wash water (e.g., spills, discharges from floor drains). Consequently, if a particular sub-watershed or drainage area has a high density of industrial sites, additional water quality parameters may need to be used to identify and characterize illicit discharges.

The seven water quality parameters that are commonly used to identify the industrial-related illicit discharges and are not picked up by the Flow Chart Method include: ammonia, color, conductivity, hardness, pH, potassium and turbidity. Table 2 summarizes the benchmark concentrations that are commonly used to identify industrial-related illicit discharges.

Table 2: Parameters and Benchmark Concentrations Used to Identify Industrial-Related Illicit Discharges		
Parameter	**Benchmark Concentration**	**Notes**
Ammonia	≥ 50 mg/L	• Existing "Flow Chart" Parameter. • Concentrations higher than the benchmark typically can identify a few industrial-related illicit discharges
Color	≥ 500 units	• Supplemental parameter that identifies a few specific industrial illicit discharges. Should be refined with local data.
Conductivity	≥ 2,000 µS	• identifies a few specific industrial-related illicit discharges • May be useful in distinguishing between different industrial sources
Hardness	≤ 10 mg/L as $CaCO_3$ ≥ 2,000 mg/L as $CaCO_3$	• Identifies a few specific industrial illicit discharges • May be useful in distinguishing between industrial sources
pH	≤ 5	• Only captures a few industrial discharges • High pH values may also indicate an industrial discharge, but residential wash water may have high pH values as well
Potassium	≥ 20 mg/L	• Existing "Flow Chart" Parameter • Excellent indicator of a broad range of industrial discharges.
Turbidity	≥ 1,000 NTU	• Supplemental parameter identifies a few specific industrial discharges. Should be refined with local data.

As shown in Table 2, most industrial-related illicit discharges can consistently be identified by using potassium as an indicator parameter. Note that these discharges would be incorrectly classified as wash water if the Flow Chart Method was used on its own.

Table 3 illustrates how the industrial flow benchmarks can be used independently or to supplement the Flow Chart Method. The best industrial indicator parameters, which can almost always (i.e., > 80% of the time) distinguish industrial-related discharges from wash water and sewage, are identified with bold text. The industrial indicator parameters that can sometimes (i.e., > 50% of the time) distinguish industrial-related discharges from wash water and sewage are identified with italicized text.

By their very nature, industrial sites can produce a bewildering diversity of illicit discharges that are difficult to identify, let alone characterize. Consequently, the CITY may experience some initial difficulties in identifying industrial-related discharges. Over time, however, as its illicit discharge detection and elimination program matures, it will build a sampling database that it can use to identify and better characterize industrial-related illicit discharges.

Table 3: Usefulness of Various Parameters to Identify Industrial Discharges

Industrial Benchmark Concentrations	Detergents as Surfactants (mg/L)	Ammonia (mg/L)	Potassium (mg/L)	Initial "Flow Chart" Class	Color (Units)	Conductivity (:S/cm)1	Hardness (mg/L as $CaCO_3$)	pH	Turbidity (NTU)	Best Indicator Parameters to Identify This Flow Type	Additional Indicator Parameters to Identify This Flow Type
	--	≥50	≥20		≥500	≥2000	≤10 ≥2,000	≤5	≥1,000		
Concentrations in Industrial and Commercial Flow Types											
Automotive Manufacturer[1]	5	0.6	**66**	**Wash water**	15	220	30	6.7	118	Potassium	
Poultry Supplier[1]	5	4.2	**41**	**Wash water**	23	618	31	6.3	111	Potassium	
Roofing Product Manufacturer[1]	8	10.2	*27*	**Wash water**	*>100*[2]	242	32	7.1	229	None	Potassium Color
Uniform Manufacturer[1]	6	6.1	**64**	**Wash water**	*>100*[2]	798	35	10.4	*2,631*	Potassium	Color Turbidity
Radiator Flushing	15	(26.3)	**(2,801)**	**Wash water**	**(3,000)**	**(3,278)**	*(5.6)*	(7.0)	-	Potassium Conductivity Color	Hardness
Metal Plating Operation	7	**(65.7)**	**(1,009)**	**Wash water**	(104)	**(10,352)**	**(1,429)**	*(4.9)*	-	Ammonia Potassium Conductivity Hardness	pH
Commercial Car Wash	140	0.9; (0.2)	4; **(43)**	**Wash water**	>61; (222)	274; (485)	71; (157)	7.7; (6.7)	156		Potassium Turbidity
Commercial Laundry	(27)	(0.8)	3	**Wash water**	47	(563)	(36)	(9.1)	-		

Best indicator, shaded in pink, distinguish this source from residential wash water in 80% of samples in both Tuscaloosa and Birmingham, AL.

Supplemental indicator, shaded in yellow, distinguish this source from residential wash water in 50% of samples.

(Data in parentheses are mean values from Birmingham); Data not in parentheses are from Tuscaloosa

[1] Fewer than three samples for these industrial-related flows.

[2] The color analytical technique used had a maximum value of 100, which was exceeded in all samples. Color may be a good indicator of these industrial discharges and the benchmark concentration may need adjustment downward for the City of Rockford.

Source: Illicit Discharge Detection and Elimination, A Guidance Manual – Center for Watershed Protection October 2004.
(Please refer to this document for further guidance.)

Appendix A

Analytical Parameters

List of Water Quality Analyses	
Storm Water Analysis	**Tributary Site Analyses**
	Dissolved oxygen
5-day biochemical oxygen demand (BOD)	5-day biochemical oxygen demand (BOD)
Chemical oxygen demand (COD)	Chemical oxygen demand (COD)
Total Kjeldahl Nitrogen Ammonia Nitrogen Nitrate+nitrite Nitrogen	 Ammonia Nitrogen Nitrate+nitrite Nitrogen
Total Phosphorus	Total Phosphorus
Fats, Oils and grease	
Cadmium (total) Copper (total) Lead (total) Zinc (total)	Cadmium (total) Chromium (total) Copper (total) Lead (total) Nickel (total) Zinc (total)
pH	pH
Hardness	Hardness
Fecal coliform bacteria E. coli (occasionally, as laboratory capacity allows)	Fecal coliform bacteria E. coli (occasionally, as laboratory capacity allows)
Total suspended solids Total dissolved solids	Total suspended solids Total dissolved solids

Appendix B

Sample Bottles, Preservatives, and Maximum Holding Times

City Staff will deliver samples to the Laboratory within three hours of collection. Laboratory Analysts will split the sample needed for the analyses required and preserve accordingly.

Parameter	Type	Container & Preservation
Fecal Coliform (and E. coli)	Grab	Sterilized, 6 oz. Nalgene sample bottle **with sodium thiosulfate ($Na_2S_2O_3$) preservative**, chill with ice.
Fats, Oils & Grease	Grab	1 liter glass sample bottle, chill with ice.
All other parameters	Composite or Grab	1 gallon plastic sample bottle, chill with ice.

Bottles used in the automatic samplers are two-gallon polyethylene.

Laboratory analysts will preserve samples, as necessary immediately upon delivery to the laboratory. In cases when analysts begin the analysis immediately upon sample delivery, they may omit sample preservation. With the exception of metals, all samples are stored in a 4°C refrigerator.

Parameter	Preservative	Hold Time
DO (field)	NA	NA
Temperature	NA	NA
pH	NA	NA
Conductivity	NA	NA
Metals	HNO_3 to pH < 2	6 months
Nitrogen, Ammonia	H_2SO_4 to pH < 2	28 days
Nitrogen, Kjeldahl	H_2SO_4 to pH < 2	28 days
Nitrogen, Nitrate	---	48 hours
Phosphorus	H_2SO_4 to pH < 2	28 days
Biochemical Oxygen Demand	---	48 hours
Chemical Oxygen Demand	H_2SO_4 to pH < 2	28 days
Hardness	HNO_3 to pH < 2	6 months
Total Suspended Solids / Dissolved Solids	---	7 days
Oil and Grease	H_2SO_4 to pH < 2	28 days
Fecal Coliform (or E. coli)	sodium thiosulfate ($Na_2S_2O_3$)	6 hours

Appendix C

Water Quality Parameter Overview

This appendix provides an overview of the thirteen different water quality parameters that can be used to confirm the presence or origin of an illicit discharge.

Ammonia

Ammonia is a good indicator of sewage, since its concentration is much higher there than is ground or tap water. High ammonia concentrations may also be found in liquid waste streams generated on industrial sites. Ammonia is relatively simple and safe to analyze. Some challenges associated with analyzing ammonia include the tendency for it to volatilize and the fact that it can come from non-human sources, such as pets or wildlife.

Boron

Boron is an element present in the compound borax, which is often found in detergents and soaps. Consequently, boron should be a good indicator for both wash water and sewage. Preliminary research conducted in Alabama supports this contention, particularly when it is combined with other detergent indicators, such as surfactants. Boron may not be a useful indicator everywhere in the country since it is occasionally found at elevated levels in groundwater and is a common ingredient in a number of water softener products. Over time, the CITY should collect data on the boron concentrations found in local tap water and groundwater sources to confirm whether or not it is a useful local indicator of illicit discharges.

Chlorine

Chlorine is used throughout the country to disinfect tap water, except where private wells serve as the primary water supply. Chlorine concentrations in tap water tend to be significantly higher than those in most other flow types. Unfortunately, chlorine is extremely volatile, and even moderate concentrations of organic material can cause chlorine levels to drop below detection levels. Because chlorine is non-conservative, it is not a reliable indicator, although if a very high chlorine concentration is found, it typically indicates a water main break, swimming pool discharge, or a discharge from a chlorine-based industrial process.

Color

Color is a numeric computation of the color observed in a water quality sample, as measured in terms of cobalt-platinum units. Both industrial wastes and sewage tend to have elevated color values. Unfortunately, some "clean" flows can also have high color values. Field testing in Alabama found high color values associated with all contaminated flows, but also for many "clean" flows, which yielded many false positive results. Overall, color may be a good initial screening parameter, but needs to be supplemented by other indicator parameters.

Conductivity

Conductivity, or specific conductance, is a measure of how easily electricity can flow through water. Conductivity is often strongly correlated with the total amount of dissolved solids found in the water column. The utility of conductivity as an indicator depends on whether concentrations are elevated in natural or "clean" waters. In particular, conductivity is a poor indicator of illicit discharges in estuarine waters and in northern climates where salt is used to remove salt from roadways.

Field testing in Alabama suggests that conductivity has limited value in detecting sewage or wash water. It does, however, have some value in detecting industrial-related illicit discharges, some of which can exhibit extremely high conductivity values. Conductivity is extremely easy to measure using meters, so it has the potential to be a useful supplemental indicator in sub-watersheds dominated by commercial and industrial land uses.

Detergents

Most illicit discharges have elevated concentrations of detergents. Sewage and wash water discharges contain detergents that were used to wash clothes or dishes, whereas industrial-related discharges contain detergents used in commercial or industrial cleaning compounds. The nearly universal presence of detergents in illicit discharges, combined with their absence in natural waters or tap water, makes them an excellent indicator parameter. Research has revealed that three indicator parameters that measure detergents or its components: surfactants, fluorescence, and surface tension. Surfactants have been the most widely applied and transferable of these three indicator parameters.

E. coli, Enterococci and Total Coliform

Each of these bacteria is found in very high concentrations in sewage flows, particularly when compared with other flow types. They are very good indicators of sewage and septic discharges, except in sub-watersheds where pet or wildlife sources exist. Overall, bacteria is a good supplemental indicator and can be used to find "problem" outfalls that are discharging flows with bacteria concentrations that exceed public health standards. Relatively simple analytical methods are now available for bacteria samples, although they still suffer from two monitoring constraints. The first is the relatively long time (i.e., 18-24 hours) it takes to get results. The second is that the waste produced during analysis may be considered a biohazard and may require special disposal procedures.

Fluoride

Fluoride is added to drinking water supplies in most communities to improve dental health, and is normally found in tap water at a concentration of two parts per million. Consequently, fluoride is an excellent indicator of tap water discharges and water main breaks or leaks that end up in the storm drain system. Fluoride is obviously not a useful indicator in communities that do not fluoridate their drinking water supplies or in areas where private wells serve as the primary water supply. One key constraint is that the recommended analytical method for fluoride uses a reagent that is considered to be a hazardous waste. It must be properly disposed of.

Hardness

Hardness measures the number of positive ions dissolved in the water column. It primarily measures magnesium and calcium, but sometimes measures the presence of other metals. Field testing in Alabama suggests that hardness has limited value as an indicator parameter, except where values are extremely high or low, which may indicate the presence of an industrial-related discharge. It may be a useful supplemental indicator in communities where groundwater has hardness levels that are higher than those in tap water. In these situations, hardness can help distinguish between groundwater and tap water and other potable water-derived flows (i.e., sewage, wash water).

pH

Most discharges are neutral, having a pH value of around 7, although groundwater pH values can be somewhat variable. pH is a reasonably good indicator for industrial-related discharges, which can have

very high or very low pH values ranging from 3 to 12. pH is very simple to measure in the field using low cost test strips or meters. Although pH, on its own, isn't a particularly conclusive indicator parameter, it can be used as an initial screening parameter, identifying outfalls that merit follow up investigation.

Potassium

Potassium is found at relatively high concentrations in sewage and in extremely high concentrations in many industrial-related discharges. Consequently, it is a very useful indicator parameter. Although simple meters can be used to detect potassium at relatively high concentrations (i.e., 5 mg/L or greater), more complex colorimetric methods are needed to detect potassium at concentrations lower than 5 mg/L.

Surfactants

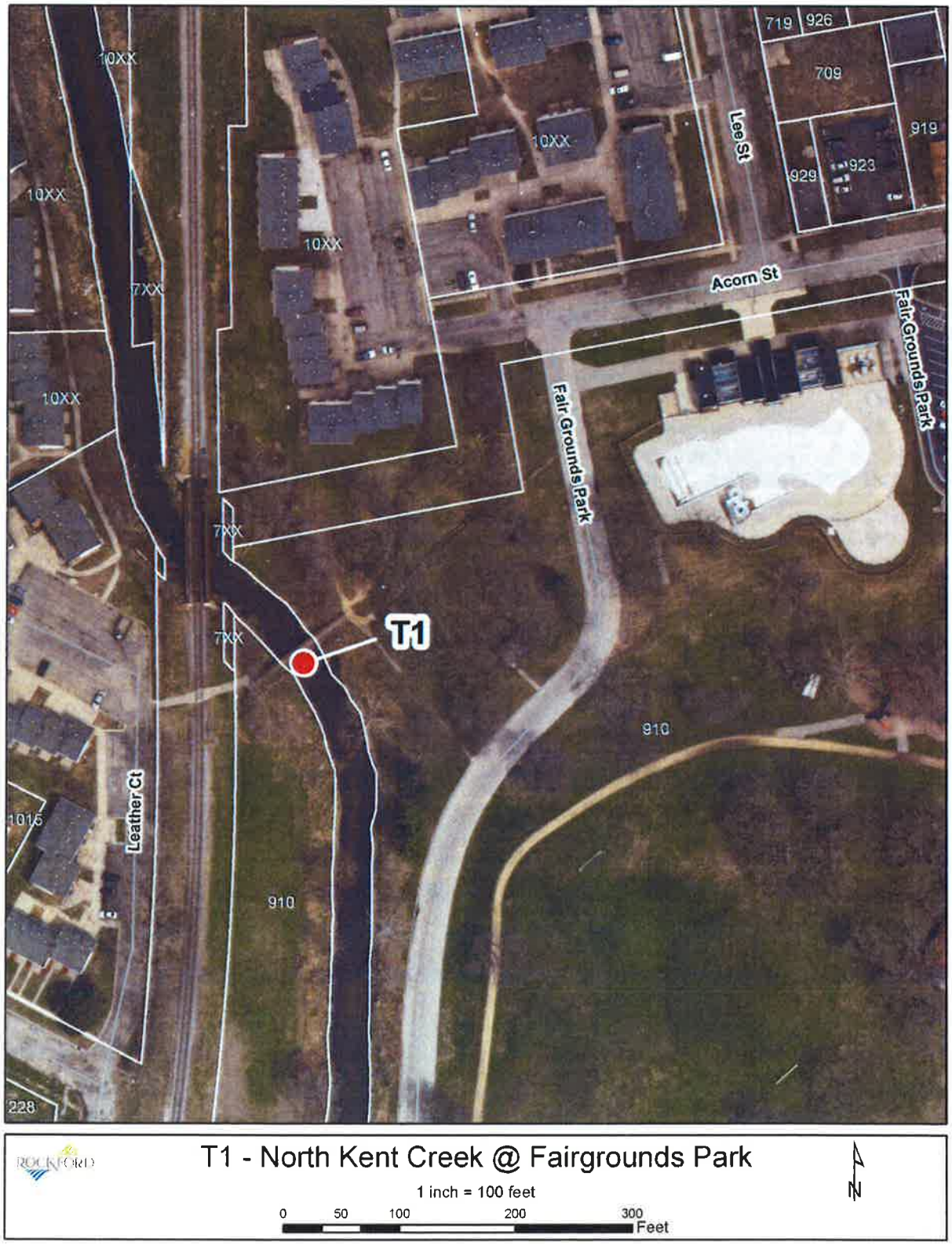
Surfactants are the active ingredient in most commercial detergents and are typically measured as Methyl Blue Active Substances (MBAS). They are a synthetic replacement for soap. Since surfactants are not found in nature, but are always present in detergents, they are excellent indicators of sewage and wash water flows. The presence of surfactants in cleaners, emulsifiers and lubricants also makes them an excellent indicator of industrial-related discharges. Several analytical methods are available to measure the surfactant content of a water quality sample. Unfortunately, the reagents used in these analyses include toluene, chloroform or benzene, each of which is considered hazardous waste and each of which pose a potential human health risk. The recommended analytical method uses chloroform as a reagent, which is safer than the reagents used in the other analytical methods.

Turbidity

Turbidity is a quantitative measure of the cloudiness of a water column and is normally measured with a specialized instrument called a turbidimeter. While turbidity itself cannot always be used to distinguish between different flow types, it is potentially useful in determining whether or not a discharge is illicit and merits a follow up investigation.

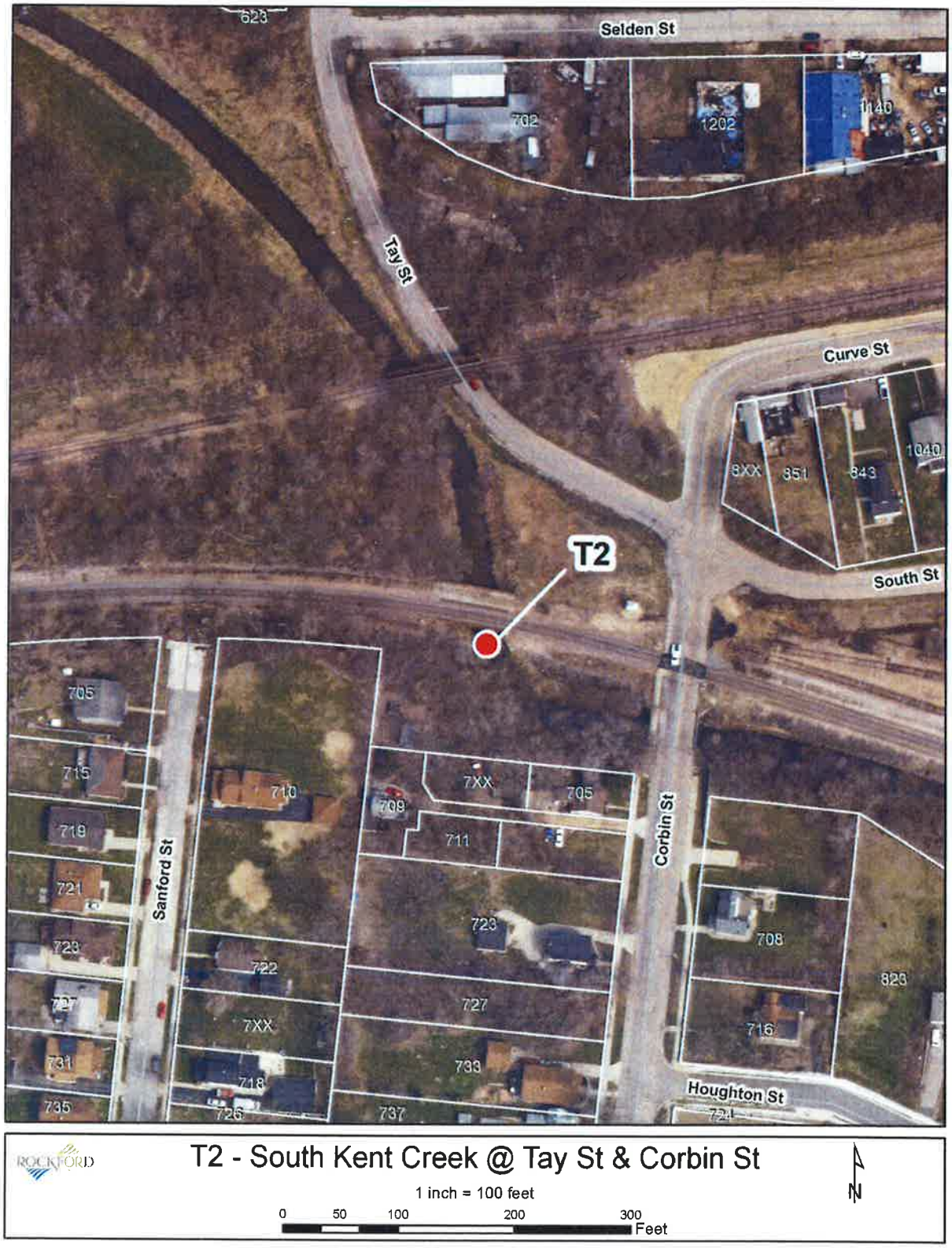
Appendix D

Tributary Site Map



Appendix E

Tributary Site Map



Appendix F

Tributary Site Map

Appendix G

Tributary Site Map

Appendix H

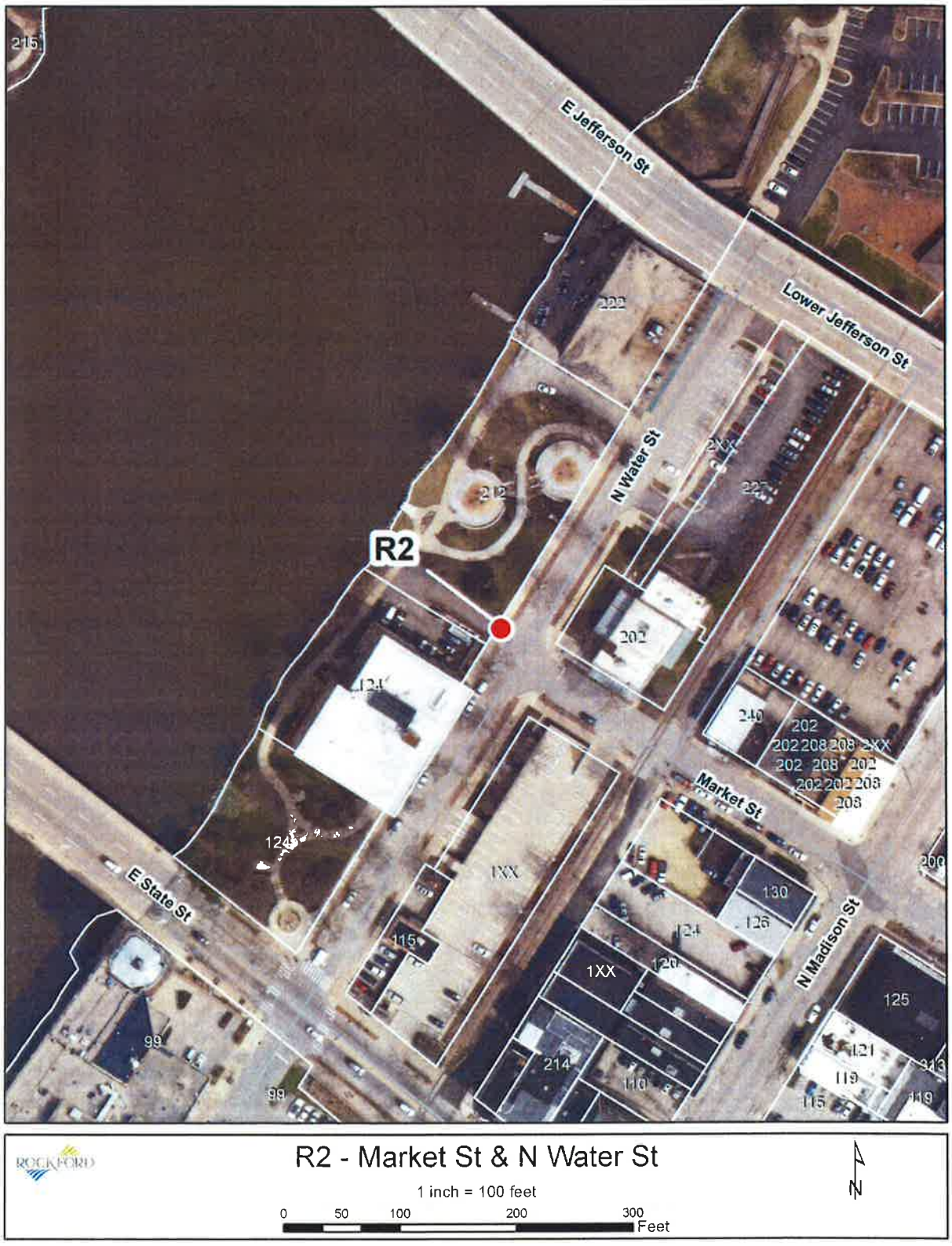
Tributary Site Map

Appendix I

Outfall Site Map

Appendix J

Outfall Site Map



Appendix K

Outfall Site Map

Appendix L

Outfall Site Map

Appendix M

Outfall Site Map

Appendix N

Baetis

ROCK RIVER WATER RECLAMATION DISTRICT
Storm Water Sample Sheet

LAB NUMBER:

Outfall Number:	Fecal Grab Grid Locations:
Date:	Sample Tech(s):
Weather Conditions:	

STREAM CHARACTERISTICS

Sample Grid Location	Time Collected	D.O.	Temp °C	pH	River Elevation	Secchi Disc Clarity

COMPOSITE SAMPLE DATA

Sample Volume:

Preservative:

CHAIN OF CUSTODY

Relinquished by:	Rec'd by:
Date:	Date:
Time:	Time:

Sample Number:					
Analysis Requested	Result (indicate units)	Analyst	Analysis Requested	Result (indicate units)	Analyst
METALS			pH		
Cu			Conductivity		
Cd					
Zn					
Pb			Fecal Coliform		
			BOD		
			COD		
			TSS		
			FOG		
NITROGEN					
TKN					
NH^3					
NO_3					
CYANIDE					
Total					
			Other		
PHOSPHORUS					
Total					
Chemist:				Date:	

ROCK RIVER WATER RECLAMATION DISTRICT
Tributary Sample Sheet

LAB NUMBER:

Site:	Fecal Grab :
Date:	Sample Tech(s):
DO Probe Model No.:	DO Probe Serial No.:
Weather Conditions:	

STREAM CHARACTERISTICS

Sample Grid Location	Time Collected	D.O.	Temp °C	pH	Conductivity	Secchi Disc Clarity

COMPOSITE SAMPLE DATA

Sample Volume:

Preservative:

CHAIN OF CUSTODY

Relinquished by:	Rec'd by:
Date:	Date:
Time:	Time:

Sample Number:					
Analysis Requested	Result (indicate units)	Analyst	Analysis Requested	Result (indicate units)	Analyst
METALS			pH		
Cu			Conductivity		
Cd					
Ni					
Cr			Fecal Coliform		
Zn			E. coli		
Pb			BOD		
			COD		
			TSS		
			TDS		
NITROGEN			Hardness		
NH^3					
NO_3					
CYANIDE					
Total					
			Other		
PHOSPHORUS					
Total					
Chemist:				Date:	

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
WESTERN DIVISION

THE UNITED STATES OF AMERICA and THE STATE OF ILLINOIS Plaintiffs, v. THE CITY OF ROCKFORD, ILLINOIS, Defendant.	)	Civil Action No. 3:15cv50250

CONSENT DECREE
APPENDIX K

THE CITY OF ROCKFORD ILLINOIS, USA

STORMWATER AND ENVIRONMENTAL EDUCATION

STANDARD OPERATING PROCEDURE

June 2015

1.0 General

The purpose of this standard operating procedure for the Stormwater & Environmental Education program is to comply with Part II, A.6.B AND Part II,A.10 of the City of Rockford's NPDES Stormwater Permit (ILS000001). The Engineering Operations Manager oversees the City's Stormwater Programs and the Stormwater and Environmental Program Manager manages the program. This document outlines how City staff and the public will be educated regarding the City's stormwater programs.

