# COOK COUNTY STORMWATER MANAGEMENT PLAN

## Draft July 10, 2014

*Protecting Our Water Environment*

*Metropolitan Water Reclamation District of Greater Chicago*

# COOK COUNTY STORMWATER MANAGEMENT PLAN ACKNOWLEDGEMENTS


The following individuals served on the Board of Commissioners of the Metropolitan Water Reclamation District of Greater Chicago during the development of the Cook County Stormwater Management Plan (CCSMP) and provided valuable information and recommendations:

Commissioners – 2005 – 2006

President Terrence J. O'Brien
Vice President Kathleen Therese Meany
Chair of Finance Gloria Alitto Majewski
Commissioner Frank Avila
Commissioner James C. Harris
Commissioner Barbara McGowan
Commissioner Cynthia Santos
Commissioner Patricia Young
Commissioner Harry "Bus" Yourell

The following individuals served on the Board of Commissioners of the Metropolitan Water Reclamation District of Greater Chicago at the time the CCSMP was adopted:

Commissioners – 2007

President Terrence J. O'Brien
Vice President Kathleen Therese Meany
Chair of Finance Gloria Alitto Majewski
Commissioner Frank Avila
Commissioner Patricia Horton
Commissioner Barbara McGowan
Commissioner Cynthia Santos
Commissioner Debra Shore
Commissioner Patricia Young

Commissioners – 2014

President Kathleen Therese Meany
Vice President Barbara McGowan
Chair of Finance Mariyana Spyropoulos
Commissioner Michael Alvarez
Commissioner Frank Avila
Commissioner Cynthia M. Santos
Commissioner Debra Shore
Commissioner Kari K. Steele
Commissioner Patrick D. Thompson

The District wishes to express its gratitude to the members of the Watershed Planning Councils (WPCs) of the North Branch of the Chicago River, Lower Des Plaines River, Cal-Sag Channel, Little Calumet River, Poplar Creek, and Upper Salt Creek for their participation in the development of the CCSMP and for their valuable information and recommendations. The District also wishes to thank the staffs of the Northwest Municipal Conference, the West Central Municipal Conference, the Southwest Conference of Mayors, and the South Suburban Mayors and Managers Association, who provided vital assistance coordinating the activities of the WPCs and communicating their concerns to the District.

Christopher B. Burke Engineering, Ltd (CBBEL) provided background information and drafted portions of the CCSMP. The following sub-consultants assisted CBBEL in their efforts:

1. D B Sterlin Consultants, Inc.
2. Molly O'Toole and Associates, Inc.

Chapter 6 of the CCSMP was authored by CH2M Hill with the assistance of the following sub-consultants:

1. David Mason & Associates of Illinois, Ltd.
2. MPR Engineering Corp., Inc.
3. Primera Engineers, Ltd.
4. Rubinos & Mesia Engineers, Inc.

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# PREAMBLE

The Illinois General Assembly enacted Public Act 93-1049 ("P.A. 93-1049") in 2004. P.A. 93-1049 placed countywide responsibility for stormwater management under the supervision of the Metropolitan Water Reclamation District of Greater Chicago (District). As described in the Cook County Stormwater Management Plan (CCSMP) adopted on February 15, 2007 by the District's Board of Commissioners, the District may plan, manage, implement, and finance activities related to stormwater management in Cook County. These activities previously authorized under P.A. 93-1049 and further defined in the CCSMP and now known as Phase I of the District's Stormwater Management Program, include the development of Detailed Watershed Plans (DWPs), and the implementation of stormwater projects intended to address critical erosion and/or overbank flooding along **regional** waterways.

Due to the large number of local stormwater problems identified during the District's DWP studies or reported by local agencies, the enabling legislation was amended to give the District the authority to participate in addressing local stormwater problems. On June 18, 2014, Governor Pat Quinn signed HB 3912 into law, becoming Public Act 98-0652 ("P.A. 98-0652"), which amends the District's statutory authority to allow for acquisition of flood-prone properties and to plan, implement, finance, and operate **local** stormwater management projects. This component of the District's Stormwater Management Program will be known as Phase II. Under Phase II, it is the District's intention to assist local units of government to address local flooding, however this should not be construed to mean the District is required to address any and all local issues associated with stormwater management.

The District routinely collects information related to local stormwater management problem areas and potential solutions from municipalities, townships, and regional agencies. The District may provide assistance for qualifying projects in the form of funding, engineering, or other means to be defined through negotiations between the District and the involved entities via Intergovernmental Agreements.

Additionally, based on the authority granted in P.A. 98-0652, the District will take steps to set up a program for purchasing flood prone and flood damaged property. The District will establish an application process and priority matrix prior to purchasing properties. Factors to be considered include the severity and frequency of flooding and whether any viable alternatives to acquisition are feasible.

The following is a summary of the proposed revisions to be made to the CCSMP to be consistent with the authority given by P.A. 98-0652.

**Chapter 1 - Authority, Purpose and Goals:**
References to P.A. 93-1049 will be revised to refer also to the recent amendments made via P.A. 98-0652. The project minimum requirements for both regional and local projects will be updated to clarify the types of projects that will be considered for implementation or assistance by the District. The types of projects that will be excluded from consideration are also provided.

**Chapter 2 - Existing Stormwater Management Framework and Resources:**
This chapter describes the stormwater management framework in Cook County prior to the passage of P.A. 93-1049. There are no changes proposed to Chapter 2.

**Chapter 3 - Assessment of Stormwater Management Activities and Programs in Cook County:**
A minor revision to Section 3.4 which compares the CCSMP goals to planning activities will be made to incorporate 'local' flooding problems along with regional flooding problems to be identified and investigated.

**Chapter 4 - Assessment of Stormwater Conditions and Problems:**
This chapter reviews the features and characteristics of Cook County as they relate to stormwater management. There are no changes proposed to Chapter 4.

**Chapter 5 - Countywide Stormwater Management Program:**
Additional language describing the potential for project cost-sharing opportunities between the District and municipalities or townships will be included in the discussion of funding mechanisms. The narrative describing Project Implementation will be revised to incorporate reference to Phase II projects and the acquisition of flood prone property.

**Chapter 6 - Watershed Planning:**
Chapter 6 describes the process for developing Detailed Watershed Plans. There are no changes proposed to this Chapter.

**Chapter 7 – Regulatory Concepts:**
This chapter discusses the regulatory concepts to be considered in development of the WMO. With the recent adoption of the WMO on May 1, 2014, there are no changes necessary to Chapter 7.

**Chapter 8 - Watershed Planning:**
Chapter 8 describes the four implementation phases of the CCSMP.
There are no changes proposed to this Chapter.

# EXECUTIVE SUMMARY

## Introduction

The Illinois General Assembly enacted Public Act 93-1049 (Act) in November of 2004. The Act allows for the creation of a comprehensive stormwater management program in Cook County. The Act places the responsibility for countywide stormwater management under the supervision of the Metropolitan Water Reclamation District of Greater Chicago (District). The Act requires the District to develop this Cook County Stormwater Management Plan (CCSMP). The CCSMP presents the framework of the stormwater management program, including its mission, goals, program elements and implementation phases.

Stormwater management in Cook County over the last 30 years has been a patchwork of efforts by local, regional, state and federal agencies. The adoption of the CCSMP and the implementation of the District's countywide stormwater management program afford Cook County the means to address a range of stormwater management issues through proper watershed regulations and watershed planning. Through the Watershed Planning Councils (WPCs) created in the Act, the District and Cook County communities can approach stormwater management through a single, countywide effort.

## Stormwater Management Authority

The Act provides the District with broad authority to plan, manage, implement, and finance activities relating to stormwater management throughout Cook County. The authority is applicable for all of Cook County and is not limited to the District's corporate boundaries. The District's role will include preparing and adopting by ordinance a countywide stormwater management plan. Some of the other authorities afforded to the District in the statute include:

- The authority to prescribe rules and regulations by ordinance for floodplain and stormwater management, for governing the location, width, course, and release rate of stormwater runoff channels, streams, and basins in Cook County.
- The use of fees to finance stormwater management activities outside the District's corporate boundaries, but within Cook County.
- The use of resources of other organizations and agencies, and ability to enter into agreements with other counties, organizations or agencies, for management of stormwater runoff.
- The District may assume responsibility for maintaining any stream within Cook County and has the authority to enter upon any land or water within the county to inspect stormwater facilities or to remove obstructions to a watercourse.

## Mission and Goals

The mission of the countywide stormwater management program is to provide Cook County with effective rules, regulations, and projects that will reduce the potential for stormwater damage to life, public health, safety, property and the environment. Nineteen stormwater management goals have been developed by the District for the CCSMP. The goals extend from protecting new and existing development from flooding to preventing the loss of water quality and habitat. The goals of the CCSMP are presented in Chapter 1.

## Watershed Planning Councils

The District has established planning councils for each of the major watersheds of Cook County which are listed below:

- North Branch Chicago River
- Lower Des Plaines Tributaries
- Calumet-Sag Channel
- Little Calumet River
- Poplar Creek
- Upper Salt Creek

The WPCs serve as advisory bodies to the District for the stormwater management program. Membership of WPCs includes the chief elected official, or his or her designee for municipalities and townships, and the Cook County Board President, or his or her designee for unincorporated areas.

In addition, the Act calls for the formation of a Combined Sewer Areas Stormwater Management Planning Council. Although the District has not yet formed the Combined Sewer Areas Stormwater Management Planning Council, a public hearing for the CCSMP was held for the Combined Sewer Areas in order to accommodate communities which are not members of the established WPCs for the aforementioned watersheds. Per the Act, municipalities with a population of 1,000,000 or more are exempt from the District's countywide program though they may opt-in through the execution of an intergovernmental agreement between the qualifying municipality and the District. The City of Chicago (City) encompasses a majority of the combined sewer area and is currently developing an intergovernmental agreement for inclusion in the District's program. The content of the intergovernmental agreement will define the City's role in the program. The formation of the Combined Sewer Areas Stormwater Management Planning Council will occur once the City's role is determined.

The WPCs will communicate the needs and interests of the members of the public and local governments to the District and advise the District on CCSMP matters that relate to their respective watersheds. The advisory role of the WPCs will be important during the preparation of watershed plans and in the development of the Watershed Management Ordinance (WMO).

The municipal conferences will assist the District in coordinating with the WPCs. The municipal conferences involved in the stormwater management program are the Northwest Municipal Conference, the West Central Municipal Conference, the Southwest Conference of Mayors, and the South Suburban Mayors and Managers Association.

## Cook County Stormwater Management Plan

The CCSMP presents the countywide stormwater management program and the implementation strategy. To develop the program, the CCSMP assesses current authorities and activities of local, regional, state and federal agencies. The assessments are examined with consideration of the stormwater management goals of the CCSMP. Additionally, using data collected from questionnaires completed by Cook County communities, current stormwater conditions and related problems are summarized. The stormwater goals in Chapter 1 and the assessments and evaluations, presented in Chapters 2, 3 and 4, form the basis for the countywide stormwater management program presented in Chapter 5.

The approach for watershed planning and the development of Detailed Watershed Plans (DWPs) and regulatory concepts for the preparation of the WMO are described in more detail in Chapters 6 and 7. Chapter 8 outlines the implementation of the countywide stormwater management program, which will be achieved through four phases that involve the development of program elements.

## Countywide Stormwater Management Program

The program will be implemented through six program elements: administration and management, regulation, maintenance, watershed planning, project implementation, and public information and education.

### Administration and Management

Several administration and management functions will support the countywide stormwater management program framework including staff training, technical support, and professional education. The administration and management functions will provide countywide coordination of the stormwater management program through the WPCs, identify funding mechanisms for stormwater activities, and develop and maintain a program budget.

### Regulation

The foundation of the regulatory program will be the WMO. The WMO will be developed by the District with input from the WPCs, and will establish countywide minimum standards for stormwater management. Concepts to be considered for the WMO encompass floodplain management, stormwater drainage and detention, wetland protection, stream habitat and riparian protection, soil erosion and sediment control, and water quality. In support of the WMO, a Technical Guidance Manual will be developed.