2.0 Staff Training

Within 90 days of their start date, all newly hired staff in the Public Works Engineering Division shall receive general training in the following areas regarding the stormwater program:

1) General overview of the stormwater program
2) Illicit Discharge Detection and Elimination
3) Erosion and Sediment Control Requirements
4) Job Site Safety

The Stormwater Program and Job Site Safety shall be provided by the Stormwater and Environmental Team.

All Public Works Engineering Division technical staff shall also attend additional training, both internally and externally, for any other stormwater related topics when necessary and as scheduling allows them to do so. Internal training may include supervisor meetings, contractor meetings, pre-construction meetings and informal reviews of stormwater program.

The City receives training notices from a variety of different sources. These include, but are not limited to: Illinois EPA, local soil and water conservation districts, USEPA (primarily webinars), Lorman, Illinois Association of Floodplain Managers and the American Public Works Association. Typically the Engineering Operation Manager or the Stormwater and Environmental Program Manager are notified of upcoming training who then forward the information to the Engineer Division staff. Other training opportunities will be reviewed as they become available.

Tracking: All training received by staff is recorded in the Stormwater Drive along with any certificates received (see section 4.0). All in-house training shall be saved in the same location. Sign –in sheets, instructor and topics discussed shall be included in the respective folders. Copies of certificates shall be given to the Engineering Operations Manager so they may be incorporated into the employees personnel file in the Human Resources Department.

In-depth in-house training shall be provided to designated staff in the City of Rockford Public Works Engineering Division for the following stormwater related topics:

2.1 Private Detention Basin Inspections (training every other year or prior to event inspections as described in the Standard Operating Procedures for Detention Basins – Section 4.2) – presented by the Stormwater Program Manager(s).

1. Public Works Engineering Division staff attendance shall include: Engineers, Managers, Technicians, and Coordinators.
2. Topics to include: review of Standard Operating Procedures Detention Basins and the detention basin maintenance guide, Identifying and locating detention basins, procedures for conducting inspections and recording and saving inspection reports and photos.

2.2 Public and Priority Private Detention Basin Inspections (annual training)

1. Public Works Engineering Division staff attendance shall include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Project Manager and Engineering Tech.
2. Topics to include: review of Standard Operating Procedures for public and high priority detention basins, list of basins, when to perform event inspections, procedures for conducting inspections and recording and saving inspection reports and photos.

2.3 Inlet & Storm Pipe Inspections (annual training)

1. Staff attendance shall include: Street Supervisors and designated street maintenance staff
2. Topics to include: Review of standard operating procedures, inspecting inlets and storm pipes, procedures for cleaning of inlets and disposal of material.

2.4 Creek Inspections (training to be held every other year)

1. Public Works Engineering Division staff attendance shall include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Project Manager.
2. Topics to include: Identify eroding stream channels, review of creek inspection form, reporting and documenting inspections.

2.5 Erosion and Sediment Control on City Construction Projects (annual training) – presented by the Stormwater Program Manager(s).

1. Public Works Engineering Division staff attendance shall include: Engineers, Managers, Technicians, and Coordinators.
2. Topics to include: ILR10 general construction permit requirements, common BMP's from Illinois Urban Manual and the IDOT Manual, requirements and procedures for conducting inspections, record keeping on City of Rockford projects.

2.6 Erosion and Sediment Control on Non-City Construction Projects (annual training) – presented by the Stormwater & Environmental Program Manager and the Environmental & Stormwater Project Manager.

1. Public Works Engineering Division staff attendance shall include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Project Manager and Engineering Tech.
2. Topics to include: ILR10 general construction permit requirements, common BMP's from Illinois Urban Manual and the IDOT Manual, requirements and procedures for conducting inspections, follow up and enforcement procedure and record keeping.

2.7 Street Sweeping (annual training) Presented by the Street Superintendent or their designee

1. Staff attendance shall include: Street Supervisors, designated street maintenance staff and designated contractor staff.
2. Topics for the training shall include but not be limited to: review of these standard operating procedures, disposing of street sweepings, review of contractor street sweeping procedures and locations of previous concerns and issues.

2.8 **Flood Control and Floodplain Management** (annual training) – presented by the City Floodplain Manager

1. Staff attendance shall include: Designated Managers, Coordinators & Technicians
2. Topics to include: floodplain regulations, review of areas where nuisance flooding occurs, IDNR/ACOE regulations.

2.9 **Pesticide, Herbicide & Fertilizer Applications** (annual training) – presented by Forestry Supervisor.

1. Staff attendance shall include: Designated street maintenance staff.
2. Topics to include: review of standard operating procedures and the IEPA General NPDES Permit for Pesticide Application Point Source Discharges (ILG870147), status of certifications and training required to maintain, reporting and documenting applications, spill plan.

2.10 **Illicit Discharge Detection and Elimination Program** (annual training) - presented by the Stormwater Program Manager(s).

1. Staff attendance shall include:
   a. Public Works Engineering Division: Engineers, Managers, Technicians, Coordinators and street supervisors.
   b. Community and Economic Development – inspectors, Enforcement Specialists

2. Topics to include: IDDE program – allowable discharges, indicators of potential illic discharges, process to report potential illicit discharges reporting and documenting observatio

2.11 **Outfall Inspections** (training to be held every other year)

1. Public Works Engineering Division staff attendance shall include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Project Manager and Engineering Tech.
2. Topics to include: Review of Standard Operating Procedures for IDDE, procedures/protocols for Monitoring (including outfall screening and sampling) and outfall inspection sheet, reporting and documenting inspections.

2.12 **Industrial High Risk Runoff Program** (annual training)

1. Public Works Engineering Division staff attendance shall include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Project Manager and Engineering Tech.
2. Topics to include: Review of Standard Operating Procedures for Industrial High Risk Runoff Program including procedures for conducting inspections, List of IHRRI facilities, reporting and documenting inspections.

2.13 **Monitoring Program** (annual training)

1. Public Works Engineering Division staff attendance shall include: Engineering Operations Manager, Stormwater Program Manager(s), Stormwater Coordinator and designated Proje Manager and Engineering Tech.
2. Topics to include: Review of Standard operating procedures for Monitoring Program and IDDE, reporting and documenting samples review on operating equipment.

3.0 Public Education

The City continues to review ways to increase public awareness on reducing contaminants in our stormwater to improve water quality. These activities adopted to date include:

3.1 Educational Brochures

Several brochures regarding a number of topics about improving our stormwater quality have been developed. These are all available for the public at City Hall and can also be found on the City's website at (http://rockfordil.gov/public-works/engineering-cip/stormwater.aspx). In addition, public works staff has placed brochures at locations throughout the City as an added effort to educate the public including but not limited to: Rockford Park District and Winnebago County Soil & Water Conservation District. Educational brochures and documents available include:

- Concrete Washout
- Erosion and Sediment Control
- Fertilizer and Pesticide Applications
- Hazardous Materials
- Illicit Discharge and Detection
- Pet Waste
- Water Friendly Landscaping
- Residential Deicing
- Recycling
- City's Stormwater Management Program
- Yard waste
- Citizens Guide to Pest Control & Pesticide Safety
- Rain Garden "How To" Manual
- Fats, Oil & Grease

The City will evaluate the need for additional education materials on an annual basis and will identify any new brochures or other materials in the City's annual reports.

3.2 Public Presentations/Meetings

When applicable, displays will be at public/private events. Presentations shall be made at neighborhood meetings, seminars, workshops as requested. A preliminary list of neighborhood meetings is included on the City of Rockford's SharePoint site under: Public Works, Engineering/Admin, Neighborhood Assoc. meetings. The City's annual reports will summarize the public presentations provided during the year.

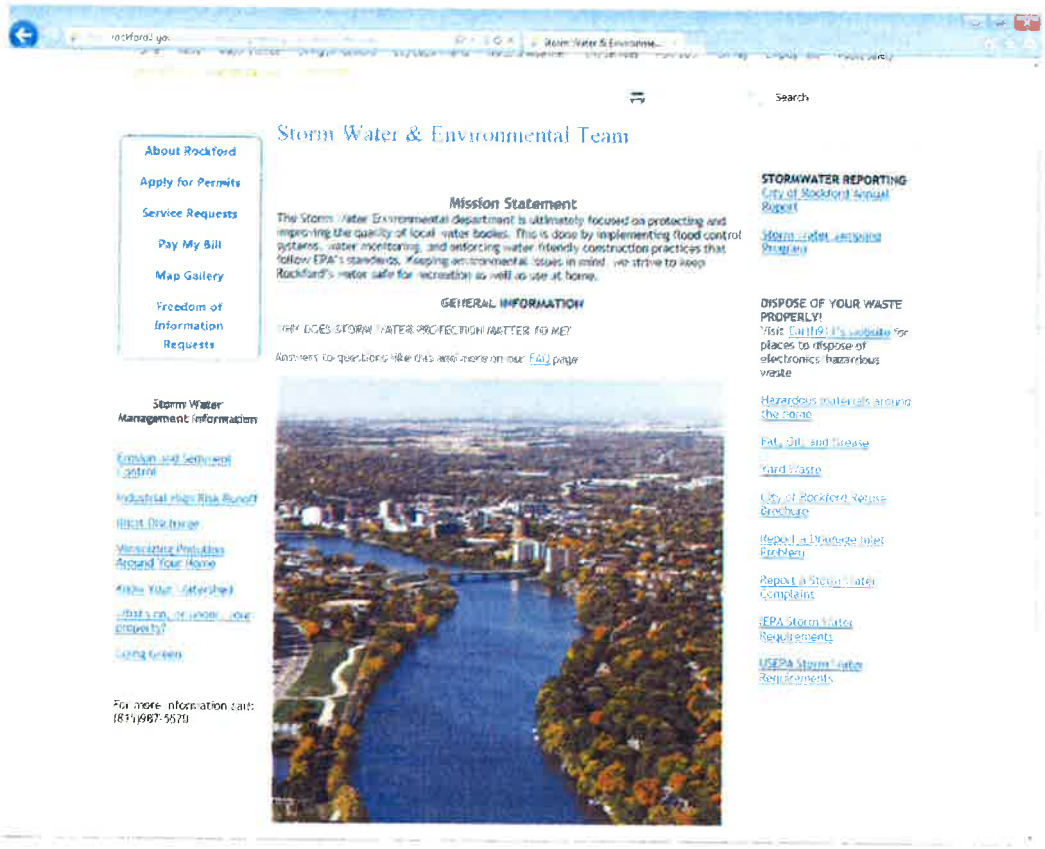
3.3 Erosion and Sediment Control Seminar

The City shall host or co-sponsor annual erosion and sediment control training for developers, development engineers, construction site operators and other interested parties. These seminars may cover a variety of topics regarding erosion and sediment control on construction sites. Certificates of attendance will be provided to attendees.

3.3 Public Reporting Tools

The public is encouraged to report any concerns about stormwater contaminants. The hotline (779-348-7300) and an online reporting tool (see web link in 3.4) are in place for the public to report a stormwater pollution concern.

A Stormwater link has been included on the City of Rockford's website (http://rockfordil.gov/public works/engineering-cip/stormwater.aspx). This link is designed to educate the public about our stormwater programs and other environmental topics and how they can help the City to improve the quality of water in the Rockford area.



4.0 Documentation and Record Management

All staff and public educations shall be saved in the Stormwater Drive.

These files shall be saved as follows:

1) Open the Stormwater Drive (note: this drive has limited access for people who perform duties directly related to the City's stormwater program),
2) Open the Education folder,
3) Open the folder for the current year,
4) Open folder for Community or staff education
5) Create a folder for the training, note: title of folder should show date and name of training (i.e. *2013.03.06 SWCD ESC Seminar*)
6) Data to be saved within folders may include: agenda, attendees (include certificate if received), correspondence

An excel spreadsheet for all inspections and education opportunities has also been created. This spreadsheet can be found in the Stormwater Drive in the folder entitled ***Inspection and Sampling Logs***. All spreadsheets saved by year for easy tracking. Data for education includes: date of event, type of public education/staff training, presenter/attendees, title of program, # in attendance and # and type of educational brochures handed out.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
WESTERN DIVISION

THE UNITED STATES OF AMERICA and THE STATE OF ILLINOIS Plaintiffs, v. THE CITY OF ROCKFORD, ILLINOIS, Defendant.	)	Civil Action No. 3:15cv50250

CONSENT DECREE
APPENDIX L

City of Rockford
Stormwater Division
Enforcement Response Plan

Introduction

The intent of this document is to provide guidance to City officials and staff in enforcing the stormwater management ordinance. It should be used only as a guide while recognizing that each situation is unique. The provisions of this enforcement response plan are not intended to limit the judgment and flexibility of the administrator in determining an appropriate response.

While the purpose is to provide guidance for administration of the stormwater management ordinance, actual enforcement procedures should consider any unusual aspects of a violation or condition, as well as special characteristics of an enforcement action, in determining the proper response.

Minor infractions may be resolved by a verbal notice, telephone call, or warning letter advising the owner/operator/person of the nature of the violation. If such action fails to generate an adequate response by the owner/operator/person, further enforcement actions as provided by the ordinance may be taken.

Inspections

The Stormwater Division completes the inspections that are incorporated and required under the City's National Pollutant Discharge Elimination System (NPDES) permit. This includes the following categories of the NPDES permit:

1. Structural Controls
    a. Private detention ponds including the structures and drainage easements
    b. Creeks located through private property
2. Erosion and Sediment Control
    a. Construction Site Runoff
    b. Post Construction Maintenance
3. Flood Control/Floodplain Management
4. Pesticide, Herbicide and Fertilizer Applications
5. Illicit Discharges and Improper Disposal
6. Industrial and High Risk Runoff

Inspections for the above categories shall be completed in accordance with their corresponding standard operating procedures. After inspection is completed and the properties are found in non-compliance of the City's stormwater management ordinance this document provides the enforcement responses as needed or required.

Enforcement Responses

The order of precedence for enforcement responses outlined in this guide should not be construed to prevent the administrator from taking a stronger action without first implementing less stringent steps, if in his opinion, a more forceful response is necessary.

A code enforcement hearing shall be held prior to any enforcement action other than a telephone call, warning letter, notice of violation (NOV), or stop work order. The purpose of a code enforcement hearing is to provide a forum for the owner to present a defense to charges as outlined, or, to obtain additional information.

THE CITY OF ROCKFORD ILLINOIS, USA

Documented Phone Calls or Informal Discussions

In the case of the most minor violation of a permit or the ordinance, a telephone call or informal meeting may be sufficient to obtain the desired compliance. Phone calls should be documented onto the division's violation tracking table. Likewise, if an informal discussion is held, it should be entered onto the division's violation tracking table.

Warning Letter

A warning letter is the lowest level of formal response to a violation. It is intended for minor violations which would not cause harm to the environment.

Notice of Violation

A notice of violation (NOV) is an official notification to inform a non-compliant owner of a violation of the stormwater management ordinance. Within ten (10) days of receipt of this notice, a written explanation of the violation and a plan for the satisfactory correction and prevention thereof, to include specific required actions, shall be submitted by the owner to the administrator. Inspection to ensure performance of any corrective actions may be conducted by the administrator at his discretion. Submission of this plan in no way relieves the owner of liability for any violations occurring before or after receipt of the notice of violation.

Stop Work Order

A Stop Work Order may be issued when the administrator finds that an owner has violated, or continues to violate, the stormwater management ordinance or order issued thereunder. The order shall require that the owner:

(a) Comply forthwith; and
(b) Take such appropriate remedial or preventive action as may be needed or deemed necessary to properly address a continuing or threatened violation, including halting operations and terminating the discharge.

Administrative Orders

Administrative code hearing findings, decision and orders (AO) are enforcement documents which direct owners to perform, or to cease, specific activities. These administrative orders may also invoke a penalty. There are three (3) primary types of administrative code hearing orders: consent orders; compliance orders; and cease and desist orders. These administrative orders are issued by the Code Hearing Officer as a result of a code enforcement hearing.

Consent orders are entered into between the City and the owner to assure compliance as to specific actions to be taken by the owner to correct non-compliance within a specified time period. The code hearing officer may officially enter such consent orders, assurances of voluntary compliance or other similar documents establishing an agreement between the City and any owner responsible for noncompliance. Such documents shall include specific action to be taken by the owner to correct the noncompliance within a time period specified in the document. Such documents shall have the same force and effect as orders issued pursuant to Chapter 109 Article 13.

Compliance orders may be issued when the code hearing officer finds that an owner has violated, or continues to violate, the ordinance or an order issued thereunder. It is similar to a consent order except that the consent of the owner is not implied in its issuance. When the code hearing officer finds that an owner has violated or continues to violate a section of this article, or a permit or order issued under this article, the code hearing officer may issue an order to the owner responsible for the violation directing that the owner come into compliance within a specified time, and such order may include assessment of a penalty to be paid if the owner does not come into compliance within the time provided. Compliance orders also may contain other requirements to address the noncompliance, including additional self-monitoring and

management practices designed to minimize the amount of pollutants discharged offsite. A compliance order does not relieve the owner of liability for any violation, including any continuing violation. Issuance of a compliance order shall not be a bar against or a prerequisite for taking any other action against the owner.

Cease and desist orders may be issued when the administrator or code hearing officer finds that an owner has violated, or continues to violate, the stormwater management ordinance or order issued thereunder. Issuance of a cease and desist order shall not be a bar against or a prerequisite for taking any other action against the owner.

Administrative orders contain the following components:

1. Title - The title specifies the type of order being issued (see below), to whom it is being issued, summarizes the purpose of the order, and contains an identification number.

2. Legal Authority - The authority under which the order is issued (the stormwater management ordinance).

3. The Finding of Noncompliance - All violations must be described including the dates, the specific permit and/or ordinance provisions violated, and any damages known and attributable to the violation.

4. Required Activity - All orders should specify the required actions, such as installation of BMPs, additional inspections, appearance at show cause hearings, etc.

5. Milestone Dates for Corrective Actions - When compliance schedules are appropriate, all milestone dates must be established including due dates for required written reports.

6. Supplemental Clauses - The document should contain standard clauses providing that:

   (a) Compliance with the terms and conditions of the administrative order shall not be construed to relieve the owner of its obligation to comply with applicable state, federal or local law, or the permit;
   (b) Violation of the administrative order itself may subject the owner to additional penalties as set out in the stormwater management ordinance;
   (c) No provision of the order shall be construed to limit the town's authority to issue supplementary or additional orders, or to take action deemed necessary to implement this program or ordinance;
   (d) The order shall be binding upon the owner, its officers, administrators, agents, employees, successors, assigns, and all persons, firms or corporations acting under, through or on behalf of the owner.

Administrative orders issued as a result of a violation of the stormwater management ordinance may contain a penalty pursuant to Chapter 109-13:03 of the stormwater management ordinance. Administrative orders may also be used to advise an owner of the need to take, or cease, certain actions, and in such case, may or may not be associated with penalties as defined in the ordinance or in this guide.

Civil Litigation

Pursuant to Section 109-13:03 of the stormwater management ordinance, the administrator may, through the city attorney, petition the appropriate court(s) for issuance of preliminary or permanent injunctions to restrain or compel activities by an owner.

Penalties, Administrative or Civil

The stormwater management ordinance authorizes assessment of penalties not to exceed $750 per violation per day. Additionally, Section 109-13:03 of the ordinance and state statutes authorize the administrator to assess a civil penalty for actual damages incurred by the City.

If a violation results in conditions requiring the expenditure of public funds for mitigation of damages, a penalty shall be assessed in such amount as to offset the public funds so expended. This will in no way reduce or offset the liability of the owner with respect to damages incurred. Mitigation of damages may include, but not limited to, maintenance and repairs to the structural controls, implementation of erosion and sediment control measures, illicit discharge and high risk runoff cleanup and the labor and equipment utilized for such efforts.

Cease and Desist Order

A civil injunction may be requested at any time, for any violation, if in the opinion of the administrator in consultation with the city attorney, such action is justified, needed or appropriate.

Criminal Action

In cases where criminal acts are suspected by the administrator, after consultation with the city attorney, information shall be gathered and forwarded to the district attorney of the appropriate county for action. Criminal prosecution, if pursued, shall be in addition to other actions authorized by ordinance.

THE CITY OF ROCKFORD ILLINOIS, USA

TABLE A

ENFORCEMENT RESPONSE GUIDE

ESCALATION OF RESPONSES

The following table outlines a recommended course of action for violations of the stormwater ordinance. When enforcement actions involving a specific site, a common operator or owner include multiple or successive violations then the severity level may be increased.

While the purpose is to provide guidance for administration of the stormwater management ordinance, it is not intended to limit the judgment and flexibility of the administrator in determining an appropriate response.

SEVERITY OF VIOLATION	ACTION
1	Informal Phone Call/Discussion
2	Written warning
3	Notice of Violation
4	Stop Work Order
5	Administrative Order
6	Administrative Order with up to $750 per day Penalty

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
WESTERN DIVISION

THE UNITED STATES OF AMERICA and THE STATE OF ILLINOIS Plaintiffs, v. THE CITY OF ROCKFORD, ILLINOIS, Defendant.	)	Civil Action No. 3:15cv50250

CONSENT DECREE
APPENDIX M

Appendix M:

Annual Reporting Requirements Under Paragraph 32 of the Consent Decree in *United States and the State of Illinois v. City of Rockford, Illinois*

The Annual Reports required under Paragraph 32 of the Consent Decree shall conform to the requirements of the Permit at Part V.C and shall include the information specified below. Annual Reports shall summarize progress in meeting all measurable goals identified in the Permit and in the City's Standard Operating Procedures (SOPs) which implement the stormwater program components in Part II and Part V of the Permit and which have been incorporated into the City's Stormwater Master Plan. In general, the information described below shall cover the activities conducted and results achieved during each annual reporting period. Where a duration is associated with a measurable goal (e.g., annual, every two years, the construction season, or the permit cycle), each Annual Report shall identify activities and results for the specific reporting period as well as the cumulative activities and results appropriate to the specific measurable goal.

1. **Municipal Operations including Structural Controls, Roadways, Flood Control, and Pesticide, Herbicide and Fertilizer Application** (***Appendix B***[1]: Standard Operating Procedures for Detention Basins; ***Appendix C***: Standard Operating Procedures for Street Sweeping; ***Appendix D***: Right-of-Way & Drainageway Inspection & Maintenance Standard Operating Procedures; ***Appendix E***: Standard Operating Procedures for City of Rockford Pesticide, Herbicide, and Fertilizer Applications)
    a. A report summarizing the inspection and maintenance database. This shall include a summary of inspection findings, follow-up needed, enforcement actions, and date corrective actions completed. The summary shall include:
        i. The following measureable goals in Section 5.0 of the *ROW and Drainage Inspection and Maintenance SOP*:
            1. Number of proactive inspections of stormwater infrastructure including inlets and pipes;
            2. Number of reactive inspections of stormwater infrastructure including inlets and pipes;
            3. Summary of findings from all inspections and status of required follow-up (e.g., cleaning, repair, replacement) including summary of the type and approximate amount of debris deducted and number of feet of storm sewer cleaned, and a summary of all structures repaired/replaced;
            4. List of current known problem areas susceptible to sediment and debris accumulation or flooding pursuant to Section 5.2 (inlet and pipe cleaning), and status of routine maintenance/cleaning in these

[1] All Appendix references are to other Appendices to the Consent Decree.

areas (number and percent of inlets cleaned; number of feet of laterals or mains cleaned; type and approximate amount of debris deducted);

5. Identify any changes to the list of known problem areas.

ii. Pursuant to Section 6.0 of *ROW and Drainage Inspection and Maintenance SOP* and Part II.A.2.d of the Permit:
    1. Number/summary of inspections of all publicly and privately maintained ditches and creeks;
    2. Summary of findings including number of miles in each maintenance category;
    3. Clearly identify stream channels inspected and inspection findings including stream miles experiencing horizontal and/or vertical erosion; if Rockford's system is capable of identifying these inspections and findings on its mapping system, produce the mapping with inspections and findings;
    4. Status of required follow-up (privately and publicly-maintained) including summary of maintenance work completed, type of activity, nature of debris removal or bank stabilization performed, approximate amount of debris removed, and status of all projects to stabilize and minimize erosion of stream channels.

iii. Summary of inspections and maintenance of dams and levees.

iv. Summary of inspections and maintenance of publicly-owned and/or maintained detention ponds, including amount of sediment and debris removed (see j. below)

v. Summary of inspection and maintenance of box culverts including both rain event and routine.

vi. Summary of inspections and maintenance of publicly-owned and/or operated trash racks including summary of the major rain event inspections (including date and size of rain events, dates debris and floatables removed, amount and type of debris/floatables removed).

vii. For the two floatables monitoring points, a summary of the amount of floatables materials collected and date(s) collected.

viii. Snow and De-Icing Operations: Summary of the annual evaluation of deicing operations pursuant to Section 11 of the *ROW and Drainage Inspection and Maintenance SOP* and Part II.A.4.c of the Permit including a description of any changes implemented to minimize the discharge of pollutants.

ix. Detention Basins:
    1. Number and percent of public and priority private basins inspected.
    2. Number and percent of non-priority private basins inspected during the reporting period and cumulatively over the two-year cycle.
    3. Number and percent of basins inspected in response to a public complaint or other concern identified by the city.

4. Number and description of storm event inspections including dates and size of rain events and dates of inspections for publicly-owned or operated basins, priority private basins, and non-priority private basins.
5. Summary of inspection findings and required follow-up including number of basins in each maintenance category, status of follow-up actions and corrective actions.
6. A summary of enforcement actions initiated including status.

x. Street Sweeping:
1. Dates of street sweeping in each category (arterial, central business district, etc.) and tonnage swept.
2. Description/rationale for any schedule deviations, schedule adjustments or changes.

xi. Pesticides, Herbicides and Fertilizer SOP:
1. Status of training and certification of City employees who apply pesticides, herbicides and fertilizers.
2. Description of reported spills including findings from the City's illicit discharge investigation pursuant to Section 3.1 of the *Pesticide, Herbicide and Fertilizer Applications SOP*.

2. **Construction Site Runoff Program** (***Appendix F:*** Erosion and Sediment Control Plan Review and Regulatory Inspections and ***Appendix G***: Erosion and Sediment Control Guidance Manual for City of Rockford Projects)
   a. A report summarizing the number of construction sites in the inventory, the number of new sites added and terminated since the last report, the number of erosion and sediment control plans reviewed and approved and the number of plans that required revisions, the number of inspections conducted and the number that required enforcement follow-up, and the number and type of enforcement actions initiated and concluded.
      i. The inventory should identify City-owned projects, private projects, and projects located in or adjacent to an environmentally sensitive area.
      ii. A summary of inspections conducted shall include pre-construction inspections, routine field inspections (including the initial inspection to be conducted within the first two weeks of the construction start date), routine drive-by inspections, final inspections (or certifications) and inspections completed in response to citizen complaints.
      iii. Identify any missed inspections pursuant to the frequencies specified in the *Erosion and Sediment Control Plan Review and Regulatory Inspections SOP*.
   b. A summary of employee training.
   c. A report summarizing the existing training opportunities and/or newly developed training for construction operators on control measure selection, installation, implementation, and maintenance as well as overall program compliance.

d. A summary of enforcement actions taken as required under Section VII of the Consent Decree including status of all actions.

3. **Industrial and High Risk Runoff Program** (***Appendix H***: Industrial High Risk Runoff Facility Inspection Program Standard Operating Procedures)
   a. A report summarizing the status of all municipally-owned and operated facilities and their development and implementation of appropriate storm water control measures via a Stormwater Pollution Plan to ensure the discharge of pollutants in storm water is minimized or eliminated, and are in compliance with Rockford's Chapter 109 Ordinance, Storm Water and Surface Water Management. As part of each annual report, describe any changes to high priority facilities' stormwater plan following each annual evaluation pursuant to Section 5.8 of the *Industrial High Risk Runoff Facility Inspection Program SOP*.
   b. A summary of its inspection and monitoring program including the inspections conducted in each priority category. Identify facility name and type pursuant to the table in Section 4.0 of the *Industrial High Risk Runoff Facility Inspection Program SOP*. For the high priority facilities, identify which are routine inspections and which are inspected in follow-up to citizen complaints, staff observations or flows observed during outfall inspections. Specify the percentage of high, medium and low facilities inspected to date up through the end of the reporting period.
   c. A summary of inspection findings including any required follow-up actions.
   d. A summary of monitoring results where the City has required monitoring at a facility pursuant to Section 6.0 of the *Industrial High Risk Runoff Facility Inspection Program SOP*
   e. Describe any changes or updates to the facility inventory and prioritization based on the annual evaluation and the reviews of the databases and other resources identified in Section 5 of the *Industrial High Risk Runoff Facility Inspection Program SOP*.
   f. A summary of enforcement actions taken and deficiencies corrected.

4. **Illicit Discharge and Improper Disposal** (***Appendix I***: Illicit Discharge Detection and Elimination Program Standard Operating Procedures)
   a. For reports covering even years, a summary of its dry weather screening activities as required under Part VII of the Consent Decree, including the number and percentage of outfalls that were screened, findings, the number and type of follow-up actions including initiation of an illicit discharge investigation (including type(s) of investigation), a description of the illicit discharge (e.g., pollutant, volume if known), and the dates each illicit discharge identified was eliminated.
   b. A summary of the number of reports received (e.g., citizen complaints), what type of follow-up actions were conducted including initiation of an illicit discharge investigation (including type(s) of investigation), whether illicit discharges were

identified, description of any illicit discharges, and whether/when an identified illicit discharge was eliminated.

c. A summary of any enforcement actions initiated to eliminate an illicit discharge including the status.

d. A summary of the dates training was provided, the number of employees required to be trained, and the number of employees actually trained as required under Part VII of the Consent Decree.

5. **Monitoring** (***Appendix J***: Monitoring and Sampling Program Standard Operating Procedures): The results of the wet weather and in-stream monitoring shall be described, including any deviations from the *Monitoring and Sampling Program SOP*, trends analysis and any changes to the City's stormwater management plan resulting from monitoring results or trends analysis.

6. **Enforcement Response Plan** (***Appendix L***): A summary of all enforcement actions initiated, active and concluded under the City's *Enforcement Response Plan*, including type of action, and status.

7. **Stormwater and Environmental Education** (***Appendix K*)**: A summary of the activities completed under the training program described in the *Stormwater and Environmental Education SOP*.

8. A description of any staffing changes.

9. A description of any proposed changes to the City's stormwater management plan including the justification or rationale for any proposed changes.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
WESTERN DIVISION

THE UNITED STATES OF AMERICA and THE STATE OF ILLINOIS Plaintiffs, v. THE CITY OF ROCKFORD, ILLINOIS, Defendant.	)	Civil Action No. 3:15cv50250

CONSENT DECREE
APPENDIX N

CITY OF ROCKFORD
STORMWATER
TECHNICAL GUIDANCE MANUAL

May 18, 2015

CITY OF ROCKFORD – STORMWATER TECHNICAL GUIDANCE MANUAL

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INTRODUCTION

The City of Rockford Stormwater Technical Guidance Manual (Manual) is a technical guide to provide developers and applicant's 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 City of Rockford 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 Management 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 City of Rockford 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. Other techniques may exist that will exceed 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.

TECHNICAL GUIDANCE

ARTICLE 2 — REQUIREMENTS FOR STORMWATER MANAGEMENT

T2-00 General Requirements

The guidance in this manual provides the minimum interpretation of the requirements of the Ordinance and serves as a baseline for preparation of a Stormwater Management Permit. In order to determine if a development requires a City of Rockford 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.

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 shall consider 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 hydraulic disturbances greater than 5000 s.f. will require a permit. Hydraulic disturbances $\geq$1 acre will also require NPDES filed with IEPA. 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.

T2-00(b) Site Runoff Storage Requirements

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.

T2-01 General Stormwater Requirements

Stormwater drainage requirements are applied to all development and redevelopment throughout the City of Rockford 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 subsurface infrastructure and to improve water quality for the City. 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 erosion and sediment control must be installed prior to commencement of general construction and detention shall be complete before issuing occupancy.

T2-01(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.

No development shall—

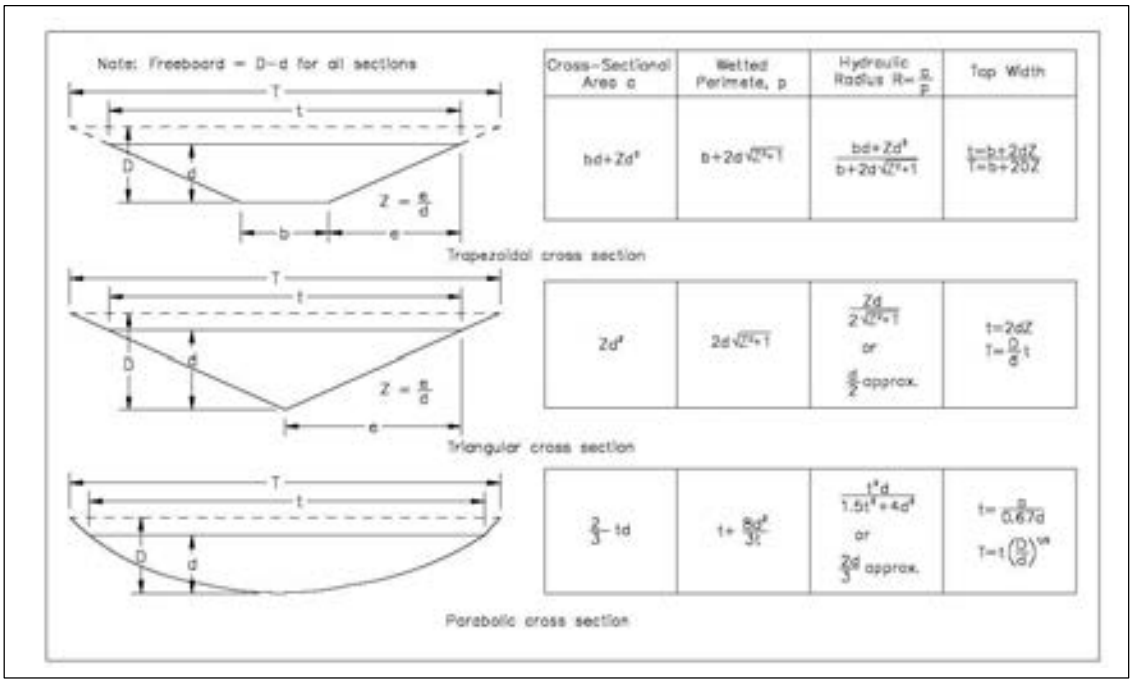
(1) result in any new or additional expense to any person other than the developer for flood protection; or

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

$$Q = (1.49/n)\, AR^{2/3}\, S^{1/2}$$

where *n* is the channel roughness coefficient.

FIGURE 1
Geometric Elements of Channel Sections
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)



T2-01(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 § 407. All usable space in buildings must be 2 feet above the base flood elevation. The required flood protection elevations for buildings is illustrated in Figure 1. Buildings proposed, but located in the floodplain must be elevated to the flood protection elevation whereas, buildings outside the floodplain in a known flood prone area must be protected to the flood protection elevation.

T2-01(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.

T2-01(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 cf 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 Winnebago 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.

T2-02 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 2, where the proposed site drains to one facility.

T2-02(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

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 shall use an energy dissipater system at the outlet) of a storm sewer system that empties into a waterway, unless otherwise approved by the Stormwater Administrator.

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.

FIGURE 2
Detention Example

DETENTION EXAMPLE

FIGURE 2
Detention Example (continued)

PROCEDURE TO DETERMINE REQUIRED STORAGE

Step 1: Calculate volume to be retained to account for existing drain tile systems

VOLUME = RUNOFF x DCI AREA
DCI AREA = HYDRAULICALLY DISTURBED AREA x 0.30
For this example, the retention volume below the invert of the outlet is 3.88 acre-ft

Step 2: Calculate the allowable release rates

Q_{100} = 0.2 cfs/acre = 60 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 depths of the 100-year design storm event. Using values associated with the example, the following runoff value is say:
Q_{100} = 5.50 in.

Using the following equation, the preliminary detention volume may be found (converted to acre-feet).
VOLUME = RUNOFF x ON-SITE TRIBUTARY AREA
V_{100} = 138 acre-feet

To finalize the detention basin design, a hydrologic model will be used in proposed detention basin designs and outlet release rates. Using 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 the 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 may need to account for evaporation and inundation of the detention facility.

Step 5: Surcharge Storage Area

Two additional feet have been added to the top of the detention facility to control overflow from the dentention basin in the event the gravity outlet is blocked. A vegitated earth weir has been designed at the overflow point of the facility. 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.

T2-02(b) Minor Stormwater System Criteria

Minor stormwater system drainageways are swales, channels, catch basins, drains, 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 selected to define the upper limit for the minor stormwater system.

T2-02(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 rated 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. § T2-02(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. If desired to be mowable a 4.1 is best. Deviations from the minimum value should be justified by appropriate calculations (e.g., slope stability calculations) and maintenance plans that do not require mowing.

T2-02(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.

T2-02(e) Design Runoff Rate

The design runoff rate for a development shall be the lesser of:

1. The runoff rate at the time of permit application, without the proposed project (i.e.- existing runoff rate); or

2. 0.2 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.

T2-02(f) Design Rainfall

For design storm events, the Illinois State Water Survey (ISWS) Bulletin 70 Northwest 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 1 lists the ISWS Bulletin 70 precipitation depths for various duration's and recurrence intervals.

TABLE 1
Illinois State Water Survey Bulletin 70
Rainfall Depths for Northwest Sectional

	Frequency						
Duration	**1-year**	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
5 min	0.31	0.37	0.47	0.56	0.67	0.78	0.89
10 min	0.57	0.68	0.87	1.02	1.23	1.44	1.62
15 min	0.70	0.84	1.07	1.25	1.51	1.76	1.99
30 min	0.95	1.15	1.46	1.71	2.07	2.42	2.77
1 hour	1.21	1.46	1.86	2.18	2.63	3.07	3.51
2 hour	1.52	1.83	2.33	2.74	3.31	3.86	4.47
3 hour	1.65	1.99	2.53	2.97	3.59	4.18	4.90
6 hour	1.93	2.33	2.96	3.48	4.20	4.90	5.69
12 hour	2.24	2.71	3.43	4.03	4.88	5.66	6.51
18 hour	2.37	2.86	3.63	4.26	5.15	6.01	6.92
24 hour	2.57	3.11	3.95	4.63	5.60	6.53	7.36
48 hour	2.80	3.42	4.28	4.96	6.07	7.02	8.07
72 hour	3.06	3.73	4.67	5.42	6.59	7.64	8.87
120 hour	3.45	4.13	5.10	5.91	7.21	8.36	9.97
240 hour	4.37	5.23	6.30	7.14	8.39	9.64	11.09

T2-02(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 access for inspection and maintenance shall be granted on the property title for any stormwater structures (e.g., culverts, swales, ponds). Easement shall be noted "Maintained by the Individual Property Owners."

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.

T2-02(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 3 helps explain the criteria of the Ordinance in regards to the maximum allowable flow depths on roadways.

T2-02(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 post diversion 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 post diversion 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 Article 4 of the Ordinance]

T2-02(j) Best Management Practices Requirements

The City requires Best Management Practices (BMP's) to be considered for stormwater management. This section contains guidelines and standards to reduce and manage stormwater runoff. A hierarchy of BMP strategies shown below:

1. Minimize impervious surfaces on site to control increases in stormwater runoff

2. Preserve natural drainage features. Grass or vegetated swales, channels or flow paths should be left undisturbed to minimize impacts downstream of the subject site.

3. Utilize filter strips and level spreaders directly downstream of runoff contributing area to reduce runoff.

4. Utilize stormwater infiltration methods such as porous and permeable pavements and infiltration trenches to reduce and store stormwater runoff

5. Utilize bio-retention methods and rain gardens to infiltrate stormwater and reduce the need for traditional stormwater detention

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

Directing sump pump flow away from storm sewers and impervious areas where practical to an infiltration area is an effective method to control stormwater flow. Redirecting sump pumps to a sanitary sewer system is not allowed.

The following standards and methods from the Illinois Urban Manual dated June 2013 shall be used as technical guidance for the BMP used:

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

FILTER STRIP

(acre)
CODE 835

(Source:OH Rainwater and Land Development)

DEFINITION

A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.

PURPOSE

The principal purpose of this practice is to remove sediment and other pollutants from runoff water by filtration, deposition, infiltration, absorption, and vegetative uptake. Another purpose is to reduce runoff quantities from impervious surfaces by infiltrating it into the ground.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied in a variety of urban land uses where surface water runoff is discharged as overland sheet flow. Some typical locations of vegetated filter strips include:

1. Adjacent to roadways, parking lots, and other impervious surfaces to filter and convey runoff before it is discharged to swales, storm sewers, or surface water bodies
2. Lawns where roof downspouts are discharged to disperse and infiltrate runoff
3. Adjacent to wetlands, streams, ponds or lakes, or conservation practices to provide the runoff mitigation benefits described above and to serve as a wildlife habitat buffer
4. On construction sites and land undergoing development to filter sediment from overland sheet flow

CRITERIA

The maximum drainage area to a filter strip shall be 5 acres.

Vegetative filter strips shall have slopes 15% or less.

The minimum length (dimension parallel to flow path) of the filter strip is determined by the drainage area being treated and the width of the filter strip. The filter strip length shall be at least 1/2 the unit area length. The unit area

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length is calculated by dividing the drainage area to the filter strip, in square feet, by the filter strip width (dimension perpendicular to flow path), in feet. The minimum filter strip length shall be 5 feet except on construction sites where the minimum length shall be 25 feet.

The width (dimension perpendicular to flow path) of the filter strip determines the required length of the filter strip. The wider the filter strip, the shorter the required filter strip length. The width shall be as near the same width as the impervious area being treated.

Some applications (e.g., roof downspouts) may require a level spreader to prevent a concentrated flow path through the filter strip. Level spreaders shall be installed according to the requirements in practice standard LEVEL SPREADER 870. For parking lots and roadways, a level spreader will not be needed if the edge of the contributing runoff area is reasonably level and uniform. Level spreaders shall be installed in the filter strip 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.

The maximum flow velocity through the filter strip shall be calculated for the 10-year frequency, 24-hour duration storm event and shall not exceed the maximum permissible velocities as described in practice standard GRASSED LINED CHANNEL 840.

Vegetation shall follow the requirements of practice standard PERMANENT VEGETATION 880 and be protected with an erosion control blanket meeting the requirements of practice standard EROSION BLANKET 830 or mulched meeting the requirements of practice standard MULCHING 875. In place of permanent seeding, the filter strip may be vegetated with sod following the requirements of practice standard SODDING 925.

The filter strip vegetation should be fully established before the contributing impervious surface is created and its runoff directed onto the filter strip. Where this is not possible, the filter strip shall be vegetated with sod.

CONSIDERATIONS

Nearly 80% of the maximum potential settleable solids removal is achieved with the sizing criteria listed above. The efficiency can be increased to nearly 90% if the filter strip length is increased so that it has a length equaling or exceeding the unit area length.

Ideally, filter strips function best on slopes 5% or less. However, on slopes 1 % or less, vegetation used should be tolerant of saturated soil conditions.

It is critical that appropriate soil stabilization materials be applied immediately after seeding on all vegetative filter strips to minimize rill development during cover establishment. Due to the added runoff volumes coming from the impervious surfaces, an erosion control blanket will be necessary in most installations. Mulch may be adequate on relatively flat slopes where the contributing drainage area is small. In addition to stabilizing soils, these materials should significantly aid seed germination and early plant establishment.

Native prairie vegetation should be used if possible. Native vegetation has distinct advantages over turf grass,

including denser, deeper root structure to enhance infiltration; reduced maintenance needs (particularly less need for herbicides and fertilizer); and enhanced wildlife habitat.

If site constraints prevent the installation of broad filter strips meeting the specified sizing criteria, even narrower strips can provide substantial stormwater mitigation benefits in contrast to conventional curb and gutter storm sewer approaches.

Protect the filter strips from heavy foot and vehicular traffic during construction to prevent compaction and loss of infiltration capacity.

The filter strip area should be cleared of trees, stumps, brush, rocks, and similar materials if they are likely to interfere with installation of the filter strip (e.g., cause short-circuiting or concentrations of flow). Ideally, uniform, well vegetated strips of natural/native vegetation should be preserved as filter strips since their infiltration capacities are likely to be greater if grading is avoided.

On construction sites and other areas with bare soil where the filter strip is being used as a temporary sediment control technique, it is critical that temporary stabilization be applied to exposed soils and that concentrated flow through the filter strip be avoided. If the potential for concentrated flow exists, consideration should be given to construction of other sediment control practices above the filter strip. These practices shall meet the requirements of practice standards found in this manual such as practice standard TEMPORARY SEDIMENT TRAP 960, and SILT FENCE 920.

PLANS AND SPECIFICATIONS

Plans and specifications for installing filter strips shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location of the practice
2. Length and width of the filter strip
3. Slope of the filter strip
4. Required appurtenant practices such as level spreaders or temporary sediment basins
5. Grading requirements, topsoil stockpiling and utilization requirements
6. Soil preparation, seeding and temporary soil stabilization (i.e., erosion control blanket or mulching) requirements

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing FILTER STRIP – GRASSED IL-535 may be used as the plan sheet.

OPERATION AND MAINTENANCE

On active construction sites, the filter strip shall be inspected after every runoff producing rain and repairs made as needed. After construction, filter strips should be inspected during and after major storm events, particularly during the first one or two years. After the first one or two years, the filter strip may be inspected each spring and after major storm events.

Filter strips should be inspected for proper distribution of flows and signs of erosion. The filter strip should be kept

free of litter. Irrigation needs should be minimal except during extended dry periods. Periodic aeration of the soils may be beneficial if the underlying soils have a high clay content, or there is difficulty in maintaining a good vegetative cover due to compaction.

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.

Maintain the vegetation at the most dense stand possible.

Filter strips vegetated with turf grass should be mowed and the residue harvested a minimum of two or three times a year to promote good growth and vegetative density at ground level, nutrient removal from the system, and filtering ability.

Caution should be used when applying herbicides to filter strips or adjacent areas to minimize pollution to the water resources being protected.

Filter strips vegetated with native species should be managed through prescribed burning once every two to three years, after the vegetation is established. Where prescribed burning is not feasible, mowing may be substituted. In contrast to turf grass, native vegetation should be mowed higher and less frequently.

Filter strips that have accumulated so much sediment that they are higher than adjacent areas should be disked or graded as necessary to reestablish shallow sheet flow conditions, and be reseeded.

REFERENCES

Dreher, D.W. and T.H. Price, 1997. Reducing the Impacts of Urban Runoff: The Advantages of Alternative Site Design. Northeastern Illinois Planning Commission, Chicago, IL

Ohio Department of Natural Resources, Division of Soil and Water Conservation, 1996. Rainwater and Land Development, 2nd ed., OH

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

LEVEL SPREADER

(no.)
CODE 870

(Source: VA Erosion and Sediment Control Handbook)

DEFINITION

A device used to disperse concentrated runoff uniformly over the ground surface as sheet flow.

PURPOSE

The purpose of this practice is to convert concentrated, potentially erosive flow to sheet flow and release it uniformly over a stabilized area or filter strip. The resultant sheet flow enhances pollutant filtering and runoff infiltration and reduces the potential for erosion.

CONDITIONS WHERE PRACTICE APPLIES

The principal application of a level spreader is to convey runoff from impervious surfaces, such as parking lots or roadways, uniformly onto vegetated filter strips. Level spreaders can also be applied as outlets for diversion structures. Level spreaders are appropriate and/or necessary under the following conditions:

1. Where runoff from an impervious surface is uneven and/or runoff is released as concentrated flow, such as through curb cuts or roof downspouts
2. At the ends of diversions
3. Where the runoff water will not re-concentrate after release from the level spreader until it reaches an outlet designed for concentrated flow
4. Where sediment-free storm runoff can be released in sheet flow down a stabilized slope without causing erosion
5. Where the lip of the level spreader can be constructed in undisturbed soil
6. Where there will be no traffic over the spreader

CRITERIA

Criteria for level spreader design can vary greatly depending on the application. For this reason, two sets of criteria are specified for several of the factors that follow.

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For impervious surface runoff applications:

The capacity for the level spreader is determined in the design of the filter strip to which it discharges (see practice standard FILTER STRIP 835).

The spreader shall run linearly along the entire width of the filter strip to which it discharges. In most cases, the spreader will be the same width as the contributing impervious surface. The ends of the spreader shall be tied into higher ground to prevent flow around the spreader.

The minimum depth shall be 6 inches and the minimum width shall be 6 feet for the lower side slope. Side slopes shall be 2:1 (horizontal to vertical) or flatter.

The grade of the spreader shall be 0%.

The discharge area shall meet the requirements of practice standard FILTER STRIP 835.

For diversion outlet applications:

The capacity of the spreader shall be determined using the peak flow from the 10-year frequency, 24-hour duration storm. The drainage area shall be restricted so that maximum flows into the spreader will not exceed 30 cfs.

Spreader dimensions: Select the length and depth of the spreader from the table below. The length dimension is parallel to the diversion.

Design Flow (cfs)	Minimum Depth (ft)	Minimum Length (ft)
0-10	0.5	10
10-20	0.6	20
20-30	0.7	30

The minimum width of the spreader shall be 6 feet for the lower side slope. Side slopes shall be 2:1 (horizontal to vertical) or flatter.

Construct a 20 foot transition section in the diversion channel so the width of the channel will smoothly meet the width of the spreader to ensure uniform outflow.

The last 20 feet of the diversion channel shall provide a smooth transition from the channel grade to the level spreader and where possible, shall be less than or equal to 1%. The grade of the level spreader shall be 0%.

The outlet discharge area must be generally smooth and well vegetated with a maximum slope of 10%.

For all applications:

The spreader lip shall be constructed to a uniform height and zero grade over the length of the spreader. For design flows of 4 cfs or greater, a rigid lip of non-erodible material, such as pressure-treated timbers or concrete curbing, shall be used. For flows less than 4 cfs, a vegetated lip may be used. The spreader lip shall be constructed on undisturbed soil.

When using a vegetated lip it shall be protected with an erosion control blanket to prevent erosion and allow the vegetation to become established. The erosion control blanket for a vegetated lip shall meet the requirements of

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practice standard EROSION BLANKET 830. The blanket shall be a minimum of 4 feet wide extending a minimum of 1 foot downstream over the level lip. The blanket shall be secured with heavy duty staples and the downstream and upstream edges shall be buried at least 6 inches deep in a vertical trench.

When using a rigid lip it shall be entrenched at least 4 inches below existing ground and securely anchored to prevent displacement. An apron of coarse aggregate meeting IDOT CA-1 or CA-3 gradation shall be placed to the top of the rigid lip and extend downslope at least 3 feet. A filter fabric shall be placed under the coarse aggregate. The filter fabric shall meet the requirements of material specification 592 GEOTEXTILE Table 1 or 2, Class I, II, or IV.

Immediately after level spreader construction, seed and mulch the entire disturbed area of the spreader. Seeding shall meet the requirements of practice standard PERMANENT VEGETATION 880 and mulching shall meet the requirements of practice standard MULCHING 875.

CONSIDERATIONS

The level spreader is a relatively low-cost structure to:

1. Disperse impervious surface runoff uniformly to a filter strip or
2. Release small volumes of concentrated flow from diversions when conditions are suitable

To accomplish these purposes, particular care must be taken to construct the spreader lip completely level. Any depressions in the lip will concentrate the flow, resulting in a loss of pollutant filtering effectiveness and/or erosion. Evaluate the outlet system to be sure that flow does not concentrate below the outlet.

For filter strip applications, the determination of whether a level spreader is needed should be based on how the runoff is entering the filter strip. If the runoff is concentrated by curb cuts, and particularly if a large area of impervious surface drains to one point, a level spreader is essential to achieve effective pollutant removal in the filter strip. A level spreader also is important if the filter strip is relatively steep in order to avoid erosion from concentrated runoff discharge. If the runoff is evenly distributed over the width of the impervious surface (e.g., a curbless, even-sloped road or parking lot), a level spreader may not be necessary.

When the level spreader is used as an outlet for temporary or permanent diversions and diversion dikes, runoff containing high sediment loads must be treated in a sediment trapping device such as practice standard TEMPORARY SEDIMENT TRAP 960 or IMPOUNDMENT STRUCTURE-ROUTED 842 before release into a level spreader.

PLANS AND SPECIFICATIONS

Plans and specifications for installing a level spreader shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. The spreader location
2. The length and width

3. For filter strip applications, plans for both the adjacent impervious surface and the filter strip, for diversion outlets, plans detailing the diversion structure and the adjacent outlet area
4. Lip details: vegetated or rigid
5. Stone gradation
6. Filter fabric specifications if used
7. Rigid lip material specifications if used
8. Erosion control blanket specifications if used
9. Seeding and mulching requirements

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing LEVEL SPREADER IL-570 may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect level spreaders after every rainfall until vegetation is established, and promptly make needed repairs. After the area has been stabilized, make periodic inspections and maintain vegetation in a healthy, vigorous condition.