The District may establish a procedure for certifying municipalities in order to enforce certain aspects of the WMO. Certified communities would be required to adopt regulations at least as stringent as the WMO and demonstrate their qualifications. Some responsibilities may include permit review and enforcement within their jurisdiction.

**Maintenance**

Maintenance of stormwater infrastructure (reservoirs, detention basins, storm sewers and catch basins) and natural drainage systems (rivers, streams and channels) will be evaluated by the District. Appropriate maintenance and inspection recommendations will be developed for the protection of existing and new stormwater infrastructure. Mechanisms for implementing natural drainage system maintenance by the District, municipalities, townships, county, and drainage districts will be developed in coordination with the WPCs.

**Watershed Planning**

Detailed Watershed Plans (DWPs) will be developed throughout the county in coordination with the WPCs to assess the specific conditions and the needs of each watershed. The methodology for the development of DWPs is presented in Chapter 6. As DWPs are developed, the District will coordinate with the WPCs to implement the recommendations. DWP recommendations may include capital improvement projects, additional planning, and maintenance activities.

Watershed planning will be coordinated with floodplain and wetland mapping initiatives, with other planning efforts in the county, and with efforts in other counties.

**Project Implementation**

When DWPs are developed, the District will facilitate preventative and remedial projects to benefit both upstream and downstream interests. Projects will be identified based on watershed needs. Capital improvement projects will be prioritized on a countywide basis. Funding decisions will be made based on the minimum criteria presented in Chapter 1, the prioritization process described in Chapter 6, and the decisions of the Board of Commissioners. Implementation of the capital improvement program will be addressed annually and will depend on the budget, priorities, and the availability of federal and state funds.

**Public Information and Education**

A public information program will be developed to educate the public on the importance of watershed management. The public information program will communicate essential stormwater management topics to various target audiences.

## Cook County Stormwater Management Plan Adoption and Implementation

A draft version of the CCSMP was distributed to municipalities, townships and various agencies for review and comment during the public review period which began on August 7, 2006 and concluded on October 13, 2006. In addition, seven public hearings were conducted during the public review period. The District received 34 letters from various municipalities, municipal conferences, agencies, organizations, private citizens, and other stakeholders in addition to comments received during the public hearings. The total number of individual comments was in excess of 450. The District provided a written response to all of the letters received during the public comment period, and posted all questions and responses on the District's website for public review. The CCSMP has been revised to incorporate comments provided during the public review process which were germane to the CCSMP. Subsequently, the CCSMP was adopted by the District's Board of Commissioners on February 15, 2007. The implementation of the CCSMP and the countywide stormwater management program will follow the four phases that are presented in Chapter 8. The four phases are summarized as follows:

Phase 1: Preparation of the WMO, DWPs, and a public information program and implementation of the Capital Improvement Program (CIP) and the Small Stream Maintenance Program (SSMP).

Phase 2: Implementation of WMO, continued preparation of DWPs and administration of the CIP and SSMP, and development of maintenance program.

Phase 3: Implementation of DWP recommendations, maintenance program and continued administration of the CIP and SSMP.

Phase 4: Continued implementation of DWP recommendations and maintenance program, administration of CIP and SSMP, and implementation of public education programs.

The implementation phases will be done in coordination with WPCs. Efforts, such as implementation of watershed plans, will be done in coordination with the adjoining counties, and through combined efforts of state and federal agencies. The capital improvement program will be initiated after eligible projects have been evaluated and prioritized, and as funding resources become available.

## Summary

The CCSMP specifies the mission and the goals of stormwater management in Cook County, and presents the framework of the countywide stormwater management program. The implementation phases allow for the effective development and growth of the countywide stormwater management program. The focus of the stormwater management program is the development of proper watershed planning and effective regulations.

The adoption of the CCSMP and the establishment of the stormwater management program allow the District to begin funding consideration for capital improvement projects that will correct existing stormwater management problems and reduce the occurrence of future problems. With the development and implementation of the DWPs, the WMO, maintenance and public information programs, the District and the communities will have the ability to accomplish comprehensive countywide stormwater management.

# CHAPTER 1
# AUTHORITY, PURPOSE AND GOALS

## Acronyms used in Chapter 1:

| | |
|---|---|
| Act | Public Act 93-1049 |
| BMP | Best Management Practice |
| CCSMP | Cook County Stormwater Management Plan |
| City | City of Chicago |
| DWP | Detailed Watershed Plan |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| FEMA | Federal Emergency Management Agency |
| IDOT | Illinois Department of Transportation |
| NFIP | National Flood Insurance Program |
| NWMC | Northwest Municipal Conference |
| SSMMA | South Suburban Mayors and Managers Association |
| SWCM | Southwest Conference of Mayors |
| TARP | Tunnel and Reservoir Plan |
| WCMC | West Central Municipal Conference |
| WMO | Watershed Management Ordinance |
| WPC | Watershed Planning Council |

CHAPTER 1
# AUTHORITY, PURPOSE AND GOALS

## 1.1 Introduction

Cook County encompasses approximately 946 square miles in northeastern Illinois (Exhibit 1-1). Highly urbanized with over 5.3 million people, it is the second largest county by population in the United States and makes up 43.3 percent of the state's population (2000 U.S. Census). Stormwater management in Cook County has been the responsibility of local, regional, state and federal agencies which have had changing and evolving roles. Recognizing the need for a countywide approach, the Illinois General Assembly enacted Public Act 93-1049 (Chapter 70 of the Illinois Compiled Statutes, Section 2605/7h) in 2004. The statute places countywide responsibility for stormwater management under the supervision of the Metropolitan Water Reclamation District of Greater Chicago (District).

## 1.2 Organization of the Cook County Stormwater Management Plan

Although the Act provides the District with the authority to develop a countywide stormwater management program, the statute does not specify the content of the program. The District therefore has prepared this Cook County Stormwater Management Plan (CCSMP) to serve as a high level organizational plan wherein the framework for the countywide program is presented. The CCSMP also serves to identify the parameters of the program and its goals. The program will include a spectrum of elements and emphasize implementation of capital projects which will be identified through detailed watershed planning.

The CCSMP is comprised of eight chapters. A summary of each chapter is presented below:

- Chapter 1 describes the statutory authority for the countywide stormwater management program, the purpose of the CCSMP, the program's mission and goals, the role of the Watershed Planning Councils (WPCs), and the absolute minimum requirements for capital improvement projects.

- Chapter 2 describes the existing stormwater management framework in Cook County and the resources available for developing and implementing the countywide program. It describes agencies' authorities and their roles in stormwater management. A description of various ecosystem partnerships, non-profit organizations and volunteer groups is also included.

- Chapter 3 assesses the available stormwater management framework in Cook County to address the implementation needs presented in the CCSMP. A gap analysis based on the goals of this plan is presented to identify additional stormwater management program and activity needs.

- Chapter 4 summarizes and assesses the current stormwater conditions and stormwater related problems across Cook County.

- Chapter 5 presents the countywide stormwater management program for Cook County. The chapter covers the functional areas of administration and management, regulation, maintenance, watershed planning, project implementation, and public information. This chapter discusses the program elements that will be prepared under each of the functional areas.

- Chapter 6 details the watershed planning process that will identify, evaluate and present future stormwater projects. Technical requirements for the preparation of Detailed Watershed Plans (DWP) are set forth. The DWP requirements cover the use of existing or new data, hydrologic and hydraulic modeling, input from WPCs, benefit-to-cost analysis for alternative projects, and procedures for prioritizing capital improvement projects.

- Chapter 7 focuses on the future regulatory program. The regulatory program will include the development, implementation and enforcement of a countywide Watershed Management Ordinance (WMO). This chapter presents the stormwater management concepts that will be considered when preparing the WMO. These concepts relate to floodplain management, drainage and detention, wetlands and water quality. Concepts covering design alternatives for new development or redevelopment, sensitive sites, pollutant filtering, and Best Management Practices (BMPs) are also discussed. The language of this chapter is intentionally non-committal as the District intends to solicit input from the WPCs, various agencies and other stakeholders prior to deciding what will be regulated and to what extent.

- Chapter 8 describes the adoption of the CCSMP, the implementation phases, and the CCSMP amendment process. The chapter outlines the process and schedule for preparing the WMO and regulatory program.

## 1.3 Statutory Background

The Chicago metropolitan area experienced historic flooding in 1986 and 1987, which precipitated the enactment of Public Act 85-905 in 1987. Public Act 85-905 set forth responsibilities for countywide stormwater management in the five collar counties of Cook County (DuPage, Lake, Kane, McHenry, and Will). Under this statute, stormwater management planning committees could be formed and the preparation of countywide stormwater plans, programs, and projects could commence. To provide an equal balance of representation within the stormwater management planning committees, the act stipulated that the committees were to be comprised of equal numbers of municipal and county representatives. Countywide stormwater management planning committees are in place and stormwater management plans have been adopted under the authority granted in Public Act 85-905 for DuPage County in 1989, Lake County in 1990, McHenry County in 1996, Kane County in 1998, and Will County in 1998.

Public Act 86-1463, enacted in 1990, extended the stormwater planning authority into Cook County but did not provide an effective organizational framework or a funding mechanism. In 2004, the Public Act 93-1049 (Act) consolidated stormwater management in Cook County under the District's direction and provided a funding mechanism. The Act acknowledged the large number of municipalities in Cook County and the existing capability of the District by authorizing the District to provide program leadership with advice from the WPCs through the municipal conferences.

In 2014, Public Act 98-0652 was enacted to amend the District's authority to allow the District to acquire flood-prone properties and to plan, implement, finance, and operate local stormwater management projects where previously only regional projects were authorized.

## 1.4 Municipal Conferences and Watershed Planning Councils

The Act called for the formation of WPCs for the following six established watersheds of the Chicago Metropolitan area:

1. North Branch Chicago River
2. Lower Des Plaines Tributaries
3. Calumet-Sag Channel
4. Little Calumet River
5. Poplar Creek
6. Upper Salt Creek

The boundaries shown on Exhibit 1-1 delineate the geographical location of the six WPCs.

In addition, the Act calls for the formation of a Combined Sewer Areas Stormwater Management Planning Council. Although the District has not yet formed the Combined Sewer Areas Stormwater Management Planning Council, a public hearing for the CCSMP was held for the Combined Sewer Areas in order to accommodate communities which are not members of the established WPCs for the aforementioned watersheds. Per the Act, municipalities with a population of 1,000,000 or more are exempt from the District's countywide program though they may opt-in through the execution of an intergovernmental agreement between the qualifying municipality and the District. The City of Chicago (City) encompasses a majority of the combined sewer area and is currently developing an intergovernmental agreement for inclusion in the District's program. The content of the intergovernmental agreement will define the City's role in the program. The formation of the Combined Sewer Areas Stormwater Management Planning Council will occur once the City's role is determined.

The WPCs were formed after the passage of the Act to communicate to the District the needs and interests of the public and local governments within Cook County. Pursuant to the requirements of the Act, the WPC membership consists of the chief elected official or designee from each municipality and township within a specific watershed, as well as the Cook County Board President or designee for unincorporated areas.

The Act specifically calls for the WPCs to serve as advisory bodies to the District for the countywide stormwater management program. The WPCs will provide information to the

District on issues related to their respective watersheds during development of the DWPs. In addition, the District will give consideration to the recommendations and concerns of the WPCs during development of the WMO. Per the Act, the WPCs may recommend rules and regulations to the District governing the location, width, course, and release rates of all stormwater runoff channels, streams, and basins in their respective watersheds. The DWP process is described in Chapter 6 and potential parameters of the future regulatory program are described in Chapter 7.