Verify that the level spreader is distributing flow evenly. If problems are noted, make appropriate modifications to ensure even flow distribution.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

NRCS IL January 1999

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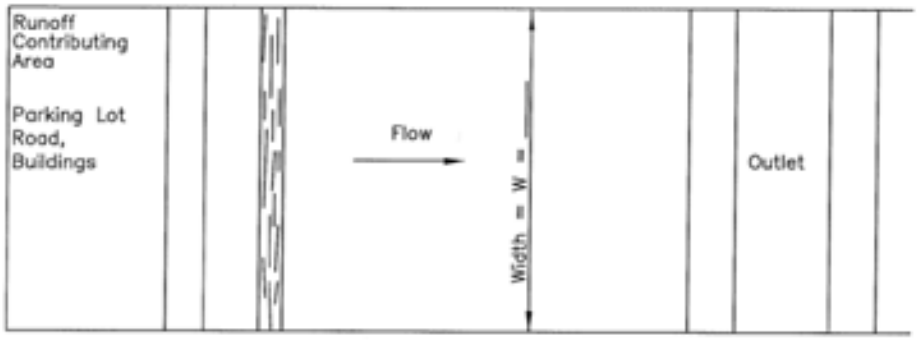
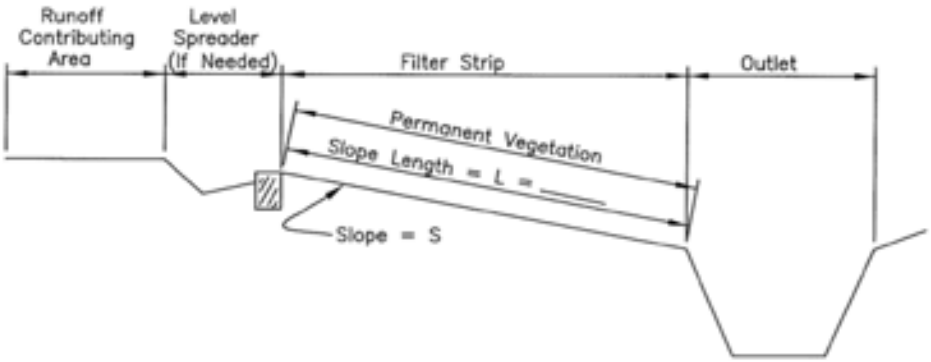
FILTER STRIP - GRASSED



PLAN VIEW



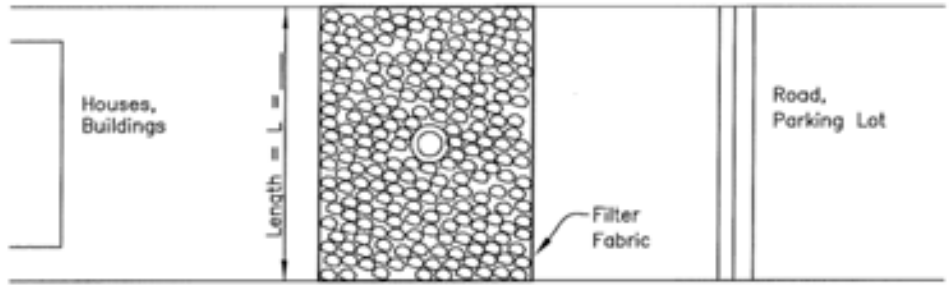
SECTION VIEW

Area To Be Seeded L x W = ____

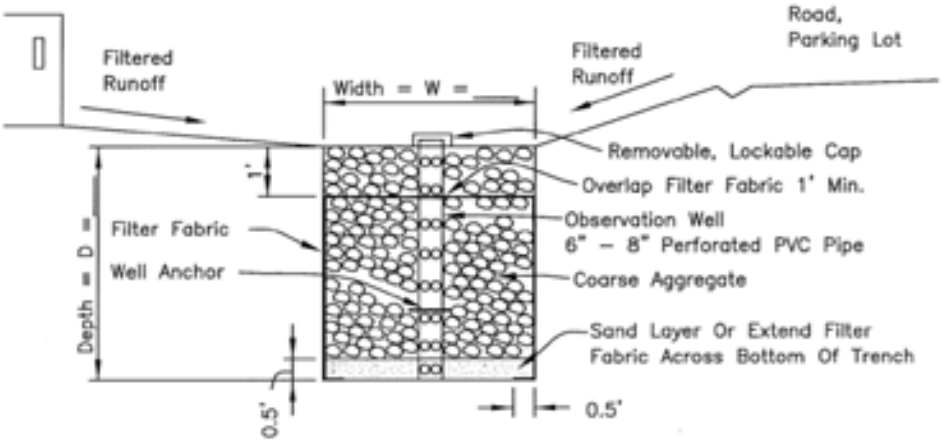
See plans for permanent vegetation requirements.
See plans for S, L and W dimensions.
Slope shall not exceed 15% (0.15 foot of fall per foot of horizontal distance).
See sheet LEVEL SPREADER IL-570 for level spreader requirements.

REFERENCE	NRCS Natural Resources Conservation Service	STANDARD DWG. NO.
Project ____		IL-535
Designed ____ Date ____		SHEET 1 OF 1
Checked ____ Date ____		DATE 1-29-99
Approved ____ Date ____		

INFILTRATION TRENCH



PLAN VIEW

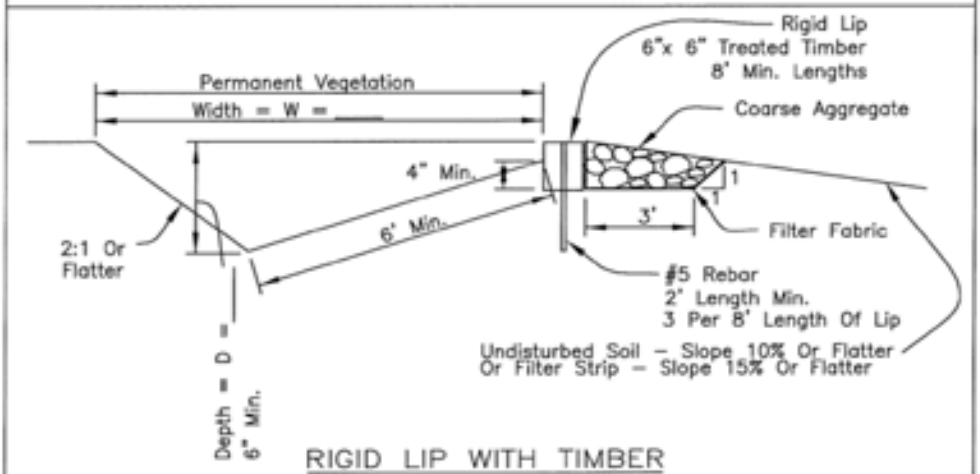


SECTION VIEW

NOTES:
1. Coarse aggregates shall meet one of the following IDOT gradations: CA–1 or CA–3.
2. Sand, if used, shall meet one of the following IDOT gradations: CA–14, CA–15 or CA–16.
3. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE Table 1 or 2, Class I with an apparent opening size of at least 30 for non–woven and 50 for woven.
4. PVC pipe shall meet material specification 547 PLASTIC (PVC, PE, ABS) PIPE.
5. See plans for L, W and D dimensions.

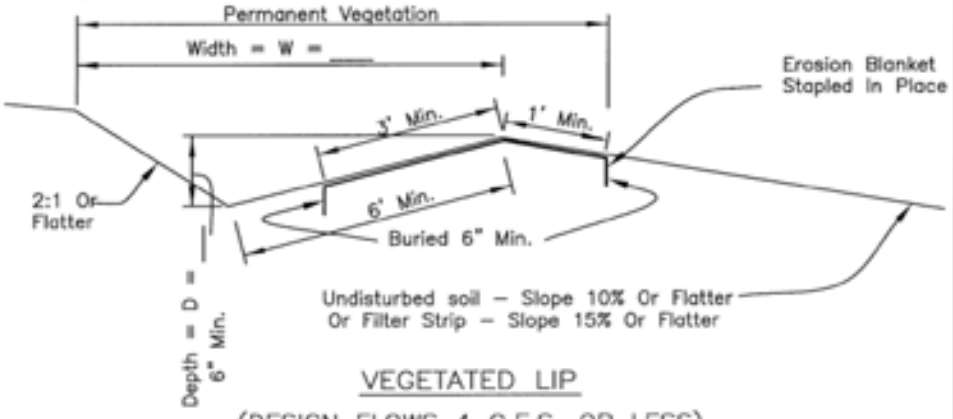
REFERENCE	NRCS	STANDARD DWG. NO.
Project _____	Natural Resources Conservation Service	IL-547
Designed _____ Date _____		SHEET 1 OF 1
Checked _____ Date _____		DATE 1-29-99
Approved _____ Date _____		

LEVEL SPREADER



RIGID LIP WITH TIMBER

(DESIGN FLOWS 4 C.F.S. TO 30 C.F.S.)



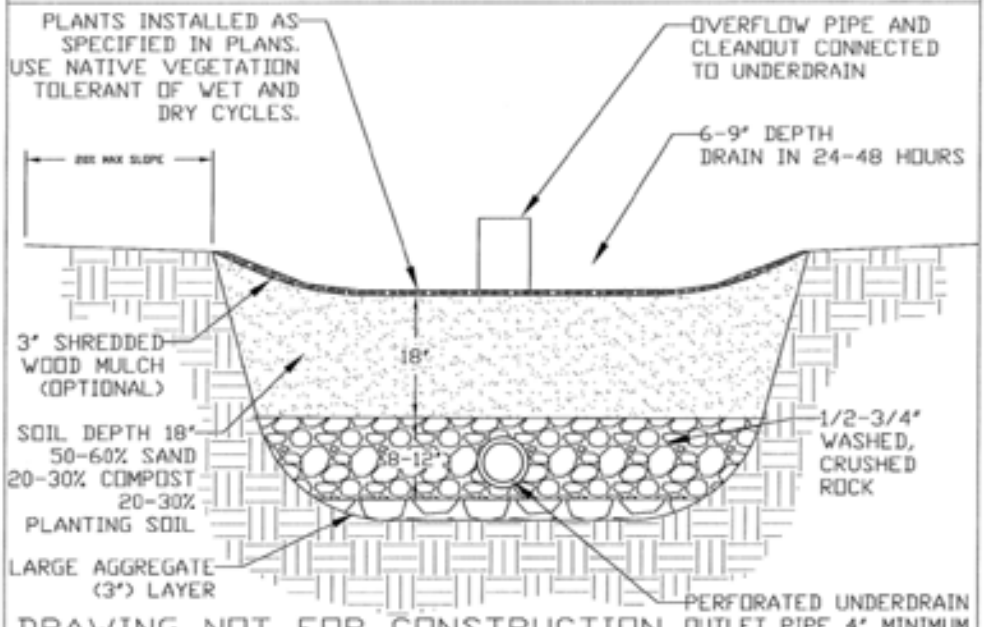
VEGETATED LIP

(DESIGN FLOWS 4 C.F.S. OR LESS)

NOTES:
1. Coarse aggregate shall meet one of the following IDOT gradations: CA–1, or CA–3.
2. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table 1 or 2, Class I, II, or IV.
3. See sheet FILTER STRIP–GRASSED IL–535 for filter strip requirements.
4. See sheet EROSION BLANKET IL–530 for blanket material and installation requirements.
5. See plans for permanent seeding requirements.
6. See plans for D and W dimensions.

REFERENCE	NRCS	STANDARD DWG. NO.
Project ____	Natural Resources Conservation Service	IL-570
Designed ____ Date ____		SHEET 2 OF 2
Checked ____ Date ____		DATE 1-29-99
Approved ____ Date ____		

BIORETENTION FACILITY PLAN



DRAWING NOT FOR CONSTRUCTION

NOTES:

1. LOCATE FACILITIES AT LEAST 100 FEET FROM ANY WELLS OR SOURCE WATER LOCATIONS.
2. LOCATE FACILITY AT LEAST 25 FEET FROM ANY SEPTIC FIELDS AND UPGRADIENT IF POSSIBLE.
3. LOCATE FACILITY AT LEAST 25 FEET AND DOWNGRADIENT FROM BASEMENTS.
4. LOCATE FACILITY 5 FEET OR GREATER FROM A SLAB OR FOUNDATION.
5. RECOMMENDED MINIMUM AREA SHALL BE 200 SQUARE FEET WITH THE LENGTH AT A 2:1 RATIO OF THE WIDTH.
6. ADDITIONAL REGULATIONS MAY BE REQUIRED BY LOCAL ORDINANCES.
7. A GEOTEXTILE FABRIC SEPARATING THE LARGE AGGREGATE AND SOIL IS OPTIONAL.
7. DRAWING NOT TO SCALE.

REFERENCE		STANDARD DWG. NO.
Project		IUM-500
Designed ____ Date ____		SHEET 1 OF 1
Checked ____ Date ____		DATE 11-18-13
Approved ____ Date ____		

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

GRASS-LINED CHANNEL

(acre)
CODE 840

(Source: NC Erosion and Sediment Control Field Manual)

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.

PURPOSE

The purpose of this practice is to convey and dispose of concentrated surface runoff without damage from erosion, deposition, or flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to construction sites and developing areas where:

1. Concentrated runoff will cause damage from erosion or flooding;
2. Sufficient depth of soil materials are present to allow establishment of vegetation that will stabilize the cross section and grade of the channel;
3. Slopes are generally less than 5%;
4. Space is available for a relatively large cross section.

Typical uses include roadside ditches, channels at property boundaries, outlets for diversions, and other channels and drainage of low areas.

CRITERIA

Capacity - As a minimum, grass-lined channels shall carry the peak runoff from the 10-year frequency, 24-hour duration storm. Where flood hazard exists, increase the capacity according to the potential damage. For grass-lined channels with a grade of less than 1 percent, out-of-bank flow may be permitted if such flow will not cause erosion, property or flooding damage. The minimum channel capacity in such cases shall be a 2-year frequency storm. Channel dimensions may be determined by using design tables with appropriate retarding factors or by Manning's formula using an appropriate "n" value. When retarding factors are used, the capacity may be based on "C" retardance and stability on "E" retardance, where the waterway will be regularly mowed and otherwise maintained.

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Velocity - The maximum permissible velocities of flow shall not exceed the values shown in Table 1.

Cross section - The channel shape may be parabolic, trapezoidal, or V-shaped, depending on the need and site conditions. The design water surface elevation of a grass-lined channel receiving water from diversions or other tributary channels shall be equal to or less than the design water surface elevation in the diversion or other tributary channels. The parabolic shape is the preferred cross section. The triangular cross-section concentrates flow in the "v" of the channel causing higher and more erosive velocities. When vegetated triangular channels are used, the minimum side slopes should be 6:1 or flatter.

Drainage - Base flow shall be handled by a stone lined center, subsurface drain, or other suitable means since sustained wetness usually prevents adequate vegetative cover. The cross-sectional area of the stone lined center or subsurface drain size to be provided shall accommodate a flow rate of 0.1 cfs/acre or by actual maximum base flow.

Where tile is used along the channel, it should be located as close to 1/3 of the channel (top) width from the center of the waterway as practical. The top of the tile should be at least 2.0 feet (up to 4 feet, where possible) below the bottom of the channel, except where soil or outlet conditions make this depth unpractical. The tile shall meet the requirements shown in the practice standard SUBSURFACE DRAIN 945.

Alignment - Minor changes may be made to improve alignment. Care must be taken to avoid exposing soil materials (such as sodium soils or high clay content glacial till subsoil) that are not conducive to the establishment and maintenance of adequate vegetative cover.

Outlets - All grass-lined channels shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. Appropriate measures must be taken to dissipate the energy of the flow to prevent scouring of the outlet channel. Examples of acceptable outlets include but are not limited to GRASS-LINED CHANNELS 840, IMPOUNDMENT STRUCTURE - FULL FLOW 841, IMPOUNDMENT STRUCTURE - ROUTED 842, INFILTRATION TRENCH 847, LEVEL SPREADER 870, and ROCK OUTLET PROTECTION 910.

Establishment of vegetation - Grass-lined channels shall be vegetated according to the practice standard PERMANENT VEGETATION 880.

Side slopes - Side slopes shall not be steeper than a ratio of 2 horizontal to 1 vertical. They should be designed to accommodate the equipment used for maintenance. Where planned to be crossed by large equipment, trapezoidal channels shall have side slopes of 8:1 or flatter and be protected according to the practice standard STABILIZED CONSTRUCTION ENTRANCE 930. When triangular (V-shaped) channels are used, the minimum side slopes should be 6:1 or flatter.

Sedimentation protection - Protect permanent grass-lined channels from sediment produced in the watershed, especially during the construction period. This can be accomplished by

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the effective use of diversions, sediment traps, protected side inlets and vegetative filter strips along the channel.

Construction - The grass-lined channel will be constructed meeting the requirements of Construction Specification 27 - DIVERSIONS AND WATERWAYS.

CONSIDERATIONS

Generally, channels should be located to conform with and use the natural drainage system. Channels may also be needed along development boundaries, roadways, and back lot lines. In all situations channels should be located so that they do not make sharp, unnatural changes in direction or grade of flow. Avoid channels crossing watershed boundaries or ridges.

Major reconfiguration of the drainage system often entails increased maintenance and risk of failure.

Establishment of a dense, erosion resistant vegetation is essential. Construct and vegetate grass-lined channels early in the construction schedule before grading and paving increase the rate of runoff.

All grass-lined channels should be designed to permit easy crossing of equipment during construction and maintenance.

If local ordinances permit, storm sewers may be used to extend existing agricultural tile or base flow across a development. They may also be used as an under drain for the channel if the conduit is open jointed.

Geotextile fabrics or special mulch protection such as fiberglass roving or straw and netting provide stability until the vegetation is fully established. It may also be necessary to divert water from the channel until vegetation is established or to line the channel with sod. Rock checks or filter fabric checks may also be needed to protect the channel before vegetation is established. Sediment traps may be needed at channel inlets and outlets.

Applicable state drainage laws, traditional case law precedent and local ordinances and regulations must be observed in locating grass-lined channels.

PLANS AND SPECIFICATIONS

Plans and specifications for installing grass-lined channels shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Channel location and alignment.
2. Grade, depth and width.
3. Channel cross section type.
4. Seeding specifications and dates.
5. Subsurface drainage, if needed.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

The grass-lined channel will be constructed meeting the requirements of Construction Specification 27 DIVERSIONS AND WATERWAYS. Standard drawings WATERWAY PLAN IL-540 P, T, or V may be used as the plan sheet.

OPERATION AND MAINTENANCE

During the establishment period, inspect grass-lined channels after every rainfall.

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After grass is established, check the channel at regular intervals and after every heavy rainfall event. Immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes. Remove all significant sediment accumulations to maintain the designed carrying capacity. Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel.

NRCS IL October 2001

urbst840.doc

TABLE 1

PERMISSIBLE VELOCITIES FOR CHANNELS LINED WITH VEGETATION

Channel Slope (%)	Lining	Permissible Velocity (ft./sec.) [1/]
0 – 5	Tall fescue Kentucky bluegrass Smooth bromegrass	5
	Grass-legume mixture	4
	Red fescue Redtop	3
	Small grains [2/]	2.5
5 – 10	Tall fescue	5
	Kentucky bluegrass Smooth bromegrass	4
	Grass-legume mixture	3
Greater than 10	Tall fescue Kentucky bluegrass Smooth bromegrass	3

[1/] For highly erodible soils, permissible velocities should be decreased 25%. An erodibility factor (K) greater than 0.35 would indicate a highly erodible soil. Erodibility factors (K-factors) for Illinois soils are available in every NRCS office.

[2/] For temporary seedings.

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ILLINOIS URBAN MANUAL
PRACTICE STANDARD

POUROUS AND PERMEABLE PAVEMENTS

(sq. ft.)
CODE 890

Source: IUM Technical Review Committee

DEFINITION

Alternate pavement systems are designed to allow water to pass through the surface into the subsurface for storage and infiltration and to also reduce peak runoff rates and volumes, as well as reduce pollution loads.

PURPOSE

The purpose of this practice is to promote volume reduction, peak flow reduction and to reduce pollution into downstream water bodies.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where pavement is desirable or required, including but not limited to:

1. Parking lots
2. Driveways for residential and light commercial use
3. Alleys
4. Low traffic roadways
5. Boat ramps
6. Paths and sidewalks
7. Fire lanes
8. Community spaces
9. As an alternative to conventional paving

CRITERIA

1. Permeable soils.
2. Tributary area is less than 3 times the porous/pervious pavement area. Things that may affect this are: soil permeability, stabilization practice and amount of overland flow.

890-1

3. The site slope is less than 2%.
4. If the soils are not permeable then some type of under drain system should be used when the sub-grade soil permeability is less than 0.5 in / hr.
5. Under drain use must require a storm drain infrastructure.
6. Depth of water table. If water table is less than 2 feet below finish surface this practice should not be considered.
7. To facilitate infiltration, a graded stone and/or geo-textile fabric (IUM 592) should be used.
8. Heavy traffic loading will affect performance and longevity.
9. Ice management; low or no chloride, no sanding or cinders
10. Owner needs to be prepared for extensive maintenance.
11. Not suitable for storm water hot spots, areas with high pollutant loads or contaminated soils.
12. Roadway and parking lot marking should be applied as paint vs. an adhesive tape.
13. The base material shall be free of contaminates to allow for water passage.
14. ASTM test C1701 should be used to identify the needed flow through the porous / pervious pavement layer.

CONSIDERATIONS

1. Pretreatment of flows may be necessary
2. A porous system is going to have more void space in its cross section than a pervious system, allowing more water passage.
3. ADA compliant.
4. Pollutants of concern shall be identified along with the appropriate Best Management Practices to address or mitigate them.
5. Materials may consist of vegetation, interlocking blocks (P-ACM/M), unbound aggregate, concrete, asphalt, paver bricks and recycled glass.
6. Recommend draw down time of the sub-surface layer to be less than 48 hours.
7. Pipe under drains shall be sized for flow requirements. Perforations shall be slotted vs. round. A geo-textile may be needed (IUM 592).
8. Some practices are better suited to reduce contributions to the heat island effect.
9. No seal coating or sealers can be used with this practice because of reduced volume of water flow.
10. Street sweeping is one method that may help to remove debris; however, it may not remove debris far enough into the cross section.
11. Should not be used for high speed roads.
12. Areas of concern if used would be:
    a. Sediment laden runoff
    b. High traffic counts
    c. Heavy repetitive loading

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d. Not accessible for maintenance

e. Non-permeable soils or a high water table

f. Removal of dissolved pollutants limited with under drain use.

g. Near or up against basement walls.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

The extent of porous and pervious pavement shall be identified on the plans with some type of cross hatching.

A cross sectional detail showing locations and thickness of the materials needs to be included.

Installation sequence of materials may need to be listed.

A detailed specification should be developed to insure the proper type of porous or pervious pavement is installed.

STANDARD DRAWINGS

Pretreatment (IUM-XXX) – *to be developed*

OPERATION AND MAINTENANCE

1. No sanding or cinder use with this practice.
2. Low or no chloride ice management.
3. Rubber or plastic tipped snow plow blades shall be used.
4. Clean out of pretreatment practices.
5. Landscapes waste (leafs, clippings, branches, seeds, etc.) shall be removed or captured to prevent clogging of the surface.
6. If flushing is the method chosen to clean the cross section, the debris that is washed through must be removed.
7. Air wands are one method of cleaning the cross section; however, care should be taken not to blow the debris deeper into the pavement.

REFERENCES

IL Urban Manual Technical Committee

Geosyntec Consultants Permeable Pavement Technical Document

Michigan DEQ

urbst890.doc June 2013

ILLINOIS URBAN MANUAL
PRACTICE STANDARD

BIORETENTION FACILITY

(feet)
CODE 800

Source: Jessica Cocroft, Winnebago Soil and Water Conservation District

DEFINITION

Facility that utilizes a soil media, mulch, and vegetation to treat stormwater runoff through filtration in clay soils areas and through infiltration in areas with porous soils.

A bioretention facility is also sometimes referred to as a rain garden. However, the term rain garden is typically used to describe a small, planted depression on an individual homeowner's property. A bioretention facility serves the same purpose but typically describes larger projects in community common areas as well as non-residential applications. Bioretention facilities may take on greater impervious areas due to their applications in commercial developments.

PURPOSE

The purposes of a properly designed bioretention facility include the decrease of peak flow rates and volume for smaller storms in the receiving stream and the removal of pollutants from stormwater runoff utilizing the chemical, biological, and physical properties of plants, microbes, and soils. A bioretention basin may be applied individually or as part of a system of stormwater management practices.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where the following or similar conditions exist:

- Drainage area is small, less than four acres (preferably less than one acre) with an impervious area of less than one acre;
- Impervious areas with shallow grade allow for sheet flow over level entrance areas;
- Stormwater runoff from impervious surfaces is diverted or conveyed by a curb or gutter to specific location(s) with inflow protection;
- The hydraulic conductivity, or permeability, of soil is sufficient for drainage within a 48 hour period;
- If soil permeability is not sufficient, replacement of clay soils with a sand mixture and/or an under drain system allows for adequate drainage; and,

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- Sufficient fall can be achieved between inlet and outlet for under drain if required.

CRITERIA

Construction projects may be subject to local, county, state and federal rules and regulations. Bioretention facilities shall be designed by a registered professional engineer as part of the overall site design for long-term water quality and quantity. A landscape architect should be used to determine types of plants needed and locations in the facility. A landscape architect may also provide valuable insight during the design, construction and maintenance phases. Plans and specifications shall be referred to by the site superintendent and field personnel during the construction process.

The facility shall not be constructed within a stream buffer or in areas adjacent to streams where sediment may be deposited during flood events.

Bioretention is not a suitable BMP at locations where the wet season water table is within four feet of the proposed ground surface and where soil is unstable. A water table that is too shallow can prevent stormwater runoff from draining completely through the facility.

The size and the design shall be based on the contributing drainage area, underlying soils, utilities, and existing vegetation. It is recommended to size a bioretention facility for a 1 year, 24 hour storm. A bypass is recommended for use in larger storms.

Locate facilities at least 100 feet from any wells or source water locations; at least 25 feet from any septic fields and upgradient if possible; at least 25 feet and downgradient from basements; five feet or greater from a slab or foundation; and, shall not cross property lines.

The recommended minimum area shall be 200 square feet with the length at a 2:1 ratio of the width. This is to allow enough space for a dense, randomly distributed planting area while decreasing the chances of concentrated flow. The facility must have soil with sufficient hydraulic conductivity (or replaced with a sand mixture of over 50%). A planting soil bed, with either a mulch layer or a grass mixture as a cover crop is highly recommended.

Vegetation must be able to withstand periods of inundation and drought such as some native plants.

The facility shall be designed to capture stormwater runoff and filter the water through the soil bed over a period of 24 to 48 hours.

Inflow velocities shall be reduced to less than three feet per second upstream of the facility to prevent erosion and facilitate uniform distribution across the BMP. This may require the installation of practices such as **FILTER STRIP 835** or **ROCK OUTLET PROTECTION 910**.

The bioretention facility can be excavated before final stabilization of the surrounding watershed; however, the soil mixture and/or underdrain system shall not be placed until the entire contributing drainage area has been stabilized and any restrictive layer remediated. Bioretention facilities should not be used for control of sediment and erosion on construction sites. Stabilization may require the installation of practices such as **EROSION CONTROL BLANKET 830**, **EROSION CONTROL BLANKET – TURF REINFORCEMENT MAT (TRM) 831** and **MULCHING FOR SEEDING AND SOIL STABILIZATION 875**.

Final graded dimensions, side slopes, and final elevations shall be constructed according to design drawings and specifications.

800 - 2

Underdrains are recommended for all facilities that do not have sufficient hydraulic conductivity (cannot drain within 48 hours). An underdrain increases the ability of the soil to drain and therefore ensures an adequate aerobic state that allows plants to grow. A minimum 4-inch perforated pipe (**PLASTIC PIPE 547**) with an 8- to 12-inch gravel bed shall be installed as an underdrain system. Space the pipe at a maximum of ten foot on-center and maintain a minimum grade of 0.5 percent. At least one cleanout shall be installed every 50 feet on each underdrain. The cleanout can also be used as an overflow relief system if situated one foot above the bioretention facility. It is recommended to cover the overflow with a grate or screen to keep large debris from clogging the pipe. The under drain shall connect to a stormwater system with adequate capacity or daylight to a suitable outfall with erosion protection such as **ROCK OUTLET PROTECTION 910**. Before placement of the aggregate, underdrain, and bioretention soil mixture, the bottom of the excavated area shall be roto-tilled to a minimum depth of six inches to alleviate any compaction that might impede infiltration. The underdrain may include an adjustable flow regulator to provide the right amount of infiltration.

Two layers of aggregate are recommended under the soil bed. A layer of ½ - and ¾-inch washed, crushed rock (CA-8: IDOT Course Aggregate gradation number 8) shall separate the soil bed from the larger 3 inch aggregate (CA-1). A geotextile fabric is optional over the tilled soil surface and under the large aggregate. The fabric should have a sufficient permeability to drain the bioretention facility in 48 hours. Geotextiles shall be selected according to material specification **GEOTEXTILE 592**.