The Act makes provisions for the municipal conferences to assist the District by coordinating the various WPCs. The following relationships have been established:

Northwest Municipal Conference (NWMC) to coordinate:
- Poplar Creek Watershed
- Upper Salt Creek Watershed
- Lower Des Plaines Tributaries Watershed (in cooperation with WCMC)
- North Branch Chicago River Watershed (in cooperation with WCMC)

West Central Municipal Conference (WCMC) to coordinate:
- Lower Des Plaines Tributaries Watershed (in cooperation with NWMC)
- North Branch Chicago River Watershed (in cooperation with NWMC)

Southwest Conference of Mayors (SWCM) to coordinate:
- Calumet-Sag Channel Watershed

South Suburban Mayors and Managers Association (SSMMA) to coordinate:
- Little Calumet River Watershed

## 1.5 History of Cook County Stormwater Management Plan Development

During legislative deliberations in 2004, the municipalities in Cook County and the District joined efforts to develop what is now Public Act 93-1049. Through the legislative agenda of the existing municipal conferences, the municipalities helped craft the advisory structure outlined in the stormwater management legislation and were instrumental in its 2004 passage. After enactment, the District and the municipalities, primarily through their municipal conferences, initiated the preparation of this document.

The District was selected as the lead agency because of its history of involvement in regional watershed planning, the extensive technical expertise of staff, and its successful implementation of large public works projects involving multiple units and levels of government. The District has worked with federal, state and local governments in the highly successful construction and operation of the Tunnel and Reservoir Plan (TARP) which has been effective in reducing pollution and flooding in the Chicagoland combined sewer area. In addition to TARP, the District has participated in the construction of more than 30 regional reservoirs for flood control purposes, for which the District has various inspection and maintenance roles. The District regularly works with municipal governments in the administration of ~~the District's Sewer Permit Ordinance.~~a regulatory program for sanitary sewer construction and sanitary sewer connections.

Throughout 2005, the District's Board of Commissioners, through the Committee on Flood Control, Drainage & Storm Flow, held study sessions during which the municipal conferences provided input on behalf of the WPCs. Organizational meetings for the WPCs were held in October of 2005. The six newly created WPCs each passed two resolutions formalizing the advisory relationship and appointing specific municipal conferences as the primary communication vehicle with the District, and establishing an executive committee for each WPC.

On January 19, 2006, the District's Board of Commissioners adopted a policy setting the absolute minimum requirements for capital improvement projects under the countywide stormwater management program. Prior to adoption, the absolute minimum requirements were discussed by the District's Board of Commissioners and questions were taken from representatives of the Councils of Government (COGs) and WPCs at a study session held on January 10, 2006. After the questions were answered by District staff, there were no objections to any of the proposed requirements, although one item was reworded for clarification. The requirements are listed in Section 1.9 of this chapter and document the District's intent to move quickly toward the construction of stormwater management and flood control projects.

Prepared in 2006, a draft version of the CCSMP was presented to the membership of the WPCs for review. In addition, 7 public hearings were held and a public comment period was provided from August 7, 2006 through October 13, 2006. The CCSMP was then adopted by the District's Board of Commissioners on February 15, 2007. On July 10, 2014, the District's Board of Commissioners amended the CCSMP to be consistent with P.A. 98-0652.

## 1.6 Stormwater Management Authority

The Act as amended prescribes requirements and procedures for the development of the countywide stormwater management program. Under the statute, the District has broad authority relating to stormwater management throughout Cook County. This authority is applicable to all of Cook County and is not limited to the District's corporate boundaries.

The Act affords the District additional new authorities and responsibilities, which include the following:

- May plan, manage, implement, and finance activities related to stormwater management in Cook County, in accordance with the adopted CCSMP.
- May use resources of other organizations and agencies, and may provide funding to those organizations on a contractual basis to perform activities related to stormwater management.
- May enter into agreements with other counties for management of stormwater runoff.

- May enter into agreements with units of local government in areas outside the District's corporate boundaries, but within Cook County, to provide stormwater management services.

- May impose fees on areas outside the District's corporate boundaries, but within Cook County.

- May assume responsibility for maintaining any stream within Cook County.

- May enter upon any land or water within the county to inspect stormwater facilities or to remove obstructions to a watercourse.

- May prescribe rules and regulations by ordinance:

  - For floodplain and stormwater management

  - For governing the location, width, course, and release rate of stormwater runoff channels, streams, and basins in Cook County

  These rules and regulations at a minimum shall meet the standards for:

  - Floodplain management established by the Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR)

  - Federal Emergency Management Agency (FEMA) for participation in the National Flood Insurance Program (NFIP)

- May petition the circuit court to dissolve existing drainage districts with stormwater management duties if determined to be in the best interest of the taxpayers of Cook County.

**District Responsibilities:**

- The District shall prepare and adopt by ordinance a countywide stormwater management plan for Cook County.

- The District shall annually report to the public on its activities and expenditures.

The District has taken the following steps towards implementing the Act:

- Levied taxes upon property within its corporate boundaries beginning in 2005 for the countywide stormwater management program.

- Established WPCs for the six established watersheds of Cook County, and given consideration to the recommendations and concerns of the WPCs since their inception.

- Held public hearings on the draft CCSMP and afforded interested persons an opportunity to be heard.

~~Upon adoption of the CCSMP, the District will implement the plan as outlined in Chapter 8 and will take further steps to assure consistency with the intent of the Act, including:~~

- ~~Coordinate the watershed plans with the adjoining counties so that recommended stormwater projects will not have significant adverse impact on the levels or flows of stormwater in the inter-county watersheds or on the capacity of existing and planned stormwater retention facilities.~~
- ~~Consider the rules and recommendations that the WPCs may relay to the District concerning the location, width, course, and release rates of all stormwater runoff channels, streams, and basins in their respective watersheds.~~
- Developed Detailed Watershed Plans for the Calumet-Sag Channel, Little Calumet River, Lower Des Plaines River, North Branch of the Chicago River, Poplar Creek, and Upper Salt Creek Watersheds in the spirit of Chapter 6 of this CCSMP.
- Adopted the Watershed Management Ordinance in the spirit of Chapter 7 of this CCSMP.

## 1.7 Mission and Purpose

The mission of the countywide stormwater management program is to provide Cook County with effective rules, regulations, and projects that will mitigate stormwater effects on public health, safety, property and the environment. The purpose of the CCSMP is to outline the approach for achieving the mission through the consolidation of stormwater management in Cook County under the leadership and general supervision of the District. The CCSMP provides program goals and outlines a plan for watershed management. The CCSMP will be supported by detailed watershed plans, regulations, technical manuals and appendices, and a capital improvement program.

## 1.8 Goals

The following goals have been established to support the mission of the countywide stormwater management program:

Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.

Goal B) Identify and remedy existing regional and local flooding problems to the extent feasible.

Goal C) Establish comprehensive basin plans within each watershed, which quantify, plan for and manage stormwater flows within and among the jurisdictions in those watersheds.

Goal D) Promote responsible land use practices in all areas of the watersheds of Cook County, particularly within floodplains and floodways.

Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal F) Require cooperation and consistency in stormwater management activities between the government entities having stormwater jurisdiction, and clearly define the roles and responsibilities of each entity.

Goal G) Coordinate with surrounding counties to ensure minimal negative impacts of inter-county stormwater runoff flows.

Goal H) Coordinate with watershed councils to provide for the short and long term maintenance of natural waterways, manmade drainageways, and stormwater management facilities in new and existing developments.

Goal I) Seek to maximize available revenue sources in undertaking comprehensive watershed planning and stormwater facility construction activities, thereby leveraging and reducing reliance on the stormwater funds raised by levy.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal K) Develop and maintain a comprehensive hydrologic, hydraulic, demographic and cartographic database using the best available and most appropriate technology to manage the stormwater, flood and water quality data needs of the program.

Goal L) Promote the awareness and understanding of stormwater management issues by the practitioner and the layperson through ongoing public information and education.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

Goal Q) Encourage the public to consider stormwater as a resource rather than as a nuisance.

Goal R) Manage and operate the program in an effective and cost-efficient manner.

Goal S) Be in compliance with all applicable state and federal laws.

## 1.9 Project Minimum Requirements

Just as the District intends to move quickly towards projects that correct existing flood problems and safeguard against potential ones in the future, the District is equally concerned with establishing exact and consistent standards. The CCSMP therefore establishes standards necessary for the preparation of DWPs, identifying stormwater management projects and developing a capital improvement program. The preparation of DWPs is described in Chapter 6. For identifying projects and developing capital improvement programs, the District's Board of Commissioners has established the absolute minimum project requirements provided below. The requirements will be used to review stormwater management projects in advance of the DWPs as well as during preparation of the DWPs.

All proposed project funding requests must meet these absolute minimum requirements:

**A. The project is consistent with the District's Stormwater Management Goals, the Countywide Stormwater Management Plan (CCSMP), and the District's watershed management plan for the watershed in which the project will be constructed. In the event that the District's goals, CCSMP, and watershed plan do not exist yet, the proposed project must have been previously approved by a federal or state government agency for funding under their program requirements.**

The Act, as amended by P.A. 98-0652 states that the "District may plan, implement, finance, and operate regional and local stormwater management projects in accordance with the adopted countywide stormwater management plan." The above absolute criterion ~~is~~was necessary to allow for the District to participate in projects prior to the completion and adoption of the CCSMP and the completion of the DWPs. Previous approval by other agencies, such as the U.S. Army Corps of Engineers and IDNR-OWR, indicates that a comprehensive study of the effects of the project on the watershed has been conducted. Furthermore, studies and approvals by these agencies help to ensure that the potential project is the most appropriate and cost effective solution to the problem in question.

**B. Benefiting communities are in compliance with the terms and conditions of all existing intergovernmental agreements with respect to stormwater management issues, and the project is legally consistent with all such agreements.**

Some communities may not be living up to their responsibilities regarding stormwater management issues as outlined in existing intergovernmental agreements with various agencies. Some of these agencies may include the District, Illinois Department of Transportation (IDOT), IDNR-OWR and the Cook County Highway Department. Examples of noncompliance include non-performance of required maintenance of waterways or stormwater management infrastructure or unauthorized modifications to stormwater management facility structures.

**C. The project is for the purpose of improved stormwater and watershed management and is not being pursued as a condition of compliance with any local regulation or requirement.**

Projects undertaken by the District will not be for the purpose of providing stormwater detention for new development or redevelopment. The developer, not the taxpayers of Cook County, shall incur the costs associated with the design and construction of stormwater management projects which are necessary for compliance with local ordinances or regulations, or state or federal requirements.

**D. The project does not serve, as its primary purpose, to accelerate development of floodplain and flood fringe areas. However, development of areas removed from the floodplain as a byproduct of an approved flood-damage reduction project will not be precluded.**

One purpose of flood control projects will be to reduce flood damage to existing structures which are located within floodplain or flood fringe areas. However, flood control projects will not be undertaken to remove undeveloped areas from the floodplain solely for the purpose of new development. The cost for removal of an area from the floodplain for the purpose of new development should be the burden of the developer and not the taxpayers of Cook County.

**E. The project does not increase the risk of flooding or erosion to downstream or upstream areas.**

The basis of this criterion comes from the Act. The Act states that "recommended stormwater projects will have no significant adverse impact on the levels or flows of stormwater in the inter-county watershed." Simply put, one community cannot benefit at the expense of another community, either downstream or upstream. Finally, according to IDNR-OWR regulations (Title 17, Chapter 1, Part 3700, “Construction in Floodways of Rivers, Lakes and Streams), IDNR-OWR will not issue a permit for a project where "flood damages or potential flood damages outside the project right-of-way due to increases in flood heights or velocities" occur.

**F. The project ~~is~~may be a regional project or a local project, which are defined as follows:**

~~F.~~ **Regional projects** address problems related to streambank erosion or overbank flooding along regional waterways that ~~**affects**~~traverse multiple jurisdictions~~.~~ ~~**Multiple**~~, or problems affecting one or more jurisdictions ~~**shall be affected in at least one of the following ways:**~~

1. ~~**The problem being addressed by the project affects multiple jurisdictions or**~~ where the source of the ~~**problem**~~critical erosion or overbank flooding arises from other jurisdictions.