The planting soil bed is a mixture of organic mulch, planting soil, and sand. Typically the mixture consists of 20-30 percent planting soil, 20-30 percent organic compost, and 50-60 percent sand. Clay shall be limited to less than 5 percent. A minimum depth of 18 inches is recommended to provide adequate moisture capacity and create space for the root systems of plants. If larger vegetation is used (i.e. trees or shrubs), the planting soil must be at least four inches deeper than the bottom of the largest root ball. This soil mix will not be as firm as natural soils, so larger trees or shrubs shall be supported with guy wires or similar support. The planting soil mixture shall be free of stones, stumps, roots, or weedy material over one inch in diameter. Brush or seeds from noxious weeds shall not be present in the material.

Set the bioretention facility ponding depth to 6-9 inches, not exceeding 1 foot. Ponding design depths shall be kept to a minimum to reduce hydraulic overload of the soil bed and to maximize the surface area to facility depth ratio. Design the overflow structure to maintain the integrity of the facility and ponding depth. The rate and volume of overflow from the bioretention facility must not cause downstream erosion.

Trees, shrubs, and other plant materials shall be installed as specified in the project plans and according to applicable landscape standards with the exception that pesticides, herbicides and fertilizer shall not be applied during planting under any circumstances. After establishment, pesticides, fertilizer and other soil amendments may be applied at a minimum. Plant selection shall include native species tolerant of both wet and dry cycles. Deep rooted perennials are encouraged to increase the rate of infiltration.

An optional layer of the bioretention cell is the mulch. The mulch layer plays an important role in the performance of the bioretention facility. It helps maintain soil moisture and helps prevent erosion. It serves as a pre-treatment layer by trapping sediments. The mulch layer should be a standard landscape style,

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shredded hardwood mulch. The mulch shall be milled and screened to a maximum four inch particle size and shall be free from sawdust, clay, trash and any artificially introduced chemical compounds. Grass clippings shall not be used as mulch. The layer of mulch shall not exceed three inches in depth to ensure plant roots are rooted in the soil. Ensure clearance of mulch around new plantings to facilitate watering and air exchange. The mulch may float and move as water backs up so raking the mulch back into place or reapplication may be necessary. If not using mulch, grass used as a cover crop would be an acceptable alternative.

Native vegetation including native trees and shrubs shall be used whenever possible.

CONSIDERATIONS

Bioretention is not recommended for upland areas with slopes greater than 20 percent. Steeper slopes may contribute to clogging if the area receives runoff with high sediment loads. Removing clogged sediment from the bioretention facility can be difficult.

When properly designed and maintained, bioretention facilities provide aesthetic enhancement as well as habitat for wildlife.

Provisions for safety may be mandatory based on local ordinance and should be considered regardless of requirements. A perimeter fence may be required based on local ordinance or specific site conditions.

PLANS AND SPECIFICATIONS

Plans and specifications for installing and maintaining a bioretention facility shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Standard construction documents, including a grading plan, planting plan, technical specifications, and a facility maintenance plan should include the following items:

1. Facility location and alignment
2. Grade, depth, width, and side slope grade
3. Facility cross section
4. Material specifications including planting prescriptions

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Bioretention facilities control stormwater runoff close to the source. They are typically shallow depressions located in upland areas used to treat stormwater runoff from pervious and impervious surfaces at commercial, residential, industrial areas and other developments. They can be designed so the runoff is either diverted directly into the bioretention facility or conveyed via a curb, gutter and/or pipe collection system.

Bioretention facilities are adaptable to most sites and integrate well with buffers, landscape berms, and setback areas.

The bioretention facility may also include pretreatment, a storage layer, flow regulation and an observation well.

Be aware of salt use in the drainage area of the bioretention facility. Salt tolerant plants or diverting the runoff away from the facility may reduce the number of replantings.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided for the bioretention facility.

For the first one to three years, bioretention systems require significant maintenance to ensure successful establishment. The primary

maintenance requirements are inspection, and repair and replacement of damaged or failed components and vegetation. Conduct routine inspections. Inspections are particularly important during vegetative establishment and should be done immediately following significant rainfall events. Routine inspections for standing water and corrective measures to restore proper infiltration rates are necessary. Invasive and/or weedy vegetation shall be removed immediately upon discovery. During the first growing season, watering and weeding shall be completed on a weekly basis or as needed.

Over the lifetime of the facility, bioretention maintenance resembles that of any maintained landscape area and shall include:

1. Inspect biannually for erosion
2. Mulch as needed to cover bare soil
3. Annually inspect vegetation to evaluate health and replace dead or diseased vegetation
4. If stressed vegetation is present, investigate soil further. If soil is contaminated, full or partial soil replacement is required
5. Inspect overflow devices
6. Remove trash and sediment as necessary
7. Aerate periodically

REFERENCES

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INFILTRATION TRENCH

(ft.)
CODE 847

(Source: Center for Watershed Protection)

DEFINITION

An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.

PURPOSE

The purposes of this practice are to reduce runoff volume and peak discharges from a site, increase groundwater recharge and baseflow, and to filter soluble contaminants out of runoff before it reaches receiving waters. Infiltration trenches are not intended to remove coarse sediments.

CONDITIONS WHERE PRACTICE APPLIES

This permanent site development practice applies to small drainage areas not exceeding 5 acres.

The soils surrounding the trench shall have permeability rates of 0.5 to 2.41 in/hr, a minimum available water capacity of 0.15 in/in, and clay content less than 35%. These values can be found in published soil surveys.

Because infiltration trenches are not designed to filter coarse particulate matter, appropriate sediment control devices must be included in the site design and must be installed prior to the construction of the trench.

CRITERIA

Design capacity shall be a minimum volume of 0.5 inches of runoff per acre of drainage area.

The capacity of the trench shall be based on the porosity (% voids) of the coarse aggregate used in the system. If test data is not available, use 40% porosity for the coarse aggregate.

The trench shall be filled with coarse aggregate which meets IDOT CA-1, or CA-3 gradation. The bottom 6 inch layer in the trench shall be sand which meets IDOT CA-14, CA-15 or CA-16 gradation. The coarse aggregate shall be separated from the soil surrounding the trench by a filter fabric. The fabric

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shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class 1 with an apparent opening size of at least 30 for non-woven and 50 for woven. The fabric shall extend through the coarse aggregate one foot below the trench surface to prevent plugging. The filter fabric may be extended across the trench bottom in place of the sand layer.

Infiltration trenches shall be designed to dewater within 72 hours. Table 1 lists the maximum trench depths allowed for various soil types for 48 and 72 hour dewatering time periods. The permeability rate shall be field verified to a depth 3 feet below the trench bottom.

The width of the infiltration trench is determined using the design volume and final trench depth values.

All infiltration trenches must have an overflow component since they are not designed to handle large runoff volumes.

The location of the infiltration trench shall meet the following requirements. The bottom of the trench shall be a minimum of 3 feet above the seasonal high water table, bedrock, an impermeable soil layer or dissimilar soil layer. The trench shall be a minimum of 20 feet downslope or 100 feet upslope from any building foundation. The trench shall be a minimum of 100 feet from drinking water wells, septic tanks, drainfields etc. The trench shall not be installed on landslopes greater than 15% and shall be at least 50 feet from where landslopes are greater than 15%. The trench shall not be installed in fill soils.

Observation wells shall be included with the infiltration trench to enable inspection of their performance. Observation wells shall be constructed of 6-8 inch diameter perforated pipe embedded vertically through the aggregate and extended above the ground surface. The surface protrusion shall be capped and protected against vandalism. A well anchor shall be secured to the pipe to prevent the well from being pulled out of the trench. The well anchor may consist of a metal plate or bar secured at or near the bottom of the observation well.

CONSIDERATIONS

It is absolutely critical that settleable particles and floatable organic materials be removed from runoff water before it enters the infiltration trench. The trench will clog and become nonfunctional if excessive particulate matter is allowed to enter the trench. Runoff filtering practices such as practice standard FILTER STRIP 835, and GRASSED LINED CHANNEL 840 must be installed upstream of the trench. If there are uncontrolled sources of grease or oil, grease traps also need to be installed upstream of the trench.

For the same reasons, control of construction site sediment is critical during trench installation. Appropriate sediment control practices such as practice standards TEMPORARY SEDIMENT TRAP 960 and SILT FENCE 920 must be installed and maintained during construction. A more reliable alternative is to wait to install the trench until construction is complete and the upstream drainage area is stabilized.

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Infiltration trenches should not be installed if there is not a reliable long term commitment to upstream sediment control.

Care must be taken to prevent groundwater contamination by not installing infiltration trenches in highly permeable sand or gravel seams that are directly connected to underlying aquifers.

For removal of soluble contaminants, a 12 inch soil layer with a cation exchange capacity (CEC) of 0.5 millieq/100g or greater needs to be present. In Illinois, most soils that meet the permeability, available water capacity and clay content criteria will have a CEC of 0.5 millieq/100g or greater.

PLANS AND SPECIFICATIONS

Plans and specifications for installing infiltration trenches shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. System location
2. Depth, width and length
3. Aggregate gradation
4. Filter fabric requirements
5. Observation well details
6. Identification of upstream sediment control BMPs

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing INFILTRATION TRENCH IL-547 may be used as the plan sheet.

OPERATION AND MAINTENANCE

During the first year after construction, the observation well should be inspected after each significant rainfall event to ensure that the trench is draining properly. Thereafter, the well should be inspected seasonally.

If the trench clogs, it may be necessary to remove and replace all or part of the filter fabric and possibly the coarse aggregate. The frequency of such repairs will depend on the adequacy of pre-treatment as discussed previously.

Most of the maintenance should be concentrated on the pretreatment practices, such as filter strips and swales, upstream of the trench to ensure that sediment does not reach the infiltration trench.

Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practice.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

Ohio Department of Natural Resources, Division of Soil and Water Conservation, 1996. Rainwater and Land Development. 2nd ed., OH

NRCS IL January 1999

urbst847.doc

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TABLE 1

MAXIMUN DEPTH FOR TRENCHES AND BASINS LIMITED BY SOIL PERMEABILITY RATE

Soil Texture	Minimum Permeability (fc) in/hr	Maximum Depth of Trench (d) in.	
		48 hours (T)	72 hours (T)
Sand	13	NA	NA
Loamy Sand	6	NA	NA
Sandy Loam	2	240	360
Loam	1	120	180
Silt Loam	1	120	180
Sandy Clay Loam	1	120	180
Clay Loam <35% Clay	0.8	96	144
Clay Loam >35% Clay	0.4	NA	NA
Silty Clay Loam <35% Clay	0.8	96	144
Silty Clay Loam >35% Clay	0.4	NA	NA
Sandy Clay <40% Clay	0.4	NA	NA
Sandy Clay >40% Clay	<0.06	NA	NA
Silty Clay	<0.06	NA	NA
Clay	<0.06	NA	NA

NA – not applicable Values based on a Soil Porosity of 40 %.

Maximum allowable depth computed by:

$$d = \frac{(fc)(T)100}{P}$$

where

d = depth — inch

fc = permeability rate — inch/hour

T = time to dewater — hour

P = porosity (% voids) — %

Design Volume of Trench = Required Runoff Volume / Porosity

Porosity = Volume of Voids / Total Volume

Required Runoff Volume = Volume of Voids in Trench

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ILLINOIS URBAN MANUAL
PRACTICE STANDARD

RAIN GARDEN

(feet)
CODE 897

Source: Kendall County Soil and Water Conservation District

DEFINITION

Rain gardens are small, shallow, flat bottomed depressions constructed to temporarily hold and infiltrate stormwater allowing stormwater to soak into the ground onsite rather than leaving a property as runoff.

Designed to be periodically inundated with water for short periods of time, rain gardens are planted with vegetation tolerant of being periodically wet and dry.

PURPOSE

Rain gardens are constructed to:

- Retain stormwater runoff and facilitate infiltration;
- Improve water quality by trapping sediment and debris;
- Remove other pollutants through the biological, chemical and physical properties of plants, microbes and soils;
- Create a unique landscape feature and provide habitat for wildlife such as birds and insects including pollinators.

CONDITIONS WHERE PRACTICE APPLIES

In developed areas, impervious and compacted surfaces increase stormwater runoff significantly. Rain gardens capture runoff from rooftops, driveways, sidewalks, lawns and other impervious and compacted surfaces.

This practice applies to small drainage locations and locations with soils that will allow adequate infiltration unless constructed with engineered soil and/or an underdrain system.

CRITERIA

Regulations

Plan, design and construct stormwater runoff practices to comply with

917-1

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CRITERIA

Regulations

Plan, design and construct stormwater runoff practices to comply with

917-1

applicable federal, state and local laws and regulations.

Utilities and Permits

The landowner and/or contractor shall be responsible for locating all buried utilities (Dial 811 to call JULIE) in the project area, including drainage tiles and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including, but not limited to, local, state and federal units of government, or document that no permits are required.

Vegetation Selection

Stabilize all areas disturbed by construction with vegetation as soon as possible after construction and in accordance with IUM practice standard PERMANENT VEGETATION 880.

Select vegetation tolerant of the site conditions, particularly moisture and sun exposure conditions, in which the vegetation will be planted. A plant selection guide can be found in TABLE 897-1. If the rain garden is expected to receive pollutants, select vegetation tolerant of those pollutants.

Location and Design

- Locate the rain garden so that the drainage area is less than 2 acres with any impermeable portion of drainage area no greater than 1 acre.
- Locate the rain garden where soil remains stable when saturated.
- Locate the rain garden to avoid damage to any structures or negative impacts to wastewater treatment systems or wells. Rain gardens shall be a minimum of 25 feet from private sewage disposal systems and wells. Avoid areas within a source water protection area for public drinking water supply.
- Rain gardens shall be located a minimum of 10 feet away from any utilities or building structure to prevent infiltrating water from seeping into the foundation. A minimum of 35-40 feet separation is preferred.
- Direct outflow from the rain garden away from any building foundation.
- The bottom of the rain garden shall be flat, not exceeding 0.5% slope, to facilitate distribution of stormwater runoff and maximize infiltration.
- Rate and volume of overflow from the rain garden must not cause downstream erosion.
- Stormwater must be directed to the rain garden through means such as topography, swales, or tile connected to downspouts.
- Soil surface where runoff water will enter the rain garden must be stable. Include measures such as rock to dissipate energy where concentrated flow is expected.
- Include pretreatment or pollution removal areas such as grass filters or settling areas when runoff is expected to contribute excessive sediment, trash, debris

or other pollutants such as salt or oil that would be damaging to the system. These areas must be adequately designed to handle the expected load capacity. Locate and build such areas so they are easy to access and maintain.

- Provide, at minimum, 2 feet of soil between the bottom of the rain garden and fractured bedrock or high water table. The target separation should be 3 feet. Where there is an increased risk of groundwater pollution, an impermeable liner or layer of compacted earth may be used to separate the rain garden and the water table where there is an increased risk of groundwater pollution.

- Rain gardens are typically between 3 and 9 inches deep, but never exceeding 12 inches in depth.

- Mound excavated material on the downhill side of the rain garden no higher than 1 foot above the bottom of the rain garden.

- Side slopes within the ponding area must be 3:1 (H:V) or flatter. Slopes of any mounded spoil outside of the ponding area must be 5:1 or flatter.

- Design the rain garden to dewater within 48 hours or less. The target dewatering time shall be 24 hours or less. Locations with existing soils that do not meet the criteria above may need a designed underdrain or soil amendment.

- Design the rain garden to drain completely between designed storm events. Any runoff directed to the rain garden, such as runoff from downspouts, lawns and paved surfaces must be intermittent. Sump pumps which discharge continuously shall not be directed to the rain garden.

CONSIDERATIONS

- Illinois rain events are typically 1 inch or less. Designing the rain garden to capture the first 1 inch of runoff will capture a significant amount of stormwater runoff flowing to the rain garden thus treating the pollutants coming into the rain garden. The first flush of runoff carries with it the majority of the pollutants from a storm event.

- Soils with a hydrologic group designation of A or B, a USDA soil textural classification of:
  - Sand
  - Loamy sand
  - Sandy loam
  - Loam

  or an infiltration rate of at least 1 inch per hour are preferable for rain gardens. Soils with slower infiltration rates shall be amended or modified to increase infiltration. When appropriate, install underdrains where the soils have infiltration rates of ½ inch per hour or less. For soils information see USDA Web Soil Survey.

- Avoid compaction in infiltration areas during construction

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including compaction from foot traffic. Ensure that any impermeable layer in the infiltration area of the rain garden is removed or broken up prior to planting on sites where compaction has occurred, particularly where construction equipment has been used to construct the rain garden.

- It is important to note, rain gardens shall not be used to control construction site erosion. Additionally, any sediment which builds up over time shall be removed from the rain garden.
- Sediment deposition can create a crust on the surface of the rain garden which will begin to limit infiltration. It is important to note removal of sediment build-up over time is necessary.
- Rain garden size typically ranges from 100 to 300 square feet in area, commonly 10-30% of the drainage area.
- Avoid construction of rain gardens on slopes greater than 12%.
- Rain gardens should not be located upslope from any building foundation from which runoff is being collected such as from downspouts.
- To adequately establish vegetation, select plants based on sun exposure, soils and moisture availability at the proposed site location. If the rain garden is expected to receive pollutants select plants tolerant of those pollutants. Road salts can be of particular concern.
- Vegetation placed in the infiltration area of the rain garden must be tolerant of periodically dry and periodically inundated conditions.
- Vegetation selection and placement is crucial to a successful rain garden. Select vegetation based on position and associated moisture regime within the rain garden.

Position	Moisture Tolerance
Low	Moist to Average
Medium	Average Moisture
High	Average to Dry

- It is important to note rain gardens are not intended to retain permanent water. Avoid plants that prefer saturated or wet conditions.
- Rain gardens can be located in areas of shade, partial sun or full sun. Partial sun and full sun, however, are preferable due to the availability of a larger selection of plant material. Areas beneath trees should also be avoided to prevent root damage to trees.
- Ensure an adequate growing medium for vegetation. Specified soil mixes or natural topsoil must be of sufficient depth to support

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the root zone of the desired vegetation.

- Deep rooted native vegetation should be used and will improve soil infiltration over time. Native vegetation will typically perform better without added fertilizers.
- Consider including species beneficial for pollinators. Pollinator habitat areas consist of a sufficient variety of plant species to sustain the target pollinators throughout the growing season.
- Consider grouping plants and including signage to facilitate maintenance.
- Successful plant establishment is most easily accomplished during spring and fall when soil moisture is readily available. During vegetation establishment ensure adequate maintenance resources and watering capabilities exist.
- Seeding is not recommended as seeds can be washed away and are slow to establish. Plant the infiltration area of the rain garden with dormant or actively growing nursery stock. Ensure that trees and other vegetation will not hinder water from entering the rain garden, create traffic or safety issues, or obstruct utilities.
- Mulch vegetation after planting to suppress weeds and conserve moisture. Use shredded hardwood mulch or equivalent non-floatable mulch. Spread mulch evenly to a maximum depth of 3 inches. Ensure clearance of mulch around new plantings to facilitate watering and air exchange. Where phosphorous levels are a concern, discontinue adding mulch once plants are established.
- Consider diverting water or lowering the rain garden outlet until vegetation is established. Remove the diversion or complete construction of outlet to design depth when plants grow taller than ponding depth.
- Consider temporarily fencing around the rain garden to protect plantings if herbivore pressure exists.
- A single rain garden will not significantly impact flooding issues or water quality problems in a community. However, the cumulative impact of rain gardens in conjunction with other stormwater management practices has the potential to tangibly affect flooding, stream flow, local groundwater recharge and water quality concerns.

PLANS AND SPECIFICATIONS

Plans and specifications for installing a rain garden shall be in compliance with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Rain garden location
2. Grade, depth, width, length and side slope grade

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3. Rain garden cross-section
4. Material specifications
5. Construction specifications

All plans shall include the installation, inspection and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided for the rain garden to include at a minimum:

- Periodic inspections during vegetative establishment and immediately following significant rainfall events.
- Prompt repair or replacement of damaged components such as areas subject to wear or erosion, as well as, failed plantings.
- Periodic inspection to remove accumulated sediment and debris.
- Rain garden vegetation will require regular watering and weeding during plant establishment.
- Prune trees and shrubs as needed. Weed rain garden to control unwanted vegetation. Annually, in early spring, remove or mulch in place the previous year's herbaceous growth which has died back.

REFERENCES

Bannerman, Roger, and E. Considine, 2003. Rain Gardens: A How-to Manual for Homeowners. University of Wisconsin Extension Publication GWQ037 or Wisconsin Department of Natural Resources Publication PUB-WT-776 2003. Madison, WI.

Iowa Stormwater Partnership, *Rain Gardens: Iowa Rain Garden Design and Installation Manual.* 2008. eBook.

Natural Resources Conservation Service, *Conservation Practice Standard Stormwater Runoff Control: CODE 570.* 2013.

Schmidt, Rusty, Dan Shaw, and David Dods, *The Blue Thumb Guide to Raingardens.* Waterdrop Innovations, LLC, 2007. Print.

USDA-NRCS, *Pollinator Biology and Habitat: Technical Note 23.* 2008.

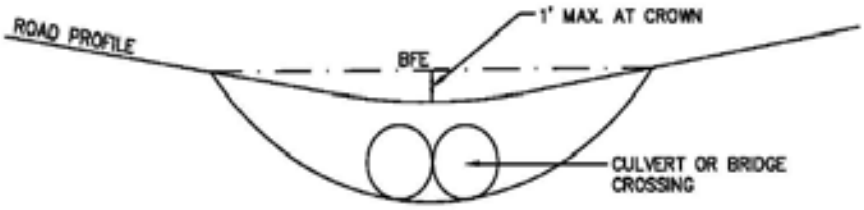
USDA Web Soil Survey
Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov

March 2014

Urbst897.doc

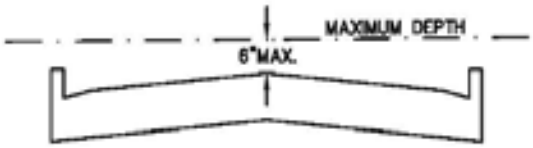
FIGURE 3
Maximum Allowable Flow Depths on Roadways

TRANSVERSE STREAM CROSSINGS



STREAM CROSS-SECTION

FLOW PARALLEL TO ROADWAY



ROAD CROSS-SECTION

Missman, INC.
Professional Engineers & Land Surveyors

CITY OF ROCKFORD
STORMWATER TECHNICAL MANUAL

MAXIMUM ALLOWABLE FLOW DEPTHS ON ROADWAYS

REVISIONS

No.	DESCRIPTION	DATE

FIG. 4

T2-03 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.

T2-03(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.

T2-03(b) Release Rate

The peak release rate from a development site shall not exceed 0.2 cfs/acre of development for the 0.01 probability in any year. This has been found to be the natural safe stormwater discharging capacity of the downstream systems in the City of Rockford.

If the design required an outlet size smaller than 4-inches, then a waiver of detention rights can be requested. Other BMPS shall be used to detain as much water as possible. 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.

All central structures shall be provided with an intercepter for trash and debris and it shall be designed and constructed to prevent soil erosion and not require manual adjustments for its proper operation.

FIGURE 4
Hydrologically Disturbed Area Example

T2-03(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 HECHMS are U.S. Army Corps of Engineers hydrologic models. TR-20 and TR55 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/SVVMM.INSTALSW.EXE

All event hydrograph routing methods shall use the Huff rainfall distribution appropriate for the storm duration as shown in Tables 2 and 3. Rainfall depths for different frequencies and durations are shown in Table 2 in § T202(f). Figure 5 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 2
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

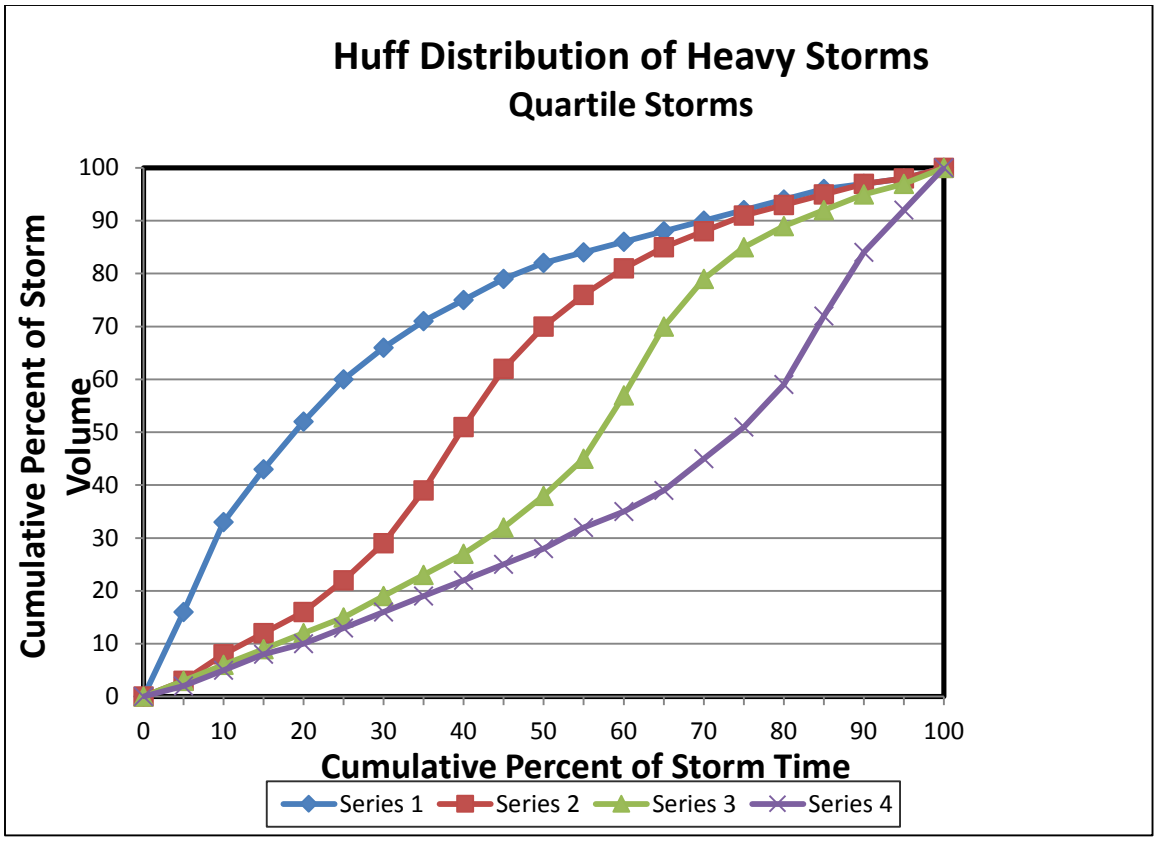
TABLE 3
Huff Quartile Distributions*

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 5

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 Winnebago 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: ATR-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 1. The TR-20 hydrologic model input/output is listed below.

FIGURE 5
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   JJJ
TITLE       Kane County Technical Manual
TITLE       Critical Duration Analysis Example 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        6.09          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          too         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


          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 usT*********************************
```

FIGURE 5
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
%SECTION 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

1

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REV PC 09183(.2) Critical Duration Analysis Example JJJ APR00 PAGE 5

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/DRAINAGE STRUCTURE ID	AREA (SQ MI)	STORM NUMBERS 1
0 XSECTION 1	.16	
ALTERNATE 0		11.38

LEND 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.

T2-03(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 0.2 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 0.2 cfs/acre.

T2-03(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 T2-03(i).

T2-03(f) Retention Requirement (Reserved)

T2-03(g) 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. Use an event hydrograph routing method to iterate the size of the detention pond knowing the allowable release rate, an approximate storage volume, , and modeling the inflow hydrograph from the development area.

T2-03(h) 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.

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.

T2-03(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.

T2-03(k) 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.

T2-03(l) See City Ordinance 2-03(L)

T2-03(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 affect 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 an 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 cannot 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.

T3-00(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. Surface and erodibility for the mapped soils were obtained from the NRCS web soil survey located at:

http://websoilsurvey.nrcs.usda.gov/app

Soil erodibility factors have been calculated for all soil types in the County and are shown in Table 4. 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 4
Soil Erodibility

Soil Map Unit	Soil	Surface Erosion Factor (k)	Subsurface Erosion Factor (k); 12" – 70" Depth Range	Erosion Risk
21B, C2	Pecatonica	.43	.49	Slight
22B, C2, D2	Westville	.43 (C2); .37 (D2)	.37	Slight (B, C2); Moderate (D2)
51A	Muscatine	.32	.49	Slight
61A	Atterberry	.37	.55	Slight
68A	Sable	.24	.49	Slight
86A, B, C2	Osco	.32 (A, B); .37 (C2)	.49	Slight
93E2	Rodman	.20	.20	Moderate
100A	Palms	N/A	.32	Slight
102A	La Hogue	.24	.37	Slight
104A	Virgil	.37	.43	Slight
119B	Elco	.37	.43	Slight
125A	Selma	.24	.28	Slight

146A	Elliot	.32	.49	Slight
152A	Drummer	.24	.37	Slight
172A	Hoopeston	.10	.20	Slight
188A	Beardstown	.20	.32	Slight
197A	Troxel	.28	.37	Slight
198A	Elburn	.28	.37	Slight
199A, B, C2	Plano	.37	.43	Slight
223B	Varna	.37	.43	Slight
227B	Argyle	.37	.43	Slight
242A	Kendall	.43	.43	Slight
243A, B, C2	St. Charles	.37 (A); .43 (B, C2)	.55 (A); .43 (B, C2)	Slight
259B2, C2	Assumption	.37	.43	Slight
278A	Stronghurst	.43	.49	Slight
279A	Rozetta	.37	.49	Slight
280B, C2	Fayette	.37	.49	Slight
290A, B, D2	Warsaw	.20 (A); .28 (B); .32 (D2)	.32 (A); .28 (B); .24 (D2)	Slight
293A	Andres	.28	.49	Slight
297B, D2	Ringwood	.28 (B); .32 (D2)	.37	Slight
310B, D2	McHenry	.49 (B); .37 (D2)	.37	Slight
327B, D2	Fox	.37 (B); .43 (D2)	.24 (B); .37 (D2)	Slight
329A	Will	.17	.32	Slight
330A	Peotone	.24	.37	Slight
332A, B	Billett	.17	.20 (A); .17 (B)	Slight
343A	Kane	.32	.37	Slight
354A, B	Hononegah	.02	.05	Slight
361B, D2, D3	Kidder	.28 (B, D3); .37 (D2)	.32 (B, D2); .28 (D3)	Slight
363B, D2	Griswold	.32	.32	Slight
369A	Waupecan	.32	.43	Slight
379A	Dakota	.20	.28	Slight
387A, B	Ockley	.37 (A); .43 (B)	.32	Slight
403C, E, F	Elizabeth	.32 (C, E); .28 (F)	.05 (E)	Slight (C); Moderate (E, F)
411B, C2	Ashdale	.37	.43	Slight
412B	Ogle	.37	.43	Slight
419A, B, C2	Flagg	.37	.43	Slight
429B, C2	Palsgrove	.43 (B); .49 (C2)	.43	Slight
440A, B, C2	Jasper	.37 (A, B); .43 (C2)	.43 (A, C2); .55 (B)	Slight
490A	Odell	.32	.43	Slight
505C2, D2, E2	Dunbarton	.37	.43 (C2, D2); .17 (E2)	Slight (C2, D2); Moderate (E2)
506A, B, C2	Hitt	.28 (A, B); .43 (C2)	.37	Slight
512B, C2	Danabrook	.37	.43	Slight
528A	Lahoguess	.28	.28	Slight
529A	Selmass	.24	.28	Slight
533	Urban Land	N/A	N/A	N/A

561B, C2, D2	Whalan & New Glarus	.37	.32 (B); .24 (C2); .28 (D2)	Slight (B, C2); Moderate (D2)
566B, C2, D2	Rockton & Dodgeville	.24 (B); .28 (C2, D2)	.32	Slight
570A, B, D2	Martinsville	.43	.43 (A); .28 (B); .32 (D2)	Slight
618B, C2	Senachwine	.32 (B); .37 (C2)	.43	Slight
622B, C2	Wyanet	.37 (B); .43 (C2)	.49	Slight
623A, B	Kishwaukee	.32	.32	Slight
675A, B	Greenbush	.37	.49	Slight
728B, C2, D2	Winnebago	.37	.37 (B); .32 (C2, D2)	Slight (B, C2); Moderate (D2)
768B, C, D	Backbone	.02	.37	
769B, D, E2	Edmund	.37	.20 (B); .24 (D)	Slight (B, D); Moderate (E2)
771A	Hayfield	.32	.37	Slight
772A	Marshan	.20	.32	Slight
777A	Adrian	N/A	.10	Slight
779B, D	Chelsea	.02	.28	Slight
780B, C2	Grellton	.28	.55 (B); .49 (C2)	Slight
781A, B	Friesland	.28	.55	Slight
783A, B	Flagler	.17	.17	Slight
802B	Orthents	.28	.37	Slight
835G	Earthen	N/A	N/A	N/A
864	Pits, quarries	N/A	N/A	N/A
865	Pits, gravel	N/A	N/A	N/A
939C2, D2	Rodman-Warsaw	.20	.20	Slight
1100A	Palms	N/A	.32	Slight
1103A	Houghton	N/A	N/A	Slight
1776A	Comfrey (undrained)	.32	.37	Slight
1777A	Adrian (undrained)	N/A	.10	Slight
3082A	Millington	.28	.32	Slight
3107A	Sawmill	.32	.43	Slight
3415A	Orion	.49	.55	Slight
3776A	Comfrey	.32	.37	Slight
3800A	Psamments	.02	.02	Slight
8451A	Lawson	.32	.43	Slight
8782A	Juneau	.49	.55	Slight
9051AA	Muscatine (terrace)	.32	.55	Slight
9061A	Atterberry (terrace)	.37	.55	Slight
9068A	Sable (terrace)	.32	.49	Slight
9086A	Osco (terrace)	.32	.49	Slight
9278A	Stronghurst (terrace)	.43	.49	Slight

9279A	Rozetta (terrace)	.37	.49	Slight
9675A	Greenbush (terrace)	.37	.49	Slight

(1) K factors are for Whole Soils.
(2) Subsurface K factor ratings are a weighted average for the depth range.
(3) Erosion risks are based on slope and soil erosion factor (k) of the soil types.

T3-00(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 5.

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 6.

TABLE 5
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 6
Seed Mixtures For Temporary or Permanent Stabilization
Remaining For More Than One Year

Mix/Seed	Rate Lbs./ac.	Soil Drainage				Planting Period
		ED	WD	SP	PD	
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
Havland 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	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.

T3-00(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 viewed from the following website link: http://www/aoswcd/orgIUM

T3-00(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

T3 00(d) Reserved

T3-00(e) 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.

T3-00(f) 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.

T3-00(g) "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. Projects shall utilize Soil Stabilization and Sediment Control measure details that are in accordance with the Illinois Urban Manual latest edition. Reference attached Figures 6 and 7 for Soil Stabilization and Sediment Control plan details.

Sediment Control (Figure 6)

a) Sediment Basin Dewatering
b) Temporary Sediment Trap
c) Temporary Sediment Trap
d) Silt Fence
e) Silt Fence Wire Support Plan
f) Fence Splicing Two Fences

Stabilization (Figure 7)

a) Erosion Blanket
b) Erosion Blanket
c) Erosion Blanket Turf Reinforcement Mat

Figure 6 A
Sediment Basin Dewatering

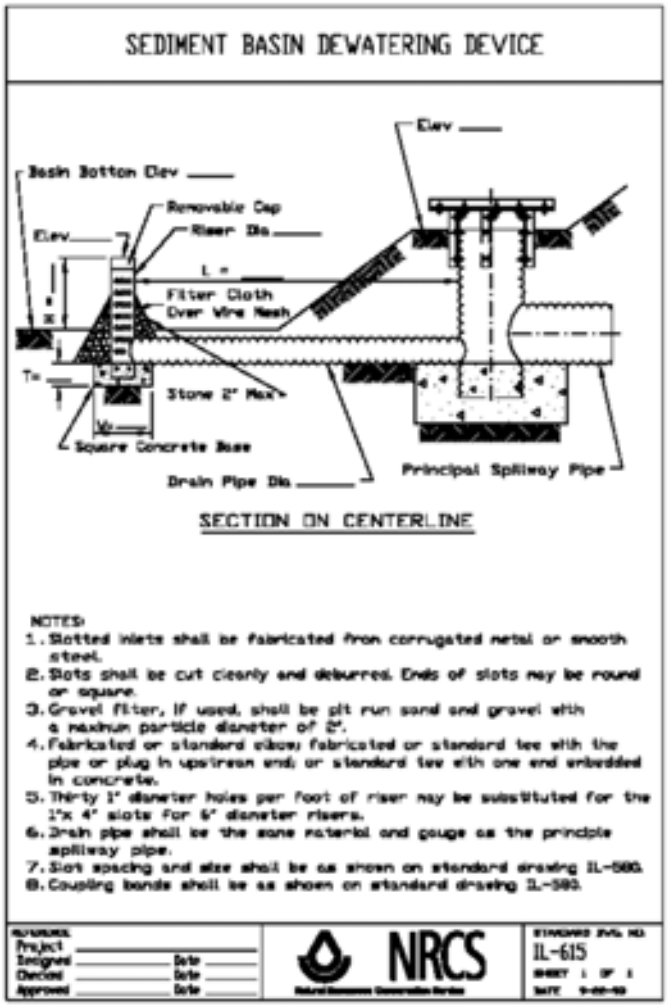


Figure 6 B
Temporary Sediment Trap

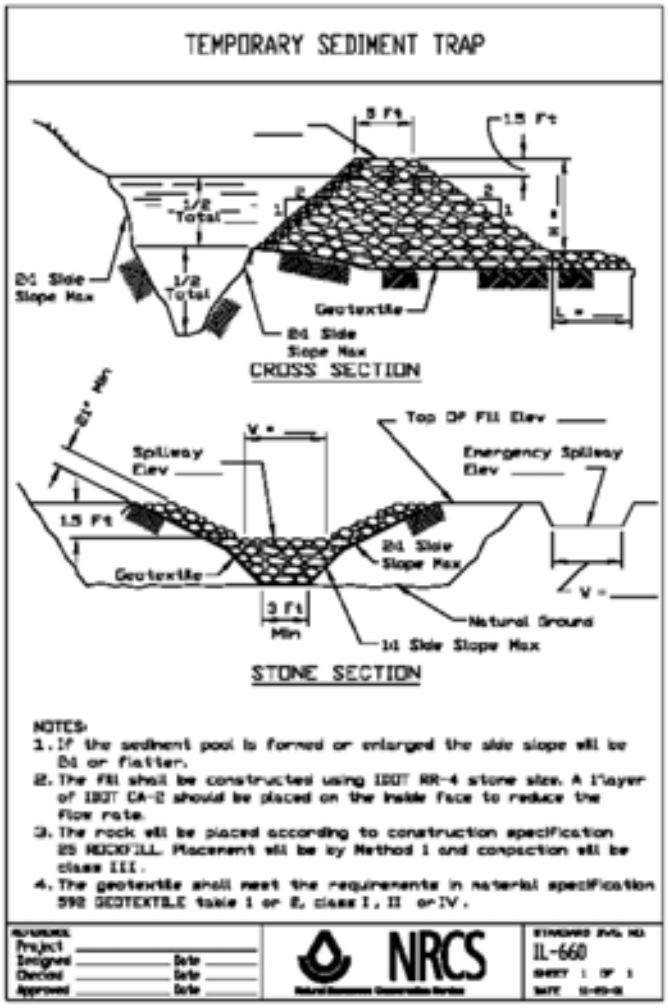
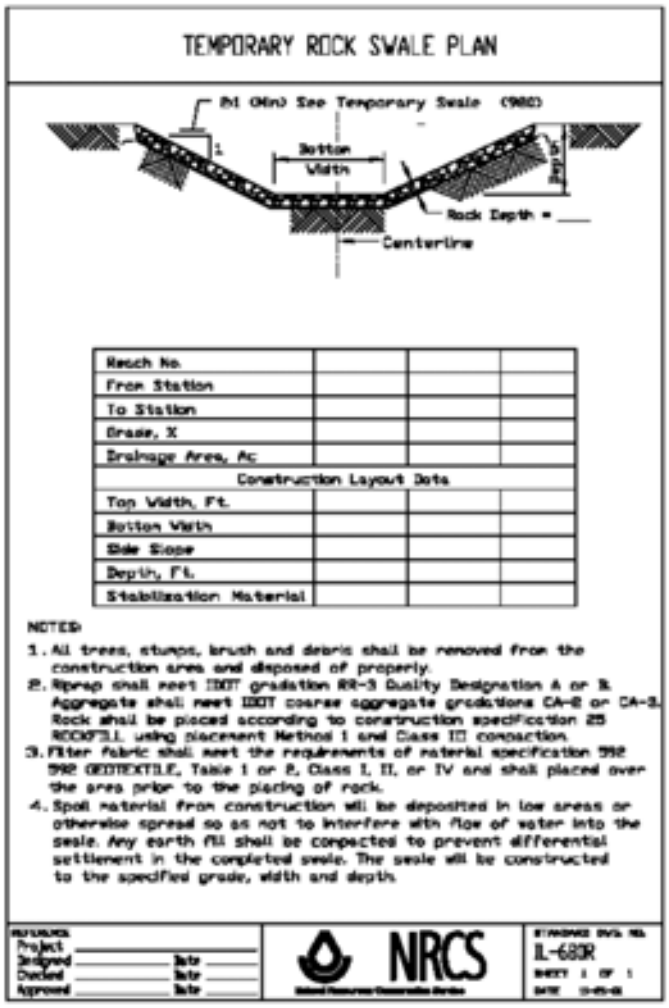


Figure 6 C
Temporary Sediment Trap



TEMPORARY ROCK SWALE PLAN

(h1 (Min) See Temporary Swale (560))

Bottom Width

Depth

Rock Depth = ____

Centerline

Reach No.			
From Station			
To Station			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Top Width, Ft.			
Bottom Width			
Side Slope			
Depth, Ft.			
Stabilization Material			

NOTES:

1. All trees, stumps, brush and debris shall be removed from the construction area and disposed of properly.
2. Riprap shall meet IDOT gradation RR-3 Quality Designation A or B. Aggregate shall meet IDOT coarse aggregate gradations CA-8 or CA-3. Rock shall be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
3. Filter fabric shall meet the requirements of material specification 592 592 GEOTEXTILE, Table 1 or 2, Class I, II, or IV and shall placed over the area prior to the placing of rock.
4. Spoil material from construction will be deposited in low areas or otherwise spread so as not to interfere with flow of water into the swale. Any earth fill shall be compacted to prevent differential settlement in the completed swale. The swale will be constructed to the specified grade, width and depth.

Project
Designed ____ Date ____
Checked ____ Date ____
Approved ____ Date ____

NRCS

IL-680R

Figure 6 D
Silt Fence

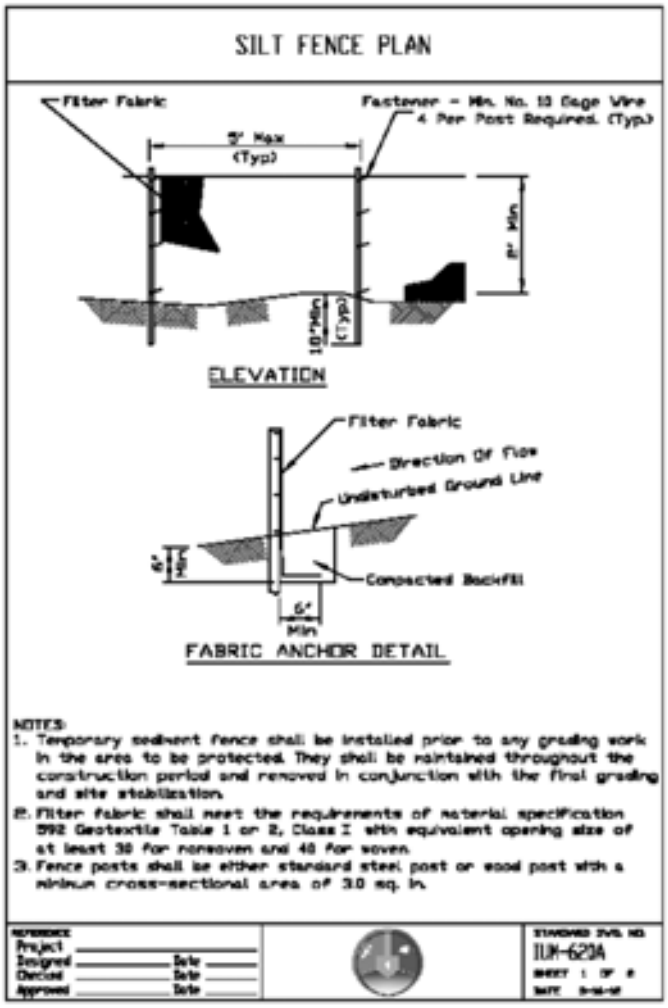


Figure 6 E
Silt Fence Wire Support

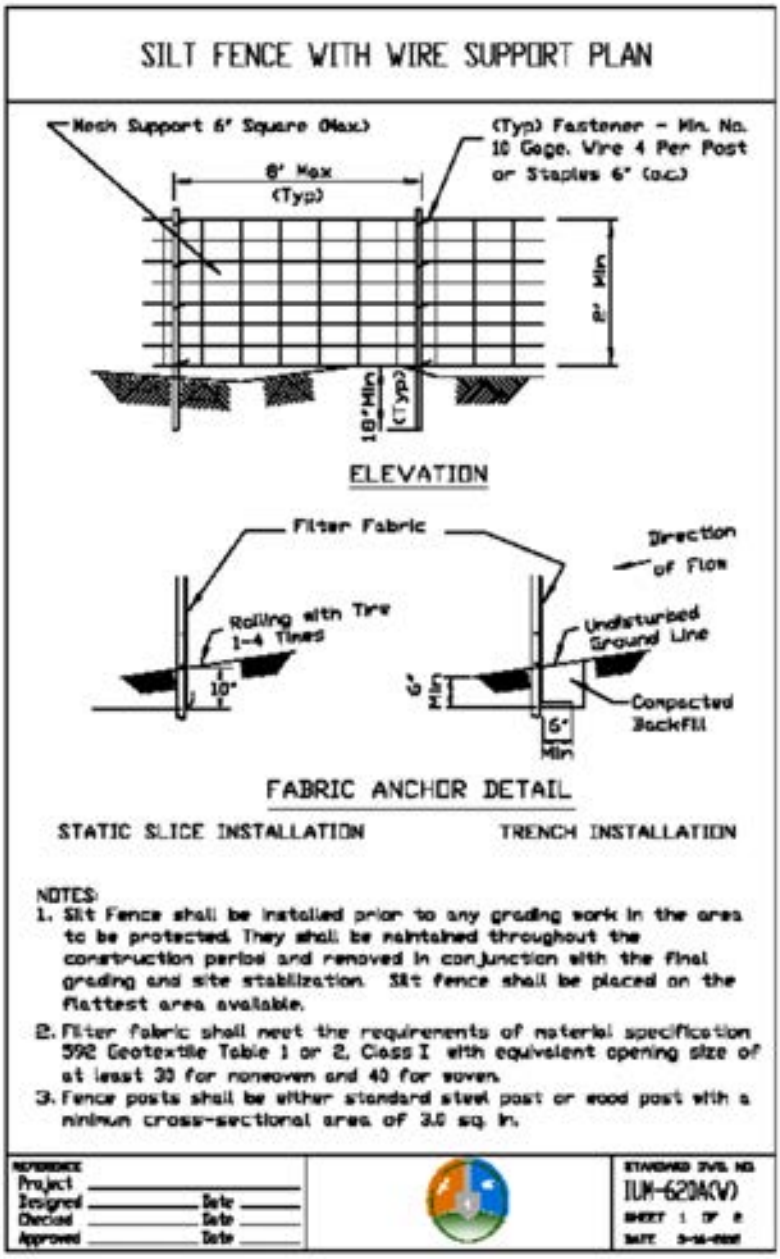


Figure 6 F
Fence Splicing Two Fences

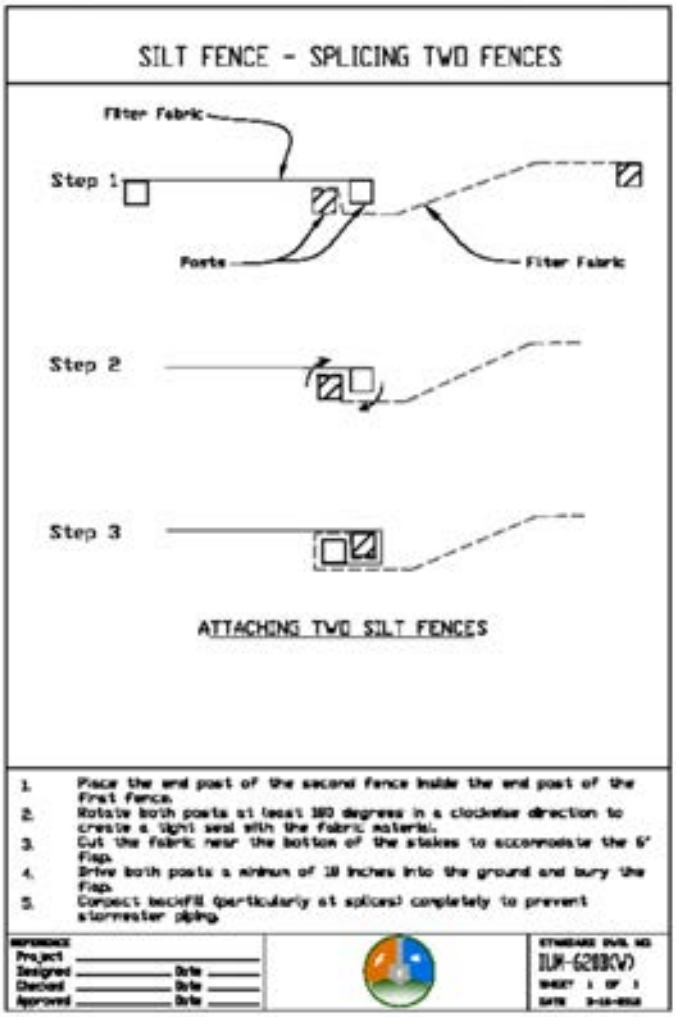


Figure 7 A
Erosion Blanket

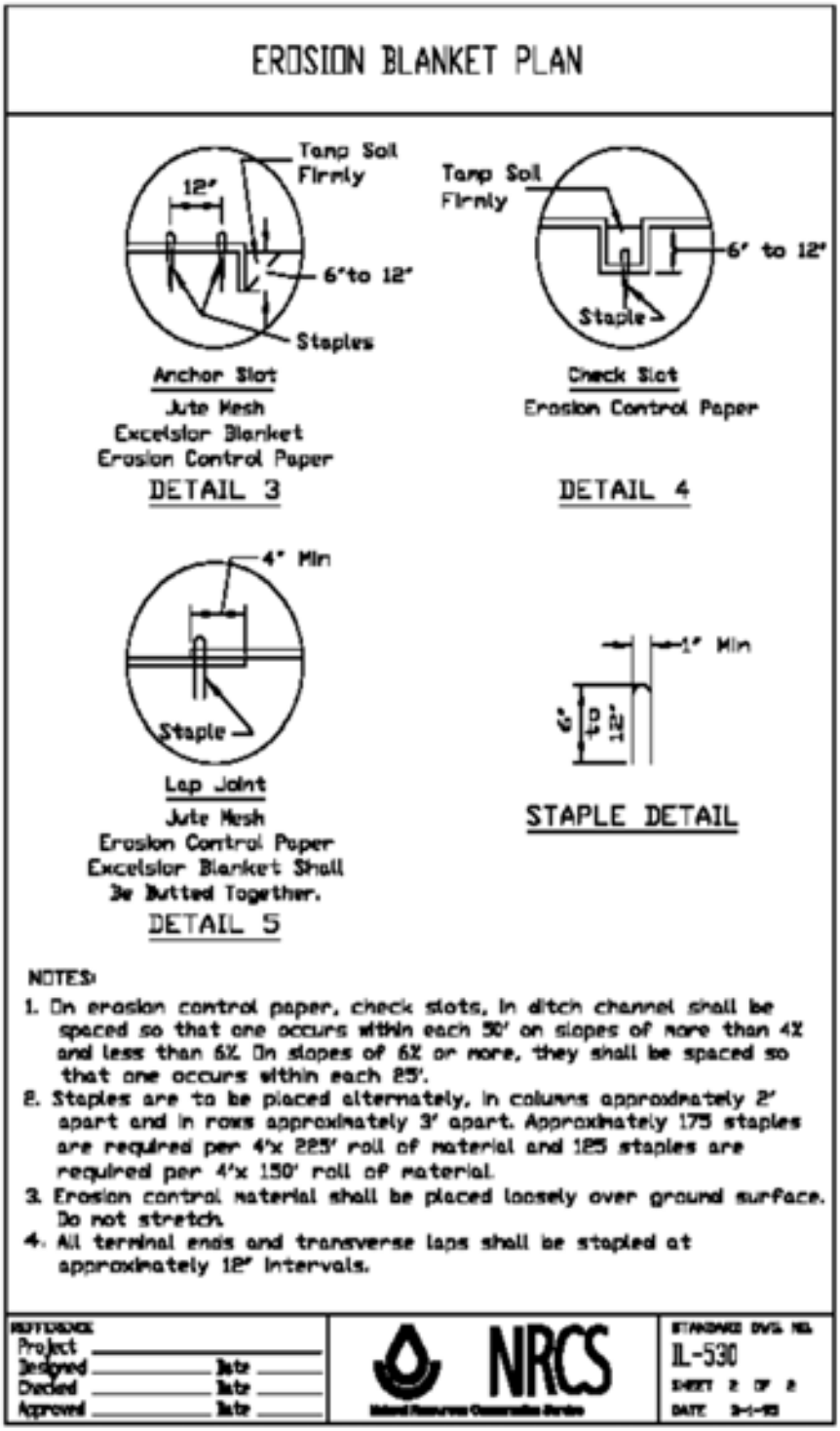


Figure 7 B
Erosion Blanket

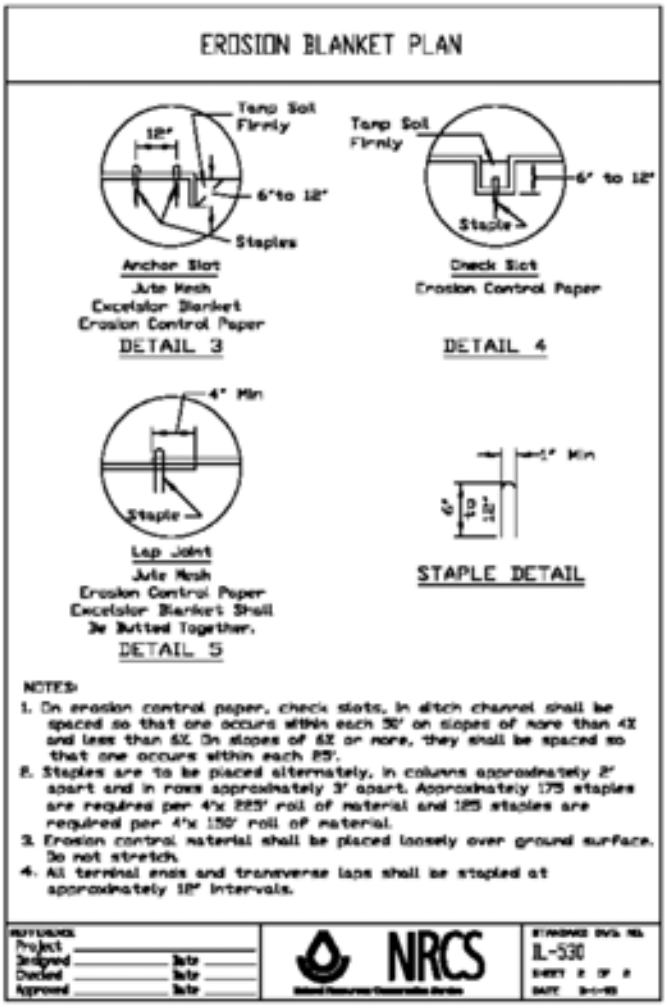
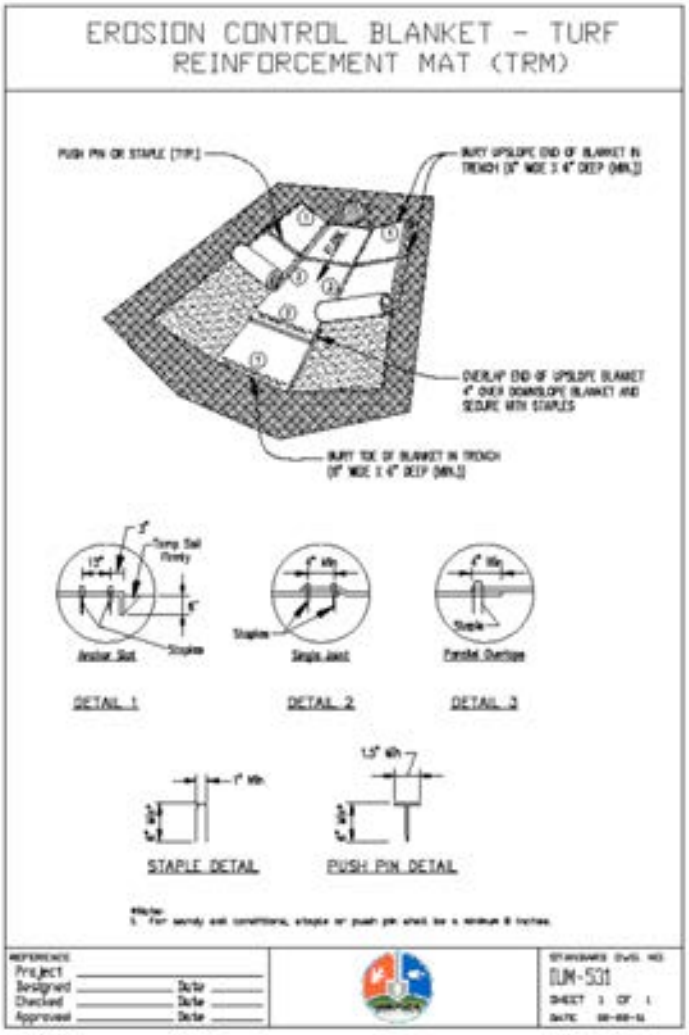


Figure 7 C
Erosion Blanket



T3-00(h) 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 the City of Rockford 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.

T3-00(i) 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. Weekly inspections shall be performed until final stabilization has occurred as defined and required by the Illinois Environmental Protection Agency's General Construction Permit (ILR10).

FIGURE 8
Sediment and Erosion Control Plan

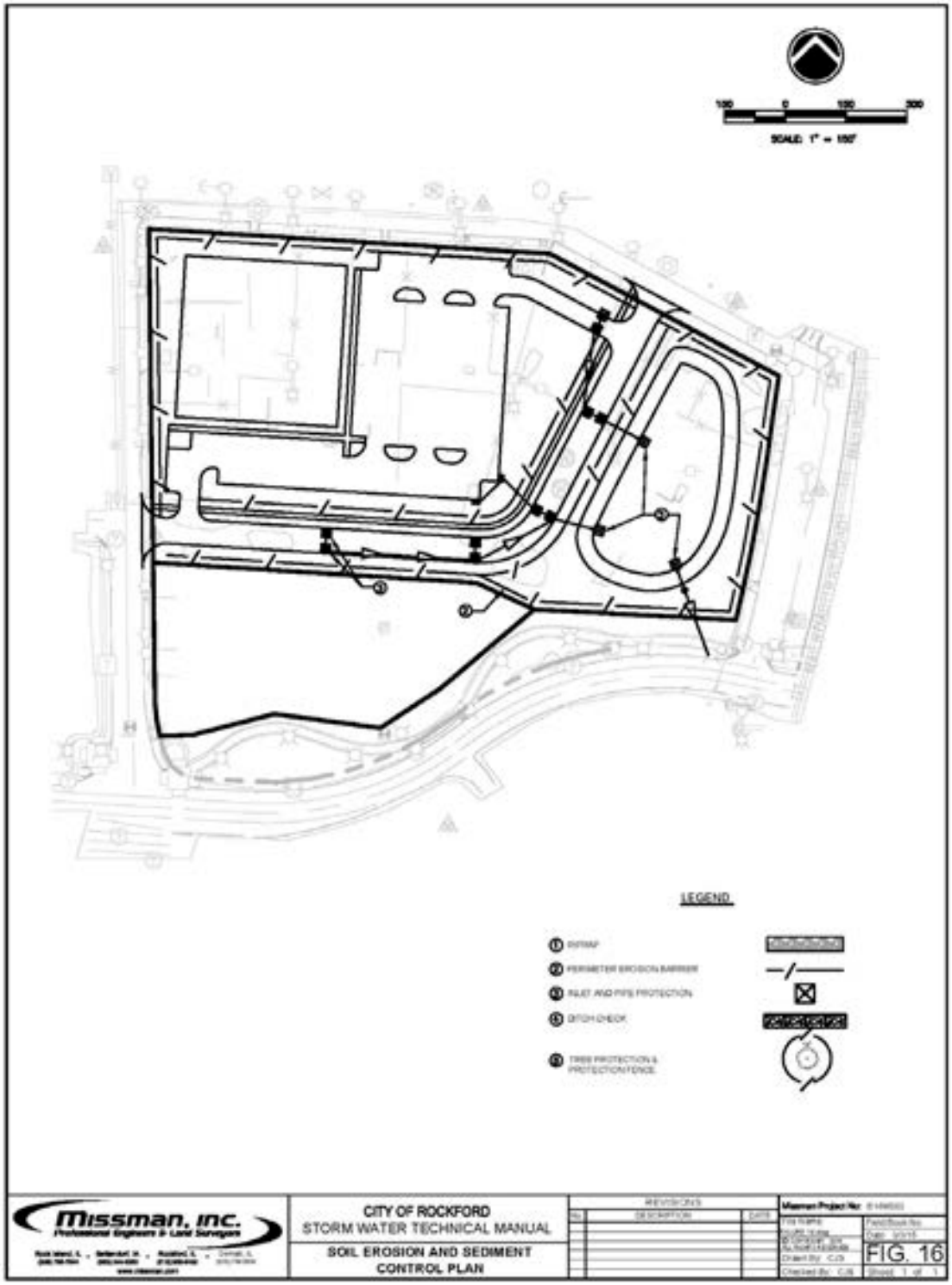


TABLE 7
Permanent Stabilization Practices

Permanent Stabilization Strategy	Urban Manual Code	Sheet & Rill Erosion	Rill & Gully Erosion	Stream-Bank Erosion	Stream Channel Erosion	Nutrients, Heavy Metal & Salt	Flooding	Increased Peak Discharge	Sediment Damage
Urban Stormwater Wetlands	880				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.

T3-00(j) 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.

T3-00(k) Stockpiles

Stockpiles are not to be placed in any special management areas or buffers. Sediment control measures shall be installed in stockpile area prior to mass excavation and stockpile placement. Control measures shall be in place on the down gradient side to prevent sediment runoff. 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.

T3-00(m) 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.

T3-00(n) 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 lie 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.

T3-00(o) Construction Waste

Potential sources of pollution expected to be present on site during construction include but are not limited to oil, petroleum based additives, cleaning solvents, tar, cleaning solvents, fertilizers, soil stabilization additives and solids, and construction wastes. Contractor shall employ good housekeeping efforts, secondary containment measure, etc. to prevent spill or other accidental exposure of materials and substances to storm water runoff and shall train all personnel in the proper handling and cleanup of spilled materials.

Construction waste shall not be allowed to enter the City's storm system (inlets, curblines, drainageways, creek, ditches etc.) nor can it be poured on the ground surface. Similar to the SWPPP for the project, an approved washout or waste receptacle must be avaialable onsite. Code No. 954 of the Illinois Urban Manual discusses procedures for Temporary Washout Facilities.

T3-00(p) 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). Prior to any in-stream work, appropriate agency(ies) permitting shall be obtained, if applicable.

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 9 A
Stabilized Construction Entrance Plan

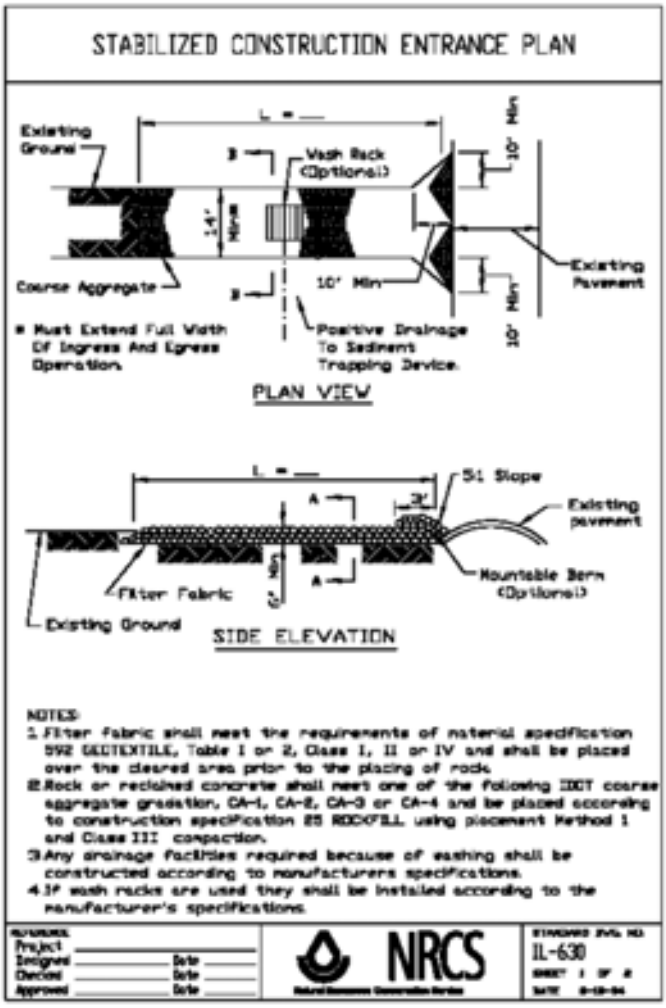
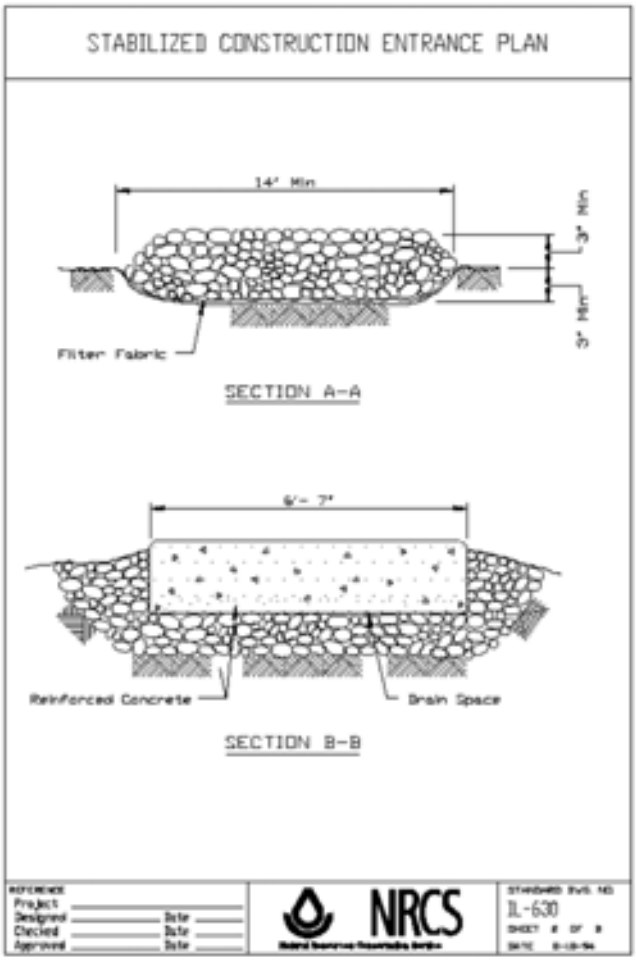


Figure 9 B
Stabilized Construction Entrance



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 completed watershed studies 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 City of Rockford and Winnebago County.

T4-01 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

T4-02 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.

T4-03 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, and the Illinois Department of Natural Resources-Office of Water Resources (IDNR-OWR). The Administrator will need to approve the use of any floodplain study not previously designated as a regulatory study prior b 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.

T4-04 Floodplain, Regulatory Floodplain, Base Flood Elevation (BFE) and Regulatory Floodway Locations

This ordinance's protection standard is the base flood. The best available base flood data are listed below. Whenever a party disagrees with the best available data, the party shall finance the detailed engineering study needed to replace the existing data with better data and submit it to the FEMA and IDNR/OWR for approval prior to any development of the site.

1. The base flood elevation for the floodplains of Ditch No. 3, Dry Creek, Keith Creek, Kilburn Creek, Kilbuck Creek, Kishwaukee River, Madigan Creek, Main Drainage Ditch, Manning Creek, McDonald Creek, Mud Creek, North Branch Otter Creek, North Kent Creek, North Kinnikinnick Creek, Otter Creek, Pecatonica River, Randalls Creek, Rock River, South Branch Dry Creek, South Branch Kishwaukee River, South Branch Otter Creek, South Ditch, South Kent Creek/Kent Creek, South Kinnikinnick Creek shall be as delineated on the 100-year flood profiles in the countywide Flood Insurance Study of Winnebago County prepared by the Federal Emergency Management Agency and dated September 6, 2006.

2. The base flood elevation for each floodplain delineated as an "AH Zone" or AO Zone" shall be that elevation (or depth) delineated on the county wide Flood Insurance Rate Map of Winnebago County

3. The base flood elevation for each of the remaining floodplains delineated as an "A Zone" on the countywide Flood Insurance Rate Map of Winnebago County shall be according to the best data available from federal, state or sources. Should no other

data exist, an engineering study must be financed by the applicant to determine base flood elevations.

4. The base flood elevation for the floodplains of those parts of unincorporated Winnebago County that are within the extraterritorial jurisdiction of the City of Rockford or that may be annexed into the City of Rockford, shall be as delineated on the 100-year flood profiles in the Flood Insurance Study of Winnebago County prepared by the Federal Emergency Management Agency and dated September 6, 2006.

    a) 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.

5. 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 this Article, including the appropriate use criteria, until such time as a LOMA/LOMR receives concurrence from IDNR/OWR and is issued by FEMA.

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

        (i) 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 modified, 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 Secs. 4-03 through 4-13 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.