~~**1. The project may be a localized part of a solution to a regional problem that has been identified in an approved watershed plan.**~~

~~The District's intent in solving multi-jurisdictional problems is to address problems that cannot be solved by local governments because the issue involves other agencies, such as other municipalities, over which the municipality experiencing problems has no control.~~

~~The Act states that the "District may plan, implement, finance and operate regional stormwater management projects in accordance with the adopted countywide stormwater management plan."~~

~~Although used multiple times in the legislation, the term regional is not defined. The District's interpretation of the legislation is that funding for projects should be based on what is best for the county on a countywide or regional basis and not as a solution to local problems.~~

~~1A. A problem will be designated as "local" if the project and all of its benefits are located in a single community. A "local" problem will not qualify for funding under the countywide stormwater management program and will need to be addressed by the local jurisdiction.~~

~~1B. A project will be considered as "regional" if it benefits multiple jurisdictions.~~

~~1C. A project located in one community and benefiting another will be considered as "regional."~~

~~2. A scenario could arise where a creek causes flooding in three communities. The watershed plan may yield two alternatives to relieve these communities of flooding. One alternative may be a single reservoir while the other alternative may suggest two smaller reservoirs. Based on costs, it may be necessary to construct the two smaller reservoirs. It is possible that one of the smaller reservoirs is located in a community where the only benefit is for that particular community. However, since the problem was determined to be regional, the smaller reservoir would be considered as a "localized part of a solution to a regional problem."~~

2. **Local projects** address drainage problems not necessarily associated with streambank erosion or overbank flooding along regional waterways, and may include green infrastructure, detention storage, upsizing critical storm sewers and culverts, pump stations, and establishing drainage ways .

   a. Local projects are not intended to include projects unrelated to stormwater management, projects involving maintenance or replacement of flood damaged facilities or property, or isolated nuisance flooding. Also excluded from consideration for District assistance are projects that are specifically intended to provide improved infrastructure for planned or future development, and upsizing of local storm sewer systems in their entirety.

   b. Local projects are also not intended to include projects for addressing issues associated with deficient private and public sanitary sewer systems.

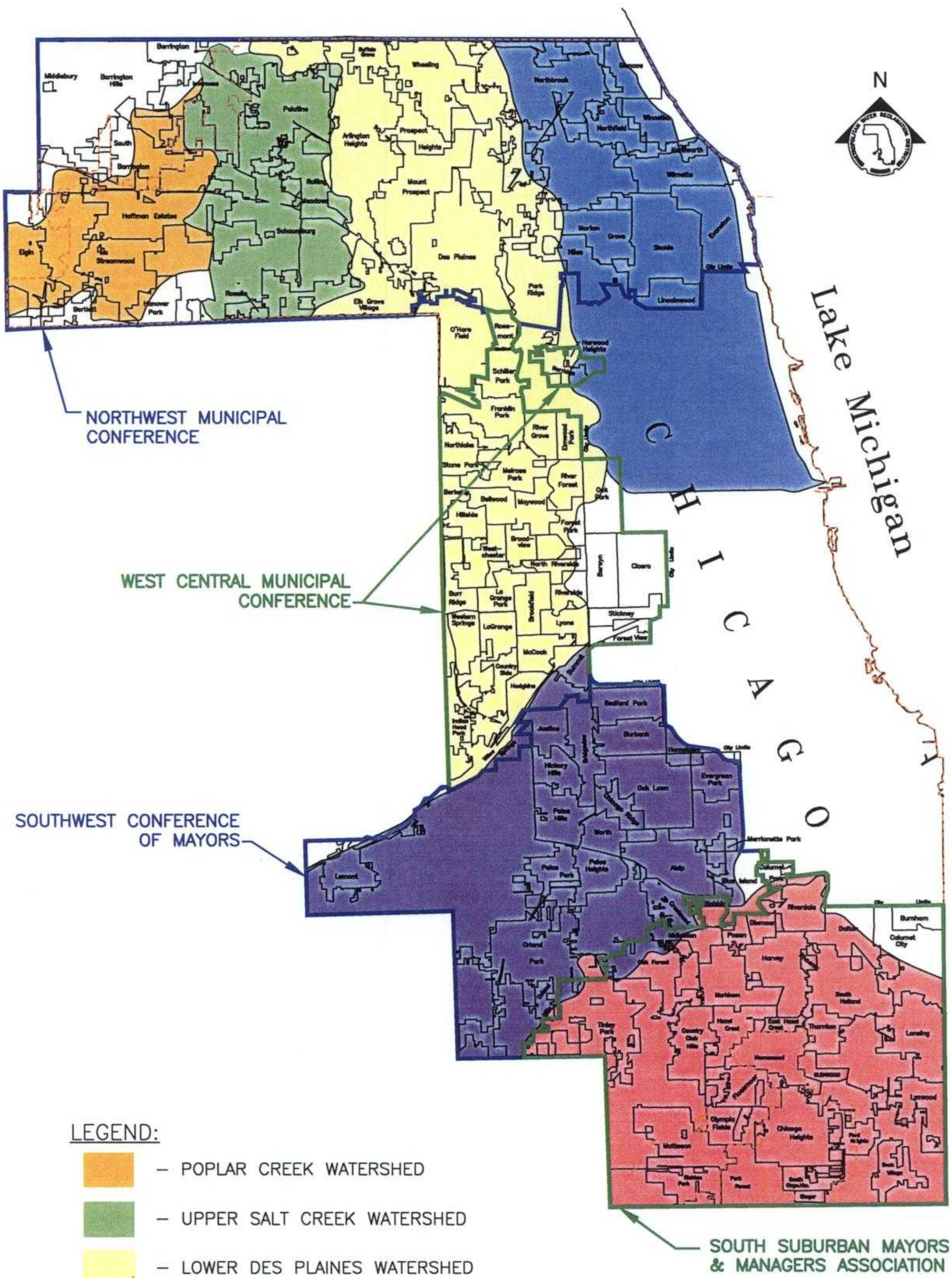
G. **Benefiting municipalities ~~must be participants in good standing~~participating in the National Flood Insurance Program must be in good standing.**

A community located in a FEMA designated special flood hazard area must be in "good standing" in order to receive funding from IDNR for any projects. Communities are audited by IDNR on behalf of FEMA to ensure compliance with the NFIP. The “good standing” status demonstrates that communities are making sincere efforts to reduce flood damages by enforcing FEMA regulations within their jurisdictions.

## 1.10 Summary

The District has the authority to develop and implement a countywide stormwater management program to reduce the potential for stormwater damage to life, public heath, safety, property and the environment in Cook County. The CCSMP outlines the countywide stormwater management program, based on the purpose, goals, and absolute minimum project criteria presented in this chapter. The following chapters summarize the current status of stormwater management in Cook County and detail the stormwater management program elements. Major components of the CCSMP and the stormwater management program include the development of the DWPs, the countywide WMO, and the capital improvement program to address existing and potential stormwater management problems.

# BOUNDARIES OF THE COUNCILS OF GOVERNMENT AND WATERSHEDS




LEGEND:

- POPLAR CREEK WATERSHED
- UPPER SALT CREEK WATERSHED
- LOWER DES PLAINES WATERSHED
- NORTH BRANCH WATERSHED
- CALUMET SAG CHANNEL WATERSHED
- LITTLE CALUMET RIVER WATERSHED

EXHIBIT 1–1

NOTE: COMBINED SEWER AREA NOT SHOWN.

## CHAPTER 2

# EXISTING STORMWATER MANAGEMENT FRAMEWORK AND RESOURCES

## Acronyms used in Chapter 2:

| | |
|---|---|
| Act | Public Act 93-1049 |
| BMP | Best Management Practice |
| CCDBZ | Cook County Department of Building and Zoning |
| CCHD | Cook County Highway Department |
| CMAP | Chicago Metropolitan Agency for Planning |
| CNT | Center for Neighborhood Technology |
| DWP | Detailed Watershed Plan |
| ELPC | Environmental Law and Policy Center |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| FPDCC | Forest Preserve District of Cook County |
| IDNR-OAEG | Illinois Department of Natural Resources – Office of Architecture, Engineering, and Grants |
| IDNR-ORC | Illinois Department of Natural Resources – Office of Resource Conservation |
| IDNR-OREP | Illinois Department of Natural Resources – Office of Realty and Environmental Planning |
| IDNR-OSRA | Illinois Department of Natural Resources – Office of Scientific Research and Analysis |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| IDNR-SWS | Illinois Department of Natural Resources - State Water Survey |
| IDOT | Illinois Department of Transportation |
| IEMA | Illinois Emergency Management Agency |
| IEPA | Illinois Environmental Protection Agency |
| NFIP | National Flood Insurance Program |
| NRCS | Natural Resources Conservation Service |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | National Park Service |
| NWMC | Northwest Municipal Conference |
| SSMMA | South Suburban Mayors and Managers Association |
| SSMP | Small Stream Maintenance Program |
| SWCD | Soil and Water Conservation District |
| SWCM | Southwest Conference of Mayors |
| TARP | Tunnel and Reservoir Plan |
| USACE | United States Army Corps of Engineers |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WCMC | West Central Municipal Conference |
| WMO | Watershed Management Ordinance |

# CHAPTER 2
# EXISTING STORMWATER MANAGEMENT FRAMEWORK AND RESOURCES

## 2.1 Introduction

This chapter describes the stormwater management framework in Cook County prior to the passage of Public Act 93-1049 (Act). Presented within the chapter is a review of the role and the authority of municipalities and various agencies, along with information on various ecosystem partnerships, non-profit organizations and volunteer groups. The institutional components of the stormwater management programs are also summarized. The information in this chapter will be combined with the assessment of current stormwater management activities in Chapter 3 to identify inconsistencies and gaps in the present system.

## 2.2 Functional Framework

The framework that supports stormwater management is categorized into four activities or functions:

- Administration and Management
- Regulation
- Planning
- Maintenance

**Administration and Management:** Various administrative and management activities support the operation and governing of stormwater management programs: program development, budgeting, identification of funding sources, and management of technical staff. Supporting these basic program management activities are items such as technical assistance, public information outreach, maintenance of a stormwater database, and disaster assistance activities.

**Regulation:** The regulatory element is comprised of a permit program, consisting typically of permit review, inspection, enforcement, and guidance. It includes coordination with other regulatory entities.

**Planning:** This function involves stormwater management and capital improvement planning activities. Watershed planning has two basic purposes. One purpose is to develop recommendations to remediate existing flooding and other water resource, environmental, or water quality problems. A strategy is then prepared to implement the recommendations. The second purpose is to identify strategies and provide the tools to prevent increased flooding and degradation of watershed resources. Additional information concerning the components of a comprehensive watershed plan is provided in Chapter 6. Capital improvement planning is included in this element.

**Maintenance:** Maintenance activities involve the upkeep of property and equipment related to constructed stormwater facilities and preserving the natural functions of streams, lakes and wetlands. Stormwater facility maintenance includes cleaning debris from detention ponds, drainage systems, catch basins and storm sewers. Inspections, regular upkeep and repair of facilities maintain system performance. Maintenance and management of the natural drainage system typically requires inspecting and removing debris from streams, and protecting streambanks from erosion. More intensive activities focus on stream corridor vegetative management and restoration as well as preventing excessive stream bed erosion and deposition.

## 2.3 Local Agency Roles and Resources

Each of the local agencies and organizations listed below is discussed in general terms based on its activities and how they fit into the four functional categories.

### 2.3.1 Municipalities

Many municipalities in Cook County are involved in stormwater management within their own corporate boundaries. A discussion of specific activities and regulations within these local authorities is in Chapter 3.

> Administration and Management – Many municipalities have primary responsibility for stormwater management and administration within their jurisdiction and operate independently of neighboring jurisdictions.
>
> Regulation – Many municipalities have adopted various forms of stormwater and floodplain regulations, soil erosion and sediment control standards, as well as regulations for protecting wetland and aquatic environments and habitat. They are not required to do so by state or federal regulations. Only floodplain regulations must be enforced to participate in the National Flood Insurance Program (NFIP).
>
> Planning – Most stormwater planning within a municipality is performed by the municipality itself or completed under its direction. Planning assistance on larger waterways may be initiated by state and federal agencies. Capital improvement projects that address local drainage problems are typically implemented by municipalities.
>
> Maintenance – Maintenance of stormwater infrastructure within municipal boundaries is commonly the responsibility of the municipality. Many municipalities have public works departments to maintain their stormwater infrastructure on a regularly scheduled basis.

### 2.3.2 Townships

Many townships in Cook County are involved in stormwater management within their own corporate boundaries.

> Administration and Management – Townships are not responsible for administration of stormwater programs.

Regulation – Townships do not have regulatory authority for stormwater management.

Planning – Townships are not typically involved in stormwater or watershed planning.

Maintenance – Many townships include highway departments which are responsible for maintaining their stormwater infrastructure, which generally consists of sewer and drainage piping as well as detention basins.

### 2.3.3 Metropolitan Water Reclamation District of Greater Chicago

The primary responsibility of the District is to keep sewage pollution out of Lake Michigan, the area's primary drinking water supply, and to treat sewage to avoid contamination of the Chicago, Des Plaines and Illinois Rivers. In the area of stormwater management, the District regulates stormwater discharge from development and participates in flood control activities.

Administration and Management – The District operates and maintains its flood control and wastewater facilities, programs and budget.

Regulation – The District developed the Sewer Permit Ordinance to protect public health, the District's infrastructure, and the water environment by regulating construction and operation of local sewers and treatment facilities. Among stormwater-related provisions, the ordinance regulates the release rate of stormwater runoff from site development by requiring detention in separate sewer areas. In addition, the rate of runoff from a site after development cannot exceed the release rate of the site in its pre-developed condition. In separate sewer areas, the ordinance provides for the prevention of stormwater inflow and groundwater infiltration into sanitary sewer systems.

Planning – The District designed and constructed the Tunnel and Reservoir Plan (TARP) to address combined sewer overflow within the District's corporate boundaries. The District is also involved in various federal and state flood control projects as a planning team member and/or as a local sponsor.

Maintenance – The District inspects 32 flood control facilities semi-annually within Cook County and shares responsibilities for a portion of these flood control facilities with communities, park districts and other agencies. Prior to the implementation of the District's Small Stream Maintenance Program (SSMP), the District also maintained certain reaches of waterways and streams located in Cook County. Further information on the SSMP can be found in Section 5.4.

### 2.3.4 Park Districts

Park districts are significant property owners in Cook County. Historically, park districts have been concerned with providing active recreational facilities. More recently, some park districts have become involved in owning and managing detention basins and natural areas, such as wetlands and lakes, for passive recreation.

Administration and Management – Park districts are not responsible for administration of stormwater programs. Some districts sponsor environmental education programs that educate the public on the many values of stream corridors, wetlands and other natural areas.

Regulation – Park districts do not have regulatory authority for stormwater management.

Planning – Park districts are not typically involved in stormwater or watershed planning.

Maintenance – Some park districts are responsible for detention facilities. Typically the maintenance is limited to mowing and other landscape activities. Park districts are responsible for maintaining culverts, ditches, lakes, streams and wetlands that pass through their property.

### 2.3.5 Drainage Districts

Drainage districts are public or municipal corporations formed for the purpose of constructing, maintaining and repairing drains, ditches, levees, and pumps to improve land for agricultural, sanitary, or mining purposes. To meet the needs of agricultural landowners, the state legislature in 1879 passed the Levee Act and the Farm Drainage Act and in 1956 passed the Illinois Drainage Code (70 ILCS 605/1-1 *et seq*.). Drainage districts are charged with specific governmental functions and, if necessary, may acquire land rights by eminent domain.

Administration and Management – Drainage districts are administered by commissioners, elected or appointed by the circuit court. The commissioners are charged with keeping drainage systems in operation and under good repair. Drainage district corporate funds may be used to repair, maintain, operate, and improve drains, ditches, levees and pumps. To construct new drains, ditches, levees and pumps, circuit court approval is necessary.

Regulation – Drainage districts do not have regulatory authority for stormwater management.

Planning – Drainage districts are primarily charged with maintaining the drainageways and facilities that have been constructed and only plan new projects as needed. Drainage districts have the ability to tax within their district to fund activities. Planning activities are limited at this time.

Maintenance – Drainage districts are involved in maintaining infrastructure including drain tiles and drainage ditches.

### 2.3.6 Cook County Highway Department

The Cook County Highway Department (CCHD) is responsible for the planning and design of major and minor roadways in Cook County. The CCHD also reviews engineering plans within the floodplain for compliance with the Floodplain Ordinance for unincorporated Cook County.

Administration and Management – The CCHD is not involved in the administration and management of stormwater activities, except for its own drainage needs related to highway construction.

Regulation – The CCHD reviews engineering plans within unincorporated Cook County for compliance with the Floodplain Ordinance of Cook County on behalf of the Cook County Department of Building and Zoning (CCDBZ). The CCHD regulates activities that affect its own rights-of-way.

Planning – The CCHD's role in stormwater or watershed planning is limited to highway drainage from and onto its rights-of-way. The CCHD has historically served as the representative for Cook County for several water resources related projects such as the United States Army Corps of Engineers (USACE) Des Plaines River Phase 2 project.

Maintenance – The CCHD is responsible for maintaining all county highway drainage systems.

### 2.3.7 Cook County Department of Building and Zoning

The CCDBZ is responsible for reviewing plans and issuing permits for developing or redeveloping all buildings and structures within designated single family, multi-family, commercial, industrial and public zoned districts of unincorporated Cook County.

Administration and Management – The CCDBZ is responsible for the administration and management of the Floodplain Ordinance of Cook County, Illinois, in unincorporated Cook County.

Regulation – The CCHD reviews engineering plans for conformance with floodplain regulations within unincorporated Cook County for the CCDBZ.

Planning – The CCDBZ does not conduct planning for stormwater management.

Maintenance – The CCDBZ does not have stormwater infrastructure maintenance responsibilities.

### 2.3.8 Forest Preserve District of Cook County

The Forest Preserve District of Cook County (FPDCC) acquires and manages land containing one or more natural forests for the purposes of protecting native habitat, educating the public on the environment, and providing recreation to the public. The FPDCC owns and manages a large percentage of the floodplains located along several rivers in Cook County.

Administration and Management – The FPDCC is not responsible for the administration of stormwater programs. The FPDCC actively educates the public on the value of native forested lands and how to protect forest environment and habitat.

Regulation – The FPDCC does not have stormwater regulatory authority.

Planning – The FPDCC is involved in land acquisition and recreational capital improvement projects of forested lands. The FPDCC's role in watershed planning and stormwater management is limited. As a major landowner in Cook

County of over 67,000 acres, the FPDCC is a participant in several watershed advisory committees, such as the Butterfield Creek Steering Committee.

Maintenance – The FPDCC is responsible for maintenance within the forest preserves of Cook County.

### 2.3.9 Soil and Water Conservation Districts

Cook County has two Soil and Water Conservation Districts (SWCDs); the North Cook County SWCD and the Will-South Cook SWCD. The purpose of the SWCDs is to provide information, education and guidance on the conservation and wise use of natural resources.

Administration and Management – The SWCDs provide technical assistance relating to soil and water to both rural and urban communities.

Regulations – The SWCDs have no specific stormwater regulatory authority. The USACE has executed intergovernmental agreements with the SWCDs to review erosion and sediment control plans for construction projects. The USACE can withhold permits until the appropriate SWCD approves a project's erosion protection. The SWCDs are charged with assisting individual communities and governments in maintaining farmlands, and protecting wetlands, lakes and rivers from damage caused by point and non-point source pollution, flooding, erosion and sediments. The SWCDs also advise and assist the Illinois Environmental Protection Agency (IEPA) with National Pollutant Discharge Elimination System (NPDES) construction violations.

Planning – The SWCDs assist local, state and federal government agencies in planning conservation programs such as streambank stabilization, habitat restoration, erosion control projects and other such capital improvement projects.

Maintenance – The SWCDs do not perform maintenance activities but do provide technical assistance and historical drainage data for maintaining drainage systems in urban and rural areas.

### 2.3.10 Property and Homeowner Associations

Many homeowner associations are responsible for maintaining stormwater facilities within their subdivisions.

Administration and Management – Homeowner associations are not responsible for administration of stormwater programs.

Regulations – Homeowner associations have no stormwater regulatory authority. In some subdivisions, developers have placed covenants on individual lots for maintaining drainage paths, roadside swales, drainage easements or native vegetation within and adjacent to wetlands, streams and detention basins.

Planning – Homeowner associations are typically not involved in regional watershed planning activities.

Maintenance – Homeowner associations are often responsible for maintaining their stormwater infrastructure, which generally consists of detention basins.

## 2.4 Regional Agency Roles and Resources

Each of the regional agencies and organizations listed below is discussed in general terms based on its activities and how they fit into the four functional categories.

### 2.4.1 Municipal Conferences

Municipal conferences in Cook County were developed to serve the needs of local governments when addressing regional issues. Through combining the resources of the municipalities within a geographical area, the conferences advise and advocate common policy initiatives, programs and services. The four municipal conferences within Cook County are Northwest Municipal Conference (NWMC), West Central Municipal Conference (WCMC), Southwest Conference of Mayors (SWCM), and South Suburban Mayors and Mangers Association (SSMMA).

Administration and Management – The municipal conferences are not responsible for the administration of stormwater programs. They do offer advisory input to agencies responsible for stormwater management.

Regulations – The municipal conferences do not have stormwater regulatory authority, but do have an advisory role with respect to regulations.

Planning – The municipal conferences offer input to the agencies responsible for stormwater planning within their region, but they do not directly plan stormwater activities and projects.

Maintenance – The municipal conferences are not responsible for the maintenance of stormwater infrastructure.

### 2.4.2 Chicago Metropolitan Agency for Planning

The Chicago Metropolitan Agency for Planning (CMAP), formerly known as the Northeastern Illinois Planning Commission, is the regional planning agency for the six-county Chicago metropolitan area. CMAP is involved with research, planning and policy development and review, and local government technical support.

Administration and Management – CMAP is not responsible for the administration of stormwater management within Cook County. CMAP has provided technical assistance and training opportunities to local governments to assist them in carrying out these activities. Some of the training activities CMAP co-sponsors include courses and workshops in design and implementation of stormwater Best Management Practices (BMPs), soil erosion and sediment control, wetland management and hydrologic computer modeling.

Regulation – CMAP does not have regulatory authority over stormwater management. As an advisory agency for local governments, CMAP has developed model ordinances that reflect its policies for stormwater detention, floodplain protection, wetlands and stream protection, and soil erosion and sediment control. CMAP encourages municipalities and counties interested in these types of environmental management to adopt these ordinances. The agency provides technical assistance to local governments in interpreting and meeting the standards of the model ordinances.

Planning – CMAP has historically performed watershed planning, including developing the area wide Water Quality Management Plan for all of the major watersheds in northeastern Illinois under Section 208 of the Clean Water Act. CMAP assists local governments in developing watershed planning.

Maintenance – CMAP is not responsible for maintaining stormwater infrastructure. With local governments, CMAP has coordinated stream and shoreline maintenance and stabilization activities, including demonstrations of their BMPs.

## 2.5 State Agency Roles and Resources

Each of the state agencies and organizations listed below is discussed in general terms based on its activities and how they fit into the four functional categories.

### 2.5.1 Illinois Department of Natural Resources – Office of Water Resources

The Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) is the state agency responsible for structural and non-structural flood control. The structural program comprises the study, design and construction of capital projects; the non-structural program regulates all construction within the floodways of the rivers, lakes and streams of the state. Public Act 93-1049 states that the Cook County stormwater management program must be consistent, at a minimum, with IDNR-OWR regulations.

Administration and Management – IDNR-OWR is the administrator and sponsor of many flood control projects within Cook County. IDNR-OWR sponsors training activities.

Regulation – IDNR-OWR's regulatory authority for floodplain construction is limited to designated public waters, floodways on streams, or in drainage areas greater than one square mile where no floodway has been defined. IDNR-OWR has jurisdiction within the floodplain of a watercourse with a drainage area of at least one square mile in urban areas or at least ten square miles in rural areas. This authority includes reviewing all state permits for construction activity in floodways in northeastern Illinois. IDNR-OWR also regulates the construction, operation, and maintenance of dams.