T4-05 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.

1. 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.

2. 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.

3. 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 Sec. 4-07. Proposed changes to the regulatory floodway delineation and the BFE must be submitted to IDNR/OWR for approval.

4. If the development is located in the Rock River a permit must also be received from IDNR/OWR.

5. 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.

6. For public flood control projects, Secs. 4-03 through 4-13 will be deemed met if the applicant demonstrates to IDNR/OWR and the Administrator—

   a) 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;

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

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

7. 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.

T4-06 Public health protection standards

1. Public health standards must be met for all floodplain development. In addition to the requirements of Sections 6 and 7 of this ordinance the following standards apply:

   a) No development in the floodplain shall include locating or storing chemicals, explosives, buoyant materials, flammable liquids, pollutants, or other hazardous or toxic materials below the flood protection elevation unless such materials are stored in a floodproofed and anchored storage tank and certified by a professional engineer or floodproofed building constructed according to the requirements of Section 7 of this ordinance.

   b) Public utilities and facilities such as sewer, gas and electric shall be located and constructed to minimize or eliminate flood damage.

   c) Public sanitary sewer systems and water supply systems shall be located and constructed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters.

   d) New and replacement on-site sanitary sewer lines or waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding. Manholes or other above ground openings located below the flood protection elevation shall be watertight.

   e) Construction of new or substantially improved critical facilities shall be located outside the limits of the floodplain. Construction of new critical facilities shall be permissible within the floodplain if no feasible alternative site is available. Critical facilities constructed within the SFHA shall have the lowest floor (including

basement) elevated or structurally dry floodproofed to the 500-year flood frequency elevation or three feet above the level of the 100-year flood frequency elevation whichever is greater. Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into floodwaters. Access routes elevated to or above the level of the base flood elevation shall be provided to all critical facilities.

c) All other activities defined as development shall be designed so as not to alter flood flows or increase potential flood damages.

T4-07 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.

1. In addition to the state permit and damage prevention requirements of this ordinance, all buildings located in the floodplain shall be protected from flood damage below the flood protection elevation. This building protection requirement applies to the following situations:

   a) Construction or placement of a new building or alteration or addition to an existing building valued at more than one thousand dollars ($1,000) or seventy (70) square feet.

   b) Substantial improvements or structural alterations made to an existing building that increase the floor area by more than twenty percent (20%) or equal or exceed the market value by fifty percent (50%). Alteration shall be figured cumulatively during the life of the building. If substantially improved, the existing structure and the addition must meet the flood protection standards of this section.

   c) Repairs made to a substantially damaged building. These repairs shall be figured cumulatively during the life of the building. If substantially damaged the entire structure must meet the flood protection standards of this section within 24 months of the date the damage occurred.

   d) Installing a manufactured home on a new site or a new manufactured home on an existing site. (The building protection requirements do not apply to returning a manufactured home to the same site it lawfully occupied before it was removed to avoid flood damage).

   d) Installing a travel trailer or recreational vehicle on a site for more than one hundred eighty (180) days per year.

   e) Repetitive loss to an existing building as defined in Article 1.

2. Residential or non-residential buildings can meet the building protection requirements by one of the following methods:

   a. The building may be constructed on permanent land fill in accordance with the following:

(i) The lowest floor (including basement) shall be at or above the flood protection elevation.

(ii) The fill shall be placed in layers no greater than six inches before compaction and should extend at least ten (10) feet beyond the foundation before sloping below the flood protection elevation.

(iii) The fill shall be protected against erosion and scour during flooding by vegetative cover, riprap, or other structural measure.

(iv) The fill shall be composed of rock or soil and not incorporated debris or refuse material, and

(v) Shall not adversely affect the flow of surface drainage from or onto neighboring properties and when necessary stormwater management techniques such as swales or basins shall be incorporated.

b. The building may be elevated on solid walls in accordance with the following:

(i) The building or improvements shall be elevated on stilts, piles, walls, crawlspace, or other foundation that is permanently open to flood waters.

(ii) The lowest floor and all electrical, heating, ventilating, plumbing, and air conditioning equipment and utility meters shall be located at or above the flood protection elevation.

(iii) If walls are used, all enclosed areas below the flood protection elevation shall address hydrostatic pressures by allowing the automatic entry and exit of flood waters. Designs must either be certified by a licensed professional engineer or by having a minimum of one (1) permanent opening on each wall no more than one (1) foot above grade with a minimum of two (2) openings. The openings shall provide a total net area of not less than one (1) square inch for every one (1) square foot of enclosed area subject to flooding below the base flood elevation, and

c. The foundation and supporting members shall be anchored, designed, and certified so as to minimize exposure to hydrodynamic forces such as current, waves, ice, and floating debris.

i. All structural components below the flood protection elevation shall be constructed of materials resistant to flood damage.

ii. Water and sewer pipes, electrical and telephone lines, submersible pumps, and other service facilities may be located below the flood protection elevation provided they are waterproofed.

iii. The area below the flood protection elevation shall be used solely for parking or building access and not later modified or occupied as habitable space, or

iv. In lieu of the above criteria, the design methods to comply with these requirements may be certified by a licensed professional engineer or architect.

3. The building may be constructed with a crawlspace located below the flood protection elevation provided that the following conditions are met:

   a) The building must be designed and adequately anchored to resist flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

   b) Any enclosed area below the flood protection elevation shall have openings that equalize hydrostatic pressures by allowing for the automatic entry and exit of floodwaters. A minimum of one opening on each wall having a total net area of not less than one (1) square inch per one (1) square foot of enclosed area. The openings shall be no more than one (1) foot above grade.

   c) The interior grade of the crawlspace below the flood protection elevation must not be more than two (2) feet below the lowest adjacent exterior grade.

   d) The interior height of the crawlspace measured from the interior grade of the crawl to the top of the foundations wall must not exceed four (4) feet at any point.

   e) An adequate drainage system must be installed to remove floodwaters from the interior area of the crawlspace within a reasonable period of time after a flood event.

   f) Portions of the building below the flood protection elevation must be constructed with materials resistant to flood damage, and

   g) Utility systems within the crawlspace must be elevated above the flood protection elevation.

4. Non-residential buildings may be structurally dry floodproofed (in lieu of elevation) provided a licensed professional engineer or architect certifies that:

   a) Below the flood protection elevation the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood.

   b) The building design accounts for flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy, and the impact from debris and ice.

   c) Floodproofing measures will be incorporated into the building design and operable without human intervention and without an outside source of electricity.

   d) Levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection.

5. Manufactured homes or travel trailers to be permanently installed on site shall be:

   a) Elevated to or above the flood protection elevation in accordance with Section 7(B), and

   b) Anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with the rules and regulations for the Illinois Mobile Home Tie-Down Act issued pursuant to 77 Ill. Adm. Code § 870.

6. Travel trailers and recreational vehicles on site for more than one hundred eighty (180) days per year shall meet the elevation requirements of section 7(D) unless the following conditions are met:

   a) The vehicle must be either self-propelled or towable by a light duty truck.

   b) The hitch must remain on the vehicle at all times.

   c) The vehicle must not be attached to external structures such as decks and porches

   d) The vehicle must be designed solely for recreation, camping, travel, or seasonal use rather than as a permanent dwelling.

   e) The vehicles largest horizontal projections must be no larger than four hundred (400) square feet.

   f) The vehicle's wheels must remain on axles and inflated.

   g) Air conditioning units must be attached to the frame so as to be safe for movement of the floodplain.

   h) Propane tanks as well as electrical and sewage connections must be quick-disconnect.

   i) The vehicle must be licensed and titled as a recreational vehicle or park model, and

   j) Must either:

      (i) entirely be supported by jacks, or

      (ii) have a hitch jack permanently mounted, have the tires touching the ground and be supported by block in a manner that will allow the block to be easily removed by used of the hitch jack.

7. Garages, sheds or other minor accessory structures constructed ancillary to an existing residential use may be permitted provided the following conditions are met:

   a) The garage of shed must be non-habitable.

   b) The garage or shed must be used only for the storage of vehicles and tools and cannot be modified later into another use.

c) The garage or shed must be located outside of the floodway or have the appropriate state and/or federal permits.

d) The garage or shed must be on a single family lot and be accessory to an existing principle structure on the same lot.

e) Below the base flood elevation, the garage or shed must be built of materials not susceptible to flood damage.

f) All utilities, plumbing, heating, air conditioning and electrical must be elevated above the flood protection elevation.

g) The garage or shed must have at least one permanent opening on each wall not more than one (1) foot above grade with one (1) square inch of opening for every one (1) square foot of floor area.

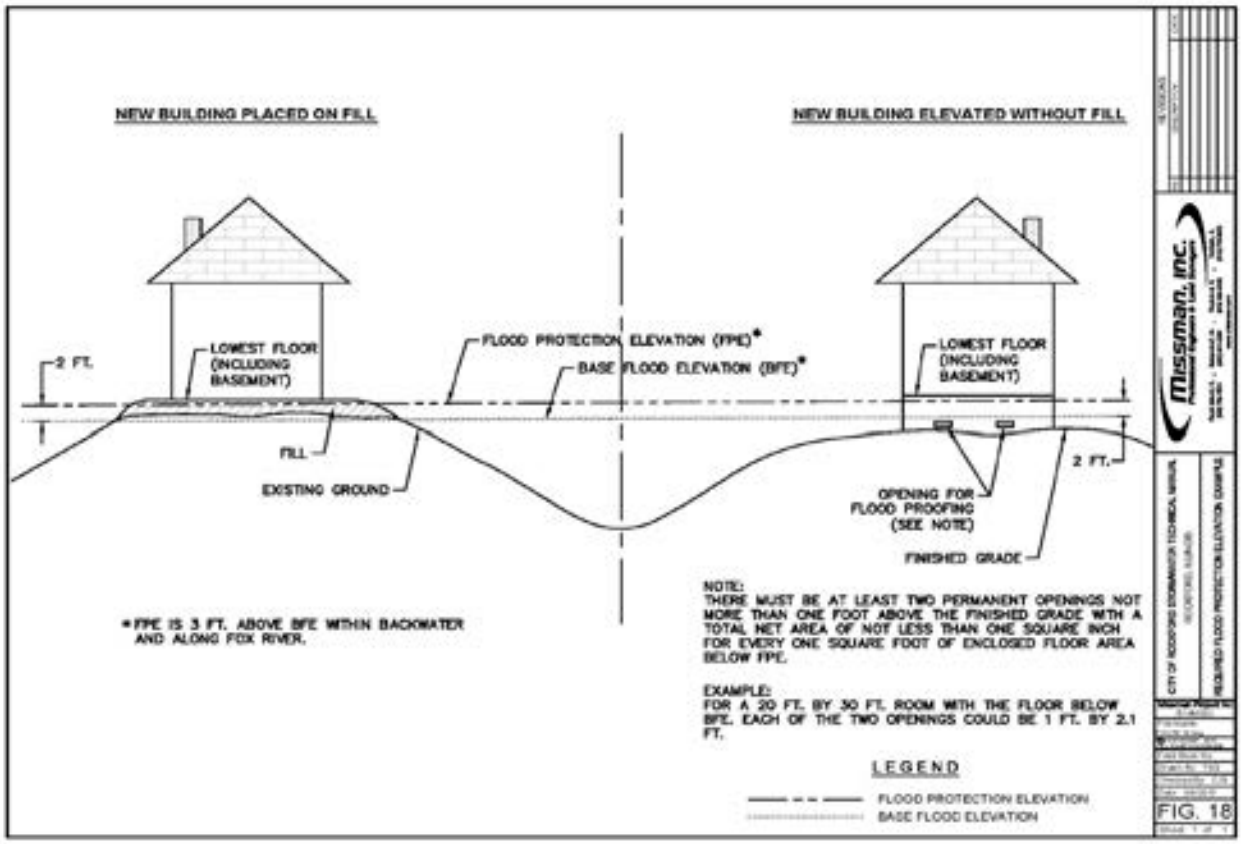
h) The garage or shed must be less than fifteen thousand dollars ($15,000) in market value or replacement cost whichever is greater or less than five hundred and seventy six (576) square feet (24'x24').

i) The structure shall be anchored to resist floatation and overturning.

j) All flammable or toxic materials (gasoline, paint, insecticides, fertilizers, etc.) shall be stored above the flood protection elevation.

k) The lowest floor elevation should be documented and the owner advised of the flood insurance implications.

FIGURE 10
Required Flood Protection Elevation



T4-08 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, and the accumulative repairs over the life does not exceed 50%. 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, § T407.

1. Lowest Opening

Proposed structures outside the Regulatory Floodplain shall be built with the lowest opening above the FPE.

2. Preventing Increased Flood Heights and Resulting Damages

No development in the floodplain shall create a threat to public health and safety.

a. Compensatory Storage.

(i) Whenever any portion of a floodplain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation.

(ii) The excavation volume shall be at least equal to ***1.5 times*** the volume of storage lost due to the fill or structure

(iii) In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied.

(iv) All floodplain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All floodplain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation.

(v) All such excavations shall be constructed to drain freely and openly to the watercourse.

Within any floodway identified on the countywide Flood Insurance Rate Map, and within all other floodplains where a floodway has not been delineated, the following standards shall apply:

b. The only development in a floodway which will be allowed are Appropriate Uses, which will not cause a rise in the base flood elevation, and which will not create

a damaging or potentially damaging increase in flood heights or velocity or be a threat to public health and safety and welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or permanently impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance. The approved Appropriate Uses are as follows:

(i) Flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding, erosion, or water quality or habitat for fish and wildlife.

(ii) Structures or facilities relating to the use of, or requiring access to, the water or shoreline, such as pumping and treatment facilities, and facilities and improvements related to recreational boating, commercial shipping and other functionally water dependent uses;

(iii) Storm and sanitary sewer relief outfalls;

(iv) Underground and overhead utilities;

(v) Recreational facilities such as playing fields and trail systems, including any related fencing (at least 50 percent open when viewed from any one direction) built parallel to the direction of flood flows, and including open air pavilions and toilet facilities (4 stall maximum) that will not block flood flows nor reduce floodway storage;

(vi) Detached garages, storage sheds, or other non-habitable accessory structures that will not block flood flows nor reduce floodway storage;

(vii) Bridges, culverts, roadways, sidewalks, railways, runways and taxiways and any modification thereto;

(viii) Parking lots built at or below existing grade where either:

A) The depth of flooding at the 100-year frequency flood event will not exceed 1.0 foot; or

B) The applicant of a short-term recreational use facility parking lot formally agrees to restrict access during overbank flooding events and accepts liability for all damage caused by vehicular access during all overbank flooding events.