The state delegates certain aspects of its program to municipalities and counties that have ordinances containing the minimum state standards. IDNR-OWR, along with CMAP, developed a model floodplain management ordinance for communities to adopt that meets the minimum requirements of the NFIP and the state's floodplain and floodway regulations. IDNR-OWR provides advice and technical assistance to local permit review officials.

IDNR-OWR coordinates the NFIP in Illinois. In this role IDNR-OWR meets with and inspects communities throughout the state to ensure that local floodplain regulations, as adopted for NFIP participation, are being properly enforced. IDNR-OWR also coordinates the development of regulatory floodplain mapping and approval of stream discharges used for regulatory programs. In addition, IDNR-OWR's nonstructural mitigation programs purchase and remove structures which repeatedly incur damages from flooding.

Planning – At the request of local governments, IDNR-OWR performs flood control studies to identify overbank flooding problems, analyze alternative solutions and determine the economic feasibility of those alternative solutions. While plans developed by IDNR-OWR focus on structural flood control measures, non-structural flood mitigation alternatives are also considered.

When the benefits of a proposed flood control project exceed the cost, IDNR-OWR may provide full construction funding for the most cost effective alternative. Local sponsors, generally the municipalities that benefit from the project, must furnish utility relocations, easements and rights-of-way required for the project. Local sponsors must also operate and maintain the completed project in perpetuity. For projects where the benefits do not exceed the costs, IDNR-OWR can provide funds for capital improvements up to an amount equal to the capitalized benefits of the project. IDNR-OWR generally performs the Benefit-to-Cost analysis for flood control projects in-house. IDNR-OWR participates in the funding of projects recommended in local plans which meet state criteria for economic efficiency.

IDNR-OWR provides other funding assistance. The small-projects program is used to address local drainage problems and can fund flood related improvements up to $100,000. A less rigorous quantification of benefits is allowed under this program. Its flood mitigation program provides funds for the acquisition of flood-prone structures and flood mitigation planning.

IDNR-OWR is involved in assisting the Federal Emergency Management Agency (FEMA) with the Map Modernization Program for Cook County, as explained further in Section 2.6.2.

Maintenance – IDNR-OWR provides limited technical and financial assistance for stream and channel maintenance on a case-by-case basis, as resources are available. IDNR-OWR owns and maintains stream gauges throughout Illinois. Numerous stream gauges maintained by the United States Geological Survey (USGS) are jointly funded by IDNR-OWR.

### 2.5.2 Illinois Department of Natural Resources – State Water Survey

The Illinois Department of Natural Resources – State Water Survey (IDNR-SWS) is the primary agency responsible for keeping records of the state's water and atmospheric resources. These records include the flood data repository, which houses copies of hydrologic and hydraulic models from IDNR-OWR, rain gauge information, and an extensive mapping collection.

Administration and Management – The IDNR-SWS is not involved in the administration and management of stormwater programs in Cook County.

Regulation – The IDNR-SWS has no regulatory authority in stormwater programs.

Planning – The IDNR-SWS manages research centers that gather and maintain scientific data resources used in watershed planning. The IDNR-SWS is also involved in planning activities for the FEMA Map Modernization Program and acts as IDNR's map production contractor under the Cooperating Technical Partners agreement with FEMA.

Maintenance – The IDNR-SWS is not responsible for maintenance related to stormwater management.

### 2.5.3 Illinois Department of Natural Resources – Office of Realty and Environmental Planning

The Illinois Department of Natural Resources - Office of Realty and Environmental Planning (IDNR-OREP) is responsible for the protection of the State's natural resources and outdoor recreation planning. The following four divisions comprise the IDNR-OREP: Division of Ecosystems, Division of Planning, Division of Realty, and Division of Resource Review and Coordination.

Administration and Management – The IDNR-OREP is not involved in the administration and management of stormwater programs in Cook County.

Regulation – The Division of Resource Review and Coordination is responsible for administering the Endangered Species Protection Act, Interagency Wetlands Policy Act, and the Illinois Natural Areas Preservation Act. The Division of Resource Review and Coordination acts as the primary point of contact for establishing an official Department environmental position on internal and external projects, permits, and plans related to construction, development or other activities that may result in a change in existing environmental conditions.

Section 404 of the Clean Water Act permit applications for the "discharge of dredged or fill material into waters of the United States" are reviewed by the Permit Review Program which is under the Division of Resource Review and Coordination.

Planning – The Division of Planning is responsible for a variety of outdoor recreation and natural resource planning, program development and management, and policy formulation activities, including greenways corridor planning. This Division is comprised of the Greenways and Trails Section and the Site Planning Section. The Greenways and Trails Section promotes greenways, trails and water trails and encourages information-sharing. The Site Planning Section includes the following activities for sites such as State Park and Fish and Wildlife Areas: site plans; capital project planning, review and coordination; land reviews; site trails planning; special studies and reports; and technical assistance.

The Division of Ecosystems is responsible for administering the Conservation 2000 Grant Program. This program is voluntary and provides financial and technical support to groups of individuals, both public and private, which seek to monitor, maintain, enhance, and restore biological diversity and the ecological condition within the watersheds of the State. Section 2.7 provides further information regarding the Ecosystem Partnerships involved in the Ecosystem Program.

Maintenance – The IDNR-OREP is not responsible for maintenance related to stormwater management.

### 2.5.4 Illinois Department of Natural Resources – Office of Resource Conservation

The Illinois Department of Natural Resources – Office of Resource Conservation (IDNR-ORC) responsibilities include the preservation and enhancement of natural resources in Illinois and management of state parks. The IDNR-ORC works with a variety of public and private agencies involved in the protection of natural resources within the State.

Administration and Management – The IDNR-ORC is not involved in the administration and management of stormwater programs in Cook County.

Regulation – The IDNR-ORC does not have regulatory authority relating to stormwater management.

Planning – The Division of Fisheries, which is under the IDNR-ORC, performs fish surveys as part of their basin survey and biannual sampling programs. The Division of Fisheries also provides technical assistance to the Ecosystem Partnerships.

Maintenance – Maintenance activities are limited to stream management activities for IDNR properties.

### 2.5.5 Illinois Department of Natural Resources – Office of Architecture, Engineering and Grants

The Illinois Department of Natural Resources – Office of Architecture, Engineering and Grants (IDNR-OAEG) manages, coordinates and executes IDNR's capital program, either through construction projects or through grants to local government entities.

Administration and Management – The IDNR-OAEG is not involved in the administration and management of stormwater programs in Cook County.

Regulation – The IDNR-OAEG does not have regulatory authority relating to stormwater management.

Planning – The IDNR-OAEG administers state and federal open space programs. The State's program is entitled Open Space Lands Acquisition and Development and the corresponding federal program is entitled Land and Water Conservation Fund. These programs provide funding assistance to local government agencies for open space acquisition. Funding assistance of up to 50% of the approved project costs may be obtained. The funds may be utilized to assist in the purchase and enhancement of significant wetland, depressional storage, and flooplain areas that are important to the management of stormwater. The IDNR-OAEG works closely with the IDNR-OREP Division of Planning in reviewing and selecting open space grants.

Maintenance – The IDNR-OAEG is not responsible for maintenance related to stormwater management.

### 2.5.6 Illinois Department of Natural Resources – Office of Scientific Research and Analysis

The Illinois Department of Natural Resources – Office of Scientific Research and Analysis (IDNR-OSRA) conducts research, provides information, and formulates policy related to the State's natural resources.

Administration and Management – The IDNR-OSRA is not involved in the administration and management of stormwater programs in Cook County.

Regulation – The IDNR-OSRA does not have regulatory authority relating to stormwater management.

Planning – The IDNR-OSRA provides research and technical assistance for projects involving natural resources.

Maintenance – The IDNR-OSRA is not responsible for maintenance related to stormwater management.

### 2.5.7 Illinois Environmental Protection Agency

The Illinois Environmental Protection Agency (IEPA) is responsible for safeguarding environmental quality, consistent with the social and economic welfare of the state, for protecting health, welfare, property and the quality of life.

Administration and Management – IEPA may provide grants to local agencies to fund administrative and management activities for stormwater management. The IEPA, with funding support from the United States Environmental Protection Agency (USEPA), has partially funded a course curriculum to educate designers and permit reviewers in applying stormwater BMPs on urban development sites, as well as distributed public education materials.

Regulation – IEPA is the state regulatory agency that oversees water quality and issues NPDES permits under Section 402p of the Clean Water Act. The Clean Water Act Amendments of 1987 established the NPDES stormwater program. The act called for implementation in two phases. Phase I applied to construction projects larger than 5 acres and municipal storm sewer systems. Phase II began in 1999, and applies to Phase I regulated sites, as well as construction sites that disturb one acre or more. These sites are required to be covered under the NPDES general permit that approves stormwater discharges from construction site activities.

In conjunction with the USACE's responsibilities for issuing permits for wetlands, IEPA makes determinations regarding water quality impacts due to wetland disturbances and issues Water Quality Certification under Section 401 of the Clean Water Act.

Planning – IEPA collects water quality and biological data on streams and lakes throughout the state. The data are reported in the biannual Illinois Water Quality Report, which documents the level to which water bodies are supporting their designated uses (such as swimming, aquatic life). IEPA also maintains the Illinois Water Quality Management Plan, which offers recommendations for stormwater, soil erosion and sediment control, and stream and wetland best management practices (BMPs). Additionally, the IEPA maintains the Illinois Water Quality Management Plan that offers recommendations for stormwater, soil erosion and sediment control, and stream and wetland BMPs.

IEPA also provides grants annually for implementation of nonpoint source control plans and demonstration projects. These projects can include BMPs to curtail urban runoff as well as instream activities to reduce erosion, sedimentation, and degradation of water quality, as detailed in Section 319 of the Clean Water Act. Activities such as ordinance implementation and workshops on stormwater BMPs have also been funded by the IEPA.

IEPA Illinois Clean Lakes Program provides annual grants for lake remediation projects where there is a realistic opportunity for restoration and protection for high quality lakes. IEPA encourages a watershed approach in addressing lake remediation and protection.

Maintenance – IEPA is not directly involved in maintaining stormwater infrastructure. IEPA does have grants available for local governments to assist in stream maintenance that addresses water quality.

### 2.5.8 Illinois Emergency Management Agency

The Illinois Emergency Management Agency (IEMA) is responsible for response and recovery activities for emergencies within the state. IEMA is responsible for hazard mitigation planning at the state and local levels, and for pre-disaster and post-disaster mitigation projects.

Administration and Management – IEMA coordinates the efforts of the Interagency Mitigation Advisory Group that includes all state and federal agencies involved in mitigation funding. The group monitors disaster recovery and mitigation activities, and allocates state and federal mitigation funds. The Interagency Mitigation Advisory Group is most active following a presidential disaster declaration.

Regulation – IEMA has no stormwater regulatory authority and is not involved in regulatory issues.

Planning – IEMA administers hazard mitigation programs in Illinois for FEMA. Three IEMA grant programs relate to stormwater and floodplain planning: the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program. These programs require the development and adoption of a local hazard mitigation plan approved by IEMA and FEMA before project funds can be granted. Projects must have benefits that exceed the cost to be eligible for funding. The IEMA grant programs provide 75% funding with a required 25% (non-federal) match of cash and in-kind services.

Funding for the Hazard Mitigation Grant Program is initiated by a presidential disaster declaration. Eligible projects include the acquisition, relocation, or elevation of flood-prone structures. The Flood Mitigation Assistance Program provides pre-flood grants to prepare and implement hazard mitigation plans. Communities must participate in the NFIP to be eligible for these grants. Funds are allocated to IEMA each year and can vary based on the federal funds allocated. The Pre-Disaster Mitigation Program is similar to the Flood Mitigation Assistance Grant Program, but extends beyond flooding to fund mitigation projects for all types of natural hazards. Grant applications are made to IEMA. IEMA then submits them to FEMA, and all applicants compete on a nationwide basis for available funding.

Maintenance – IEMA is not involved in maintenance activities.

### 2.5.9 Illinois Department of Transportation

The Illinois Department of Transportation (IDOT) is responsible for planning, building and maintaining the state's highway system. It is involved in drainage issues on projects related to stream crossings and drainage of roadways.

Administration and Management – IDOT is not involved in the administration and management of stormwater programs in Cook County, other than its own drainage needs.

Regulation – IDOT has regulatory authority over construction activities that may affect its drainage system. The authority allows IDOT to review drainage plans to determine whether there is a diversion or increase of runoff onto IDOT rights-of-way.

Planning – IDOT is not involved in stormwater or watershed planning activities, other than activities related to its own drainage systems.

Maintenance – IDOT is responsible for maintaining the drainage system within its rights-of-way, including bridges and culverts.

### 2.5.10 Illinois Pollution Control Board

The Illinois Pollution Control Board (IPCB) is responsible for adopting environmental regulations and decision making for contested environmental cases in Illinois.

Administration and Management – IPCB is not involved in the administration and management of stormwater programs in Cook County.

Regulation – The IPCB has the authority to enforce Illinois' environmental requirements brought to action by the Attorney General and State's Attorneys on behalf of the people. Actions may be brought to the IPCB for failure to comply with NPDES stormwater permits, stormwater pollution prevention plans, and erosion control plans.

Planning – IPCB is not involved in stormwater or watershed planning activities.

Maintenance – IPCB is not involved in maintenance activities.

## 2.6 Federal Agency Roles and Resources

Each of the federal agencies and organizations listed below is discussed in general terms based on its activities and how they fit into the four functional categories.

### 2.6.1 United States Army Corps of Engineers

The USACE is responsible for structural and non-structural urban flood control. The structural program features the study, design and construction of capital projects whereas the non-structural program regulates all dredging and filling in the Waters of the United States including jurisdictional wetlands.

Administration and Management – The USACE is the administrator and sponsor of many flood control projects along navigable waters within Cook County.

Regulation – Section 404 of the Clean Water Act prohibits the discharge of dredged or fill material into Waters of the United States without a permit from USACE.

USACE is primarily interested in protecting the water quality and habitat value of wetlands and does not directly protect the stormwater storage volume of wetlands.

In a number of northeastern Illinois counties, including Cook, USACE has entered into interagency coordination agreements with the SWCDs to review soil erosion and sediment control plans and conduct inspections on development sites with permitted wetland disturbances. Violations of permit conditions noted by the SWCDs are reported to USACE for enforcement action.

Planning – USACE administers a program for cost-sharing funding for the study, design and construction of flood control projects. These projects are generally limited to structural flood control measures. If a reconnaissance level study shows that a project is likely to be cost effective, USACE proceeds with a project analysis, which must be funded locally by 50% matching funds. For approved projects, USACE administers funds up to 65% of design and construction costs with the remaining costs to be funded by a non-federal or local sponsor. These sponsors must furnish all required lands, easements and rights-of-way, utility relocations, as well as operate and maintain the completed project in perpetuity. Cost sharing agreements must be individually negotiated with USACE on a project-by-project basis. USACE also provides design services for floodproofing of residences as part of an overall flood control project.

Maintenance – The USACE is responsible for the infrastructure maintenance of the Chicago River, Chicago Sanitary and Ship Canal, the Calumet-Sag Channel and its own facilities.

### 2.6.2 Federal Emergency Management Agency

FEMA is part of the United States Department of Homeland Security and responsible for the NFIP. FEMA provides disaster assistance during floods and other disasters, and provides mitigation funds. FEMA produces floodplain maps used for insurance and regulatory purposes under the NFIP.

Administration and Management – FEMA is the lead agency in providing federal disaster assistance. In Illinois, assistance and funding for relief, recovery, and mitigation programs is provided through IEMA. The NFIP is administered through IDNR-OWR. FEMA has participated in and sponsored training programs on the NFIP and flood hazard mitigation activities.

Regulation – To maintain eligibility in the NFIP, local governments must adopt and enforce minimum floodplain standards set by FEMA. Participation in the NFIP allows residents of the community to purchase flood insurance and their communities to be eligible for federal emergency relief funds if a presidential disaster is declared. Flood insurance must be purchased for insurable structures within floodplains if the owners apply for loans and mortgages from federally insured or regulated lenders. In support of the local regulatory programs, floodplain mapping has been produced for all communities participating in the NFIP. The most recent countywide mapping update to the Cook County Flood Insurance Rate Maps (FIRM) occurred in 2000.

In support of the NFIP, IDNR-OWR and CMAP prepared a model floodplain ordinance for communities to adopt. Adoption and enforcement of the ordinance satisfies FEMA's requirements to maintain eligibility in the federal program.

Planning – FEMA has several flood hazard mitigation funding programs that are administered by IEMA and described in Section 2.5.8. Some of the FEMA regulatory floodplain maps for Cook County are inadequate. They do not include water surface elevations or they are out of date, due to significant land use and other topographic changes. FEMA has initiated a NFIP map modernization program, for which IDNR-OWR is a cooperating technical partner. The primary goal of map modernization is to make flood risk maps easy to use and readily available in digital format. NFIP maps will be updated as part of this effort, which at a local level is compiling existing hydrologic and hydraulic modeling data for selected map panels in Cook County. This data will be included in a countywide modernization of floodplain maps.

Maintenance – FEMA is not involved in maintenance activities.

### 2.6.3 United States Department of Agriculture – Natural Resources Conservation Service

The United States Department of Agriculture – Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, is primarily concerned with the wise use of soil, water and other related natural resources. NRCS assists local government by providing soils data, swamp buster maps (location of farmed wetlands and hydric soils), floodplain management studies and other natural resources information.

Administration and Management – NRCS provides technical assistance to local soil and water conservation districts. NRCS co-sponsors training including courses and workshops in design and implementation of stormwater BMPs, soil erosion and sediment control, wetland management, and hydrologic computer modeling.

Regulation – NRCS uses a voluntary, rather than a regulatory, approach to enforce its conservation program authorities. In agricultural areas, producers who want to participate in the United States Department of Agriculture's programs and receive benefits must meet NRCS conservation requirements. NRCS has developed conservation practice standards and specifications that may be used in regulatory programs.

Planning – NRCS has planned, designed, and constructed flood control facilities to address overbank flooding in the Chicago metropolitan region with local sponsors including the District. NRCS has also performed floodplain management studies and updated floodplain mapping for local governments.

In an effort partially funded by Section 319 of the Clean Water Act under the IEPA's direction, NRCS developed the Illinois Urban Manual, a technical reference for developers, planners, engineers, government officials and others involved in land use planning, building site development, and natural resource conservation. Applicable in rural, urban, and developing areas, the manual includes BMPs for soil erosion and sediment control, stormwater management, and special area protection. The Illinois Urban Manual was updated in 2002.

Maintenance – NRCS has no maintenance responsibilities but does provide technical assistance to land owners and public works officials on maintenance of streams and stormwater management facilities in agricultural and urban areas.

### 2.6.4 United States Geological Survey

The United States Geological Survey (USGS) provides the hydrologic information necessary to achieve the best use and management of the nation's water resources.

Administration and Management – Although the USGS is not involved in local stormwater administration and management, USGS co-sponsors training courses in hydrologic and hydraulic modeling in northeastern Illinois.

Regulation – The USGS does not have regulatory authority relating to stormwater management.

Planning – Through a cooperative program, the USGS (Illinois Water Science Center) maintains a stream gauging network and publishes an annual report containing daily streamflow data, water quality and precipitation information for selected sites around the state. The USGS provides funding for site-specific hydrologic and water quality data collection and analysis. Some mapping efforts may be fundable through the USGS. USGS funds 50% of a project's in-house labor and expenses. On this reimbursable basis, USGS provides technical assistance in developing watershed models and other hydrologic and water quality related assistance. In the past, the USGS has researched and completed studies on emerging technologies in the water resources field.

Maintenance – USGS is not involved in maintenance activities.

### 2.6.5 United States Environmental Protection Agency

The United States Environmental Protection Agency (USEPA) protects the nation's waters from pollution through the Clean Water Act.

Administration and Management – USEPA is not involved in local administration or management of stormwater programs.

Regulation – NPDES is the responsibility of USEPA; however, that authority has been delegated to the IEPA in Illinois. Not directly involved in the permitting process, USEPA works with USACE to establish wetlands policy. USEPA has enforcement authority for several sections of the Clean Water Act.

Planning – USEPA provides grants for water quality related planning and demonstration projects under Section 319(h) of the Clean Water Act, as discussed under IEPA's roles and resources in Section 2.5.7. USEPA routinely holds national conferences on stormwater-related topics.

Maintenance – USEPA plays no direct role in maintenance activities. USEPA is an administrator of grant funds to assist in maintenance and restoration activities, also discussed in Section 2.5.7, IEPA.

### 2.6.6 United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is responsible for protection of aquatic and wildlife habitats and is actively involved in water quality and wetland preservation. The USFWS works with numerous agencies on a variety of wetland protection projects.

Administration and Management – USFWS is not involved in administration and management of stormwater activities in Cook County.

Regulation – Section 404 permit applications required by USACE are reviewed by USFWS for impacts to fish and wildlife resources.

Planning – USFWS can provide technical review and support for planning and designing wetland protection and restoration.

Maintenance – USFWS may provide technical assistance to land owners performing stream and wetland maintenance and management that would enhance their wildlife habitat functions.

### 2.6.7 National Park Service

The National Park Service (NPS) is charged with preserving the nation's natural, cultural, and recreational resources. The NPS carries out its mission through acquisition, development, and maintenance of the nation's parks and by providing technical assistance to state and local governments as well as private organizations.

Administration and Management – The NPS is not involved with administration and management of stormwater activities in Cook County.

Regulation – The NPS does not have regulatory authority relating to stormwater management.

Planning – The Rivers, Trails and Conservation Assistance Program provides technical assistance to support local river conservation projects. The NPS staff will work with local governments and private groups on river corridor projects to help them achieve multiple benefits including floodwater retention, wetland protection, habitat restoration, water quality improvements, and recreational opportunities. The NPS staff can assist with citizen involvement activities, local discussion and decision making, and development and implementation of plans.

Maintenance – The NPS is not involved in maintenance activities in Cook County.

## 2.7 Ecosystem Partnerships

As stated in Section 2.5.3, the Division of Ecosystems is one of the four divisions that comprise the IDNR-OREP. The Division of Ecosystems is responsible for administering the Conservation 2000 Grant Program, which is a comprehensive long-term approach to protecting and managing Illinois' natural resources. The Ecosystems Program is funded through the Conservation 2000 Grant Program and is a voluntary, broad-based incentive program. The purpose of the Ecosystems Program is to integrate the interests and participation of local communities and private, public and corporate landowners to enhance and protect watersheds through ecosystem-based management.

It is the goal of the Ecosystem Program to promote the formation of Ecosystem Partnerships. Ecosystem Partnerships include a combination of local stakeholders such as private landowners, businesses, scientists, environmental organizations, recreational enthusiasts, and policy makers. Ecosystem Partnerships within Cook County include the following:

- Chicago Wilderness
- Fox River
- Lake Calumet
- Lake Michigan Watershed
- Lower Des Plaines
- North Branch of the Chicago River
- Prairie Parklands
- Thorn Creek Macrosite
- Upper Des Plaines

Administration and Management – Ecosystem Partnerships are not involved in the administration and management of stormwater programs.

Regulation – Ecosystem Partnerships have no regulatory authority in stormwater programs.

Planning – Ecosystem Partnerships are involved in planning projects which protect and manage Illinois' natural resources. Grants for these projects are funded through the Conservation 2000 Grant Program.

Maintenance – Ecosystem Partnerships are involved in stream and creek maintenance activities such as clearing blockages caused by debris.

## 2.8 Non-Profit Organizations Roles and Resources

Each of the organizations listed below is discussed in general terms based on its activities and how they fit into the four functional categories.

### 2.8.1 Center for Neighborhood Technology

The Center for Neighborhood Technology (CNT) promotes the development of more livable and sustainable communities. The mission of CNT is to recognize and enhance hidden assets and undervalued resources to make households, neighborhoods, and regions more efficient and economically viable.

Administration and Management – The CNT is not involved with administration and management of stormwater activities in Cook County.

Regulation – The CNT does not have regulatory authority relating to stormwater management.

Planning – The CNT provides technical assistance in support of stormwater management planning activities in Cook County. CNT has developed interactive maps which illustrate floodplains, soil types, conservation easements, streets, wetlands, trails, and greenways by municipality, zip code, county, or watershed.

Maintenance – The CNT is not involved in maintenance activities in Cook County.

### 2.8.2 Environmental Law and Policy Center

The Environmental Law and Policy Center (ELPC) is a non-profit organization which has the goal of achieving cleaner energy resources and implementing sustainable energy strategies, promoting innovative and efficient transportation and land use approaches that produce cleaner air and more jobs, and developing sound environmental management practices that conserve natural resources and improve the quality of life in communities. ELPC believes that environmental progress and economic development can be achieved together. ELPC also identifies opportunities to improve environmental quality in the Midwest and works to actively develop and achieve the potential benefits.

Administration and Management – The ELPC is not involved with administration and management of stormwater activities in Cook County.

Regulation – The ELPC does not have regulatory authority relating to stormwater management.

Planning – The ELPC provides planning assistance to support stormwater management planning activities in Cook County by creating a strategic regional perspective as energy, transportation, and forests and land conservation issues are increasingly complex and require coordinated strategies to shape public policy.

Maintenance – The ELPC is not involved in maintenance activities in Cook County.

### 2.8.3 Friends of the Chicago River

The Friends of the Chicago River is a non-profit organization and its mission is to preserve, protect, and foster the vitality of the Chicago River for the human, plant, and animal communities within its watershed.

Administration and Management – The Friends of the Chicago River is not involved with administration and management of stormwater activities in Cook County.

Regulation – The Friends of the Chicago River does not have regulatory authority relating to stormwater management.

Planning – The Friends of the Chicago River are active participants of the North Branch of the Chicago River Planning Committee Ecosystem Partnership and have played an important role in representing the interest of Cook County stakeholders to date.

Maintenance – The Friends of the Chicago River is involved in stream and creek maintenance activities such as the removal of blockages caused by debris.

### 2.8.4 Openlands

Openlands is a non-profit organization dedicated to preserving and enhancing public open space in northeastern Illinois. To date, Openlands has taken leadership roles in securing more than 45,000 acres of land in the Chicago area for public parks, forest preserves, land and water greenway corridors, and urban gardens.

Administration and Management – Openlands is not involved with administration and management of stormwater activities in Cook County.

Regulation – Openlands does not have regulatory authority relating to stormwater management.

Planning – Openlands is not involved in planning activities for stormwater management within Cook County.

Maintenance – Openlands is involved in stream and creek maintenance activities such as clearing blockages caused by debris.

### 2.8.5 Sierra Club Illinois Chapter

The Sierra Club Illinois Chapter is a non-profit organization which is committed to protecting the environment.

Administration and Management – The Sierra Club is not involved with administration and management of stormwater activities in Cook County.

Regulation – The Sierra Club does not have regulatory authority over stormwater management in Cook County.

Planning – The Sierra Club is not involved with stormwater management planning activities within Cook County.

Maintenance – Maintenance activities conducted by the Sierra Club Clean Water Committee include monitoring the quality of Illinois' waters.

## 2.9 Volunteer Groups Roles and Resources

Each of the volunteer groups listed below is involved in a variety of stormwater management activities including but not limited to planning and maintenance. These groups will be contacted for input during preparation of the Detailed Watershed Plans (DWPs) and Watershed Management Ordinance (WMO).

- Butterfield Creek Steering Committee
- Corlands
- Evanston Environment Board
- Glenview Prairie Preservation
- North Branch Restoration Project
- Poplar Creek Watershed Coalition
- Salt Creek Watershed Network
- Thorn Creek Restoration Coalition

## 2.10 Summary

Flood control and stormwater management programs have been in place in Cook County for many years. The District's construction of TARP and its many other flood control projects, along with state and federal agencies' work, have reduced flooding throughout the county. Yet many existing and potential flood problems have not been addressed due to existing program funding limitations. Stormwater runoff controls in the county have been in place for many years, but a uniform countywide minimum standard for stormwater management does not exist. The existing stormwater management framework in Cook County is extensive, though it is fragmented among the authorities and responsibilities of local, state and federal agencies.

# CHAPTER 3
# ASSESSMENT OF STORMWATER MANAGEMENT ACTIVITIES AND PROGRAMS IN COOK COUNTY

## Acronyms used in Chapter 3:

| | |
|---|---|
| BMP | Best Management Practice |
| CRS | Community Rating System |
| CCSMP | Cook County Stormwater Management Plan |
| CMAP | Chicago Metropolitan Agency for Planning |
| DWP | Detailed Watershed Plan |
| FEMA | Federal Emergency Management Agency |
| FPDCC | Forest Preserve District of Cook County |
| GIS | Geographical Information Systems |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| IEPA | Illinois Environmental Protection Agency |
| IWPA | Interagency Wetlands Policy Act of 1989 [20 ILCS 830 et seq.] |
| NFIP | National Flood Insurance Program |
| NPDES | National Pollutant Discharge Elimination System |
| USACE | United States Army Corps of Engineers |
| WMO | Watershed Management Ordinance |
| WPC | Watershed Planning Council |

## CHAPTER 3
# ASSESSMENT OF STORMWATER MANAGEMENT ACTIVITIES AND PROGRAMS IN COOK COUNTY

## 3.1 Introduction

This chapter assesses the current stormwater management activities and programs in Cook County. The information in this chapter has been combined with the review of the current stormwater management framework provided in Chapter 2 to identify inconsistencies and gaps which exist in the present system. This assessment will serve as a benchmark on which to base and develop the District's countywide stormwater management program.

Stormwater management questionnaires were sent to all of the municipalities, townships and drainage districts located within Cook County in February 2006. The survey requested information on existing stormwater management programs, including the following:

- Community concerns regarding stormwater management
- Planning and inventory of stormwater facilities throughout the community, capital improvement projects, and the maintenance of stormwater facilities
- Coordination of water resources-related projects and efforts between other local, regional, state and federal authorities
- Regulatory standards including those for stormwater, floodplain, water quality, soil erosion and sediment control, stream and wetland management, as well as the regulatory framework

The District received completed questionnaires from 79 municipalities, 9 townships and 4 drainage districts. In addition, 10 questionnaires were completed by the District for municipalities which did not respond, but did have applicable information posted on the Internet. A summary of the responses and findings, along with a copy of the questionnaire, can be found in Appendix A.

The assessment that follows is based on a three-part review: the questionnaire responses, the agency roles in Chapter 2, and the water resource studies and ordinances within Cook County. The assessment is intended to reveal the adequacy of local programs with respect to the goals of the Cook County Stormwater Management Plan (CCSMP). The assessment uses the same functional categories established in Chapter 2:

- Administration and Management
- Regulation
- Planning
- Maintenance

## 3.2 Administration and Management

This functional element comprises the administrative and management activities that support a stormwater management program.

### 3.2.1 Assessment of Administration and Management

The majority of this assessment is based on the questionnaire responses, which are discussed below.

**Administration**

- On a local level, the municipalities, Cook County agencies, and the District have primary responsibility for administration and management of stormwater activities in Cook County.

**Community Concerns**

- In most communities, the top priority concerns were drainage problems followed by overbank flooding. A small portion of communities (9%) indicated that water quality, soil erosion and sediment control were the number one concern.

**Public Education/Involvement for Water Quality**

- Of the communities that responded to the question about having public education on water quality, more than half (62%) indicated that they had performed some public education-related activities towards stormwater management and water quality.
- The programs that are being implemented by the communities with public education and involvement consist of website information, newsletters, informational mailings or handouts at the community's office, public information announcements on cable TV, Earth Day activities, and school visits and programs.
- No countywide programs exist to educate the public on generalized stormwater issues and the role residents play in addressing stormwater flooding and water quality.

**Coordination**

- Approximately 41% of the communities have coordinated efforts with their neighboring communities or other agencies to address maintenance, plan capital improvement projects, and develop stormwater standards. These coordination efforts involved a combination of municipalities, townships and municipal conferences; regional agencies and authorities such as the Forest Preserve District of Cook County (FPDCC), highway authorities and state agencies, such as Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) and Illinois Environmental Protection Agency (IEPA).

**Data Collection/Storage**

- Approximately 61% of the communities have an inventory of stormwater information, ranging from paper maps to computer spreadsheets to Geographical Information System (GIS) maps.
- Of the communities that keep stormwater inventories, approximately 75% update them on a regular basis. The inventories include such items as storm sewer atlases, locations of natural features (such as wetlands, lakes and streams), detention pond locations and other water resources-related features.

**Regional/State/Federal Involvement**

- Communities are accessing the regional, state and federal technical assistance and training opportunities as discussed in Chapter 2.
- IDNR-OWR and Federal Emergency Management Agency (FEMA) are becoming more involved in education of citizens and public officials, particularly in relation to flood proofing and enforcement of floodplain rules.

### 3.2.2 Gap Analysis for Administration and Management Functions

The following discussion compares the CCSMP goals that relate to administration and management with the questionnaire responses, and analyzes the gaps, overlapping authorities and inconsistencies. Applicable goals are presented—identified by letter as introduced in Section 1.8—followed by a summary of the findings.

Goal D) Promote responsible land use practices in all areas of the watersheds of Cook County, particularly within floodplains and floodways.

> Public information and education will increase the awareness of responsible land use practices. The questionnaire responses reveal that communities are already attempting to address this goal. This goal will be further explored during development of the countywide regulatory program discussed in Chapter 7.

Goal F) Require cooperation and consistency in stormwater management activities between the government entities having stormwater jurisdiction, and clearly define the roles and responsibilities of each entity.

> The wide range of questionnaire responses indicates that there are many inconsistencies between community regulations and programs. The Watershed Management Ordinance (WMO) will provide consistency throughout the county by defining minimum standards to be enforced countywide. However, municipalities will be permitted to enforce more stringent standards than the WMO.

Goal G) Coordinate with surrounding counties to ensure minimal negative impacts of inter-county stormwater runoff flows.

> Some coordination exists in dual county municipalities and other municipalities that have intergovernmental agreements and capital improvement projects with surrounding counties. Insufficient coordination with surrounding counties will be addressed by the stormwater management program.

Goal H) Coordinate with watershed councils to provide for the short and long term maintenance of natural waterways, manmade drainageways, and stormwater management facilities in new and existing developments.

> Communities are currently the main providers of short-term and long-term maintenance of water resources related facilities. With advice from the Watershed Planning Councils (WPCs), maintenance can shift to a watershed-focused strategy.

Goal I) Seek to maximize available revenue sources in undertaking comprehensive watershed planning and stormwater facility construction activities, thereby leveraging and reducing reliance on the stormwater funds raised by levy.

The District has the ability to raise stormwater funds with a tax levy. The tax levy is applicable to areas located within the District's corporate boundaries. The District's corporate boundaries encompass approximately 93% of the land area and 98% of the assessed valuation of Cook County. Although this levy may fund portions of the stormwater management program, the District will develop Detailed Watershed Plans (DWPs) and capital projects in a manner that complies with state and federal funding criteria. The District will seek state and federal funding for the implementation of the countywide program where appropriate.

Goal K) Develop and maintain a comprehensive hydrologic, hydraulic, demographic and cartographic database using the best available and most appropriate technology to manage the stormwater, flood and water quality data needs of the program.

Approximately 61% of the municipalities responding to the questionnaire have stormwater databases for a variety of stormwater facilities and natural features. The goal of developing a comprehensive database will be addressed by establishing a countywide stormwater management GIS database.

Goal L) Promote the awareness and understanding of stormwater management issues by the practitioner and the layperson through ongoing public information and education.

As stated in the findings for public involvement for water quality, many communities have public information and education programs. The programs, however, are varied in method and frequency of communication. The countywide stormwater management program must establish a consistent program that includes public education and training.

## 3.3 Regulation

This functional element represents the regulatory standards that are part of a stormwater management program. This section summarizes municipal, township and county regulatory standards and evaluates the ability