(ix) Floodproofing activities to protect previously existing lawful structures including the construction of water tight window wells, elevating structures, or construction of floodwalls around residential, commercial or industrial principal structures where the outside toe of the floodwall shall be no more than ten (10) feet away from the exterior wall of the existing structure, and, which are not considered substantial improvements to the structure.

(x) The replacement, reconstruction, or repair of a damaged building, provided that the outside dimensions are not increased, and if the building

was damaged to fifty (50%) percent or more of the market value before the damage occurred, the building will be protected from flooding to the flood protection elevation.

Modifications to an existing building that would not increase the enclosed floor area of the building below the 100-year frequency flood elevation, and which will not block flood flows including but not limited to, fireplaces, bay windows, decks, patios, and second story additions. If the building is improved to fifty (50%) percent or more of the market value before the modification occurred (i.e., a substantial improvement), the building will be protected from flooding to the flood protection elevation.

Appropriate uses do not include the construction or placement of any new structures, fill, building additions, excavation or channel modifications done to accommodate otherwise non-appropriate uses in the floodway, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined above as an Appropriate Use.

c. Compensatory storage in noted in Article 4.09A shall apply.

d. Except as provided in Article 4.09B of this ordinance, no development shall be allowed which, acting in combination with existing and anticipated development will cause any increase in flood heights or velocities or threat to public health and safety. The following specific development activities shall be considered as meeting this requirement*:

(i) Bridge and culvert crossings of streams in rural areas meeting the conditions of the Illinois Department of Natural Resources, Office of Water Resources Statewide Permit Number 2:

(ii) Barge fleeting facilities meeting the conditions of IDNR/OWR Statewide Permit Number 3:

(iii) Aerial utility crossings meeting the conditions of IDNR/OWR Statewide Permit Number 4;

(iv) Minor boat docks meeting the following conditions of IDNR/OWR Statewide Permit Number 5:

(v) Minor, non-obstructive activities such as underground utility lines, light poles, sign posts, driveways, athletic fields, patios, playground equipment, minor storage buildings not exceeding 70 square feet and raising buildings on the same footprint which does not involve fill and any other activity meeting the conditions of IDNR/OWR Statewide Permit Number 6:

(vi) Outfall Structures and drainage ditch outlets meeting the following conditions of IDNR/OWR Statewide Permit Number 7:

(vii) Underground pipeline and utility crossings meeting the conditions of IDNR/OWR Statewide Permit Number 8:

(viii) Bank stabilization projects meeting the conditions of IDNR/OWR Statewide Permit Number 9:

(ix) Accessory structures and additions to existing residential buildings meeting the conditions of IDNR/OWR Statewide Permit Number 10:

(x) Minor maintenance dredging activities meeting the following conditions of IDNR/OWR Statewide Permit Number 11:

(xi) Bridge and culvert replacement structures and bridge widening meeting the following conditions of IDNR/OWR statewide Permit Number 12:

(xii) Temporary construction activities meeting the following conditions of IDNR/OWR statewide Permit Number 13:

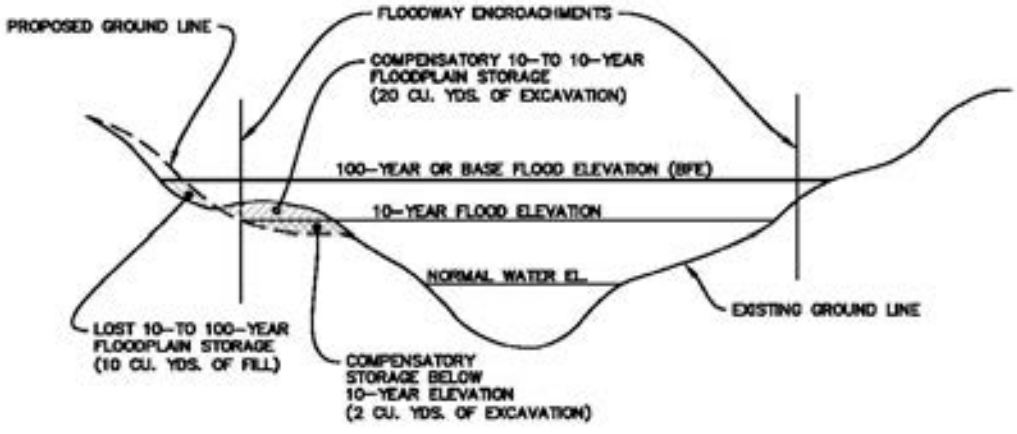
(xiii) Any Development determined by IDNR/OWR to be located entirely within a flood fringe area shall be exempt from State Floodway permit requirements.

e. Other development activities not listed in 10(B) may be permitted only if:

(i) Permit has been issued for the work by IDNR/OWR (or written documentation is provided that an IDNR/OWR permit is not required), or

(ii) Sufficient data has been provided to FEMA when necessary, and approval obtained from FEMA for a revision of the regulatory map and base flood elevation.

FIGURE 11
Compensatory Storage Example



COMPENSATORY STORAGE

Flood storage is measured between the normal water surface elevation and the BFE for a particular cross-section. The Ordinance defines hydraulically equivalent compen-satory 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 1:1, 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:

(i) 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.

(ii) 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.

(iii) The scale chosen should be large enough to show the intent of the proposed grading.

(iv) Cross-sections should reflect both the existing and proposed conditions on the same plot.

(v) 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.

(vi) 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:

(i) Planimetric Data for All Structures and Construction (Including Location and Dimensions);

(ii) All Property Lines:

(iii) Certified Elevation Data, Including Ground Contours at Intervals of 2 Feet or less;

(iv) Location of Drainage and Flood Control Easements; and

(v) Location and Orientation of Cross-Sections.

3. 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, § 4-11(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 included 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)], 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 8
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 Administrator.

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.

4. 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 shall locate all of the development outside the flood conveyance path and 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, § 411 to the entire floodplain, with the exception of the appropriate use requirements of Section 411.8.9. 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.

5. 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, § 401 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.

T4-10 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, locations, limits and area of all on-site wetlands.

This wetland delineation will follow the current federal guidance, which is conducted in

accordance with the standard methods sanctioned by the COE Corps of Engineers Wetland Delineation Manual (1987) and Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual; Midwest Region (2008). Wetland delineations under this section shall be valid for five years. 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. Winnebago County lies within the boundaries of the Rock Island District COE. Specific Information on the current delineation of wetlands may be obtained from the District.

U.S. Army Corps of Engineers
Rock Island District
ATTN: Regulatory Branch
Clock Tower Building
Post Office Box 2004
Rock Island, IL 61204-2004
Phone: 309-794-5057
Fax: 309-794-5190 or 5191

T4-10(a) Delineation Hierarchy

In addition to identifying the location, extent, and area of on-site wetlands, off-site wetlands must be evaluated to a distance of 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
4833 Owen Center Road
Rockford, IL 61101-6007
(815) 965-2392

T4-11 Mitigation to be Local

All wetland mitigation required under a Corps of Engineers §404 permit for wetland impacts must occur in Winnebago County. Every effort should be made to mitigate in the same watershed where the impacts occur.

T4-12 Threatened and Endangered Species Consultation

Prior to the issuance of a stormwater management permit or Building Permit, the applicant shall consult with the IDNR via utilizing their Ecological Compliance Assessment Tool (EcoCat) http://dnr.illinois.gov/EcoPublic/ with respect to the presence of threatened and endangered species. The applicant must obtain a statement of "consultation terminated" from the IDNR either by the EcoCat (immediate response) or by letter following IDNR review.

If COE 404 permitting is required, consultation with the U.S. Fish and Wildlife Service shall also be completed. The consultation process can be obtained at the following website:

http://www.fws.gov/midwest/Endangered /section7/s7process/index.html

Illinois Department of Natural Resources
524 S. Second Street
Springfield, IL 62701

The U.S. Fish and Wildlife Services may be contacted at the:

Rock Island Ecological Field Office
1511 47th Avenue
Moline, IL 61265
(309)_ 757-5800

T4-13 Wetland Preservation During Development

Jurisdictional wetland/stream areas that are not to be impacted by development shall be protected during all phases of construction activities by the best management practices available.

T4-14 Buffer Requirements

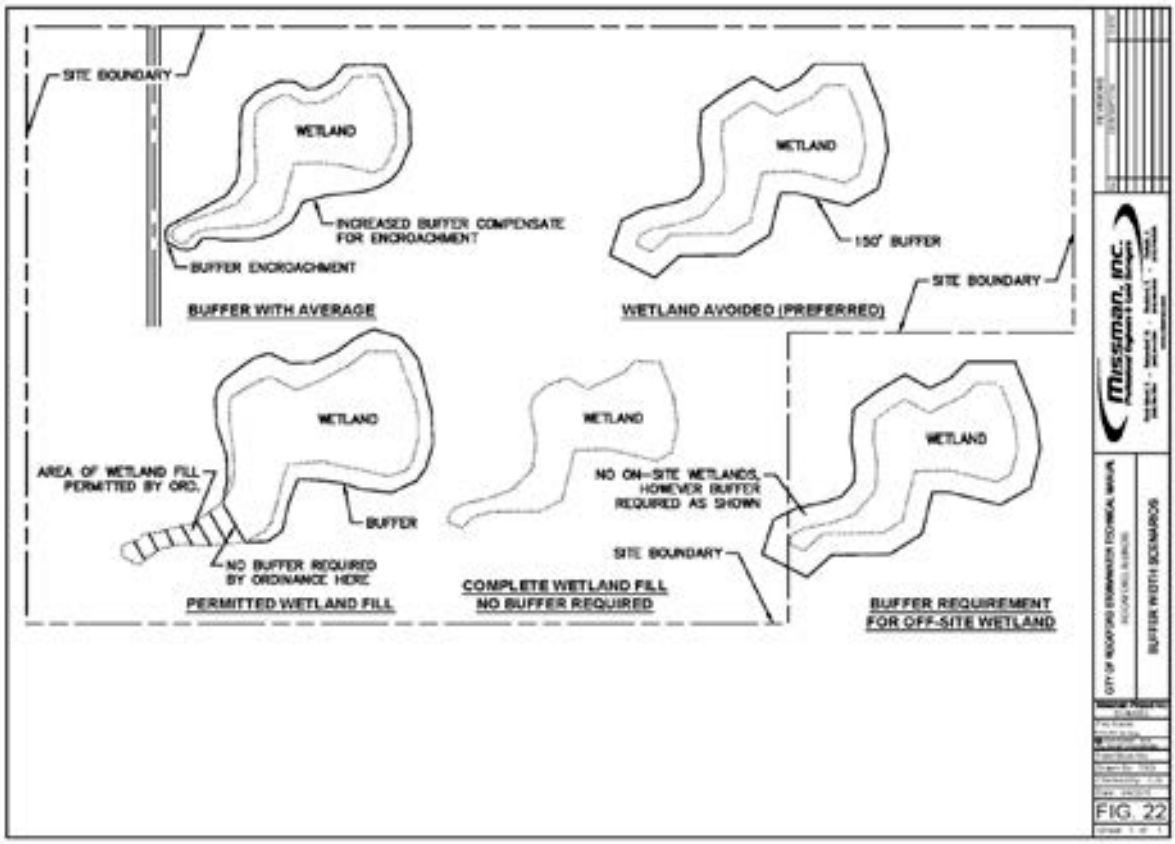
All buffer requirements shall be in accordance with all appropriate sections of Article 4-18 of the City of Rockford Stormwater Ordinance. Ordinance and COE requirements shall supercede all items discussed in the following article.

Buffers are defined as vegetated upland that serves a variety of functions including shoreline stabilization, sediment filtration, habitat, promotion of infiltration, and nutrient sequestration. 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.

T4-14(a) Plantings in Buffers

Native vegetation, particularly deep-rooted warm season grasses and prairie forbs, are required for seeding, re-seeding, or inter-planting buffers. Only native plants with local (Upper Midwest) provenance maybe used. Plant material selection information may also be found in the Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois prepared by USDA-N RCS.

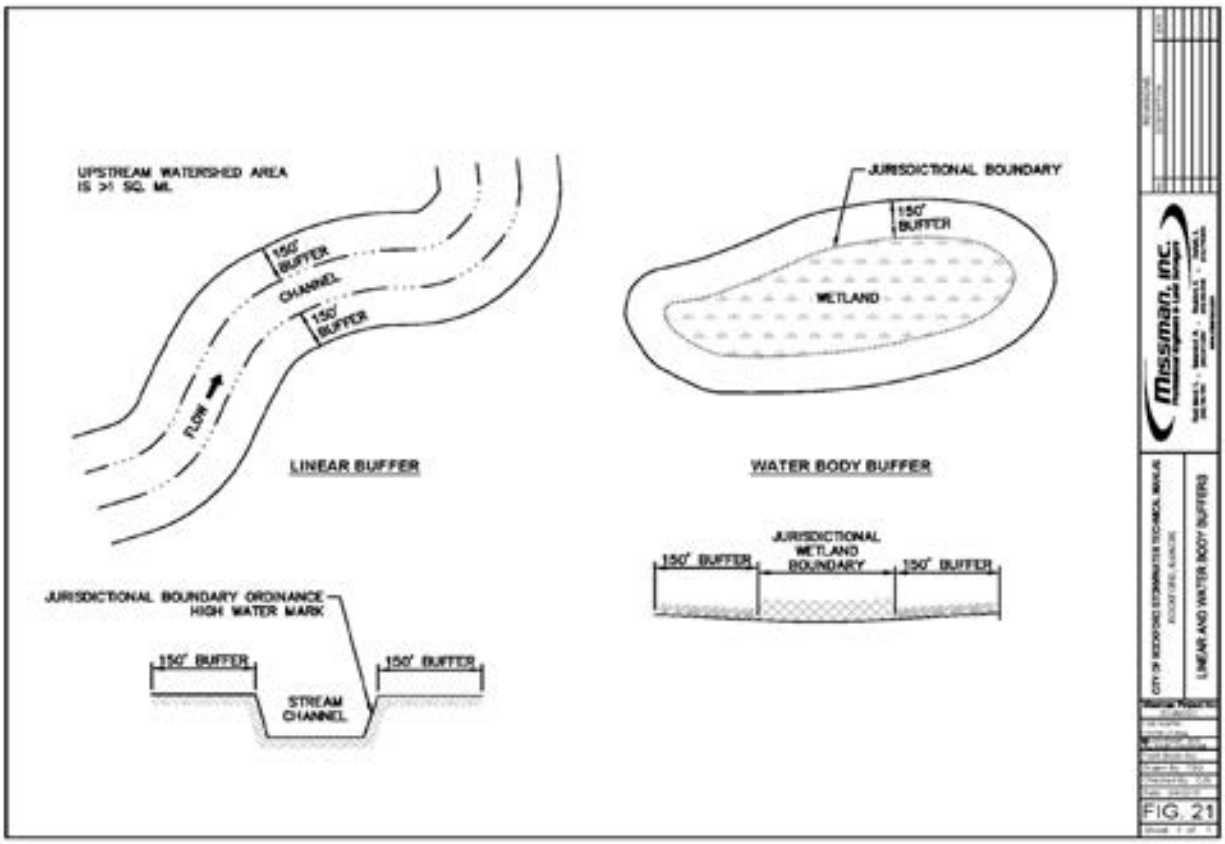
FIGURE 12
Buffer Width Scenarios



T4-14(b) Buffer Width Requirements

Two types of buffers are recognized: linear buffers and water body buffers (Figure 13).

FIGURE 13
Linear and Water Body Buffers

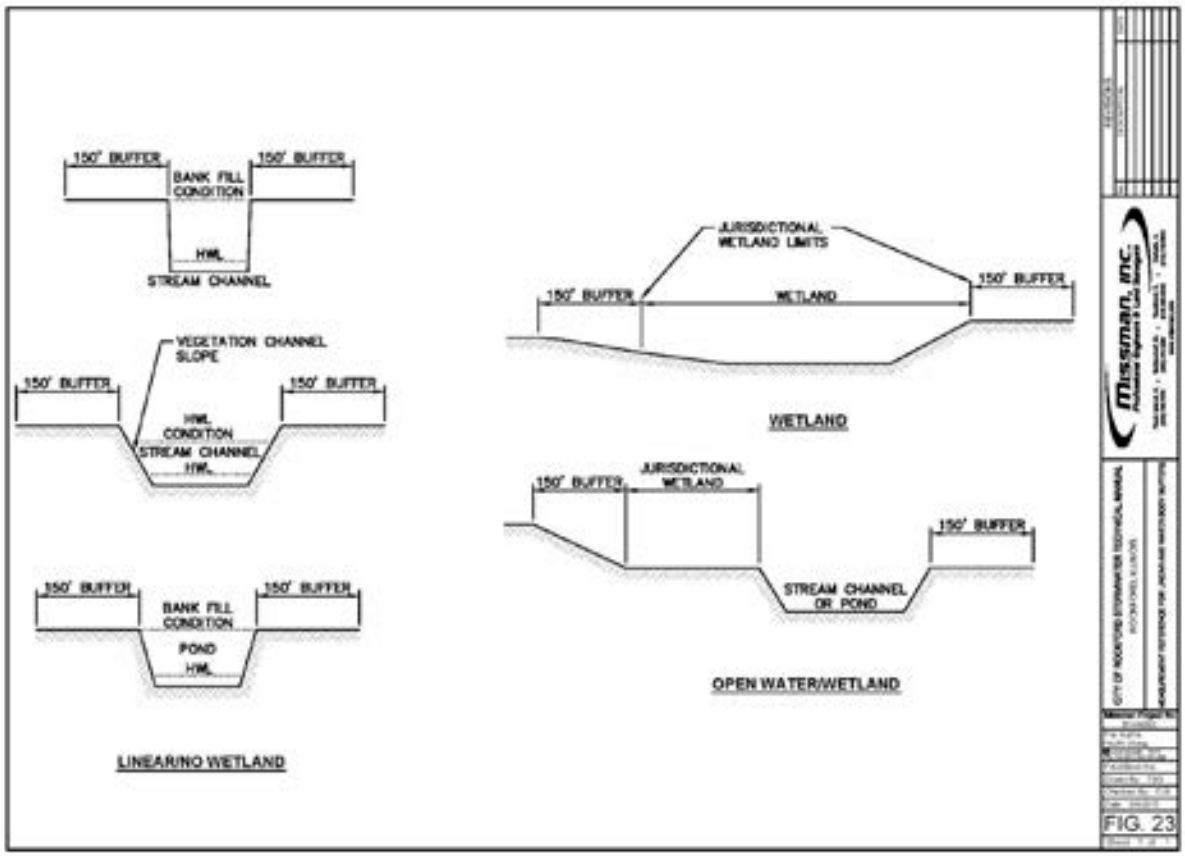


Buffer areas including the "Waters of the U.S." they protect shall be shown as easements on all newly platted lots and maintenance requirements for the buffer shall be recorded as a note against the deed. Buffer widths required are determined as part of the COE 404 permit. Jurisdictional “Waters of the U.S.”, including regulated wetlands, may not be considered buffer and shall not be encroached upon to create buffer.

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 14).

FIGURE 14
Measurement Reference for Linear and Water Body Buffers



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

As a general rule, linear buffer widths are 50 feet, if the drainage area is greater than 640 acres. For drainage areas less than 640 acres, 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.

Buffer protective measures include effective stabilization measures included in the “Illinois Urban Manual” or those approved by the Administrator.

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.

In both linear and water body buffers, buffer width averaging may be utilized. A conceptual buffer is illustrated in Figure 13 to show the ways in which buffer averaging may be applied.

T4-14(c) 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.

T4-14(d) Undetained Stormwater

Per Ordinance § 4-14(d), 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.

T4-14(e) Disturbance During Construction

Construction disturbance in buffer areas are prohibited. Disturbances include, but not limited to the following:

- Topsoil stockpiles
- Material stockpiles
- On-site equipment maintenance
- On-site equipment storage

ARTICLE 5 — STORMWATER MANAGEMENT
PERMIT SUBMITTAL REQUIREMENTS

T5-00 Stormwater Management and Other Permits Required

1. A stormwater management permit is required if—

   a) the development is located in the regulatory floodplain;

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

   c) there is any regulatory floodplain within the site; or

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

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

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

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

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.

T5-00(d) Professional Seals and Certification Required

A professional engineer shall certify a Stormwater Management Permit application by signing and sealing the application. By certifying 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 are 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 Winnebago County or City 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.

T5-01(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, 2015, the permit shall expire on December 31, 2018. If a permit is issued December 1, 2015 the permit shall expire on December 31, 2018.

T5-01(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.

T5-01(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.

T5-02 Required Submittals

The applicant shall refer to Table 5-02 in §502 of the Ordinance to determine the required permit submittal sections. All Stormwater Management Permit applications shall include an application and project overview, 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 the City of Rockford Stormwater Management Submittal and include the original forms with the required signatures in the bound application.

T5-02(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.

T5-03 Application and Project Overview

The applicant may obtain from the developer a letter authorizing the applicant to sign any documents related to the Stormwater Management Permit Applicaton. In such cases the signed letter by the developer shall be attached to the Stormwater Management Application. In completing parts (7) through (9) of §503(a), the sheet(s) addressing each part shall be attached to the application.

T5-04 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 Winnebago 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.

T5-05 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.

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 the City of Rockford, Illinois. The existing site conditions consist of farmed row crops. The Main project will consist of 40 acres of [1]4-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.

T5-06 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 Winnebago 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.

T5-07 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 15).

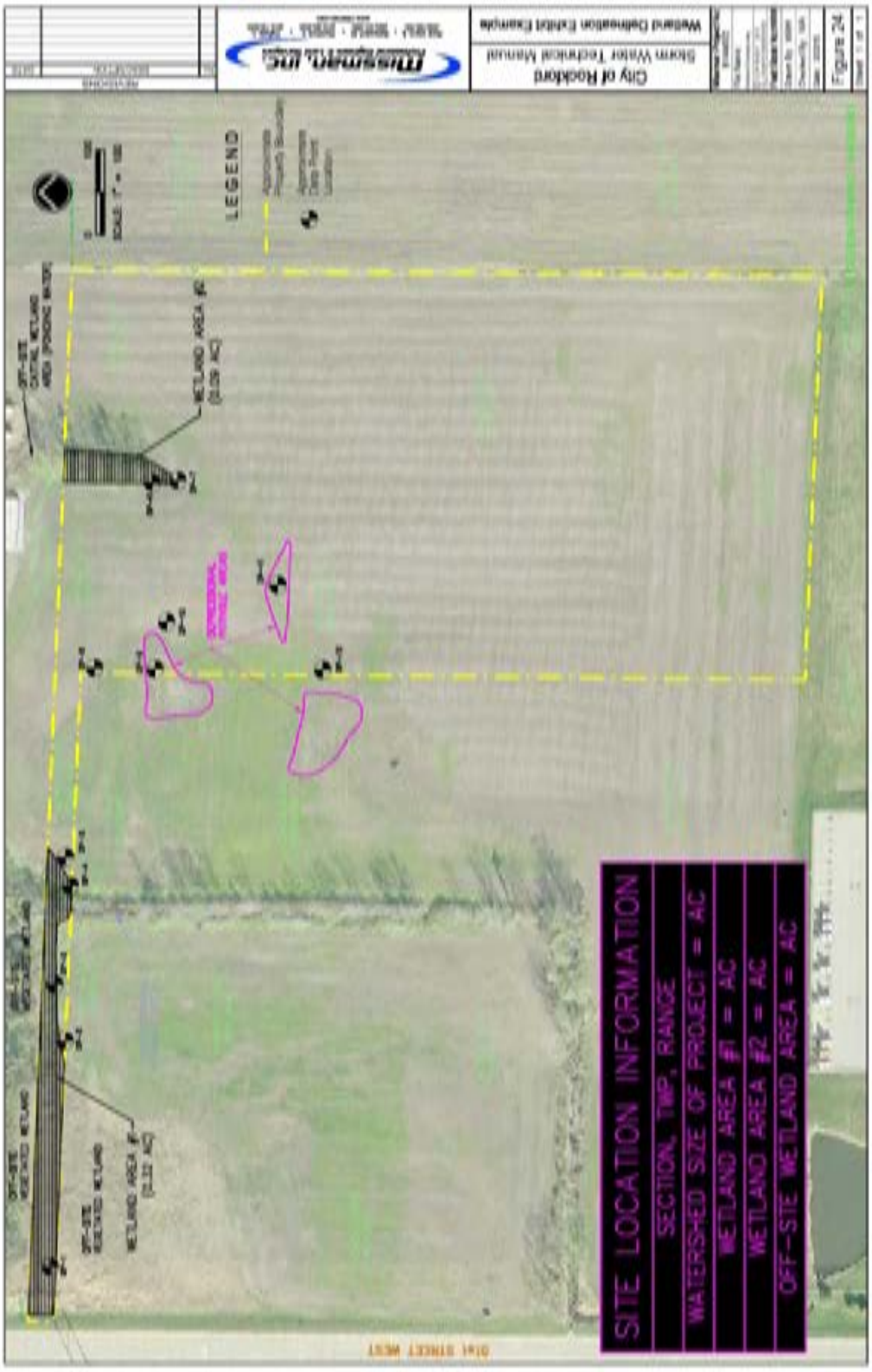
- All existing wetlands or waters on-site
- All existing off-site wetlands that lie all or in part within 50 ft. of the site boundary.

- 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 15
Wetland Delineation Example


City of Rockford
Storm Water Technical Manual
Wetland Delineation Exhibit Example
Figure 24
LEGEND
SITE LOCATION INFORMATION
SECTION, TWP, RANGE
WATERSHED SIZE OF PROJECT = AC
WETLAND AREA #1 = AC
WETLAND AREA #2 = AC
OFF-SITE WETLAND AREA = AC

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.

T6-00 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:

1. 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 require drainage improvements to eliminate them from reoccurring. All cover crop species must be non-persistent 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.

2. 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.

3. 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.

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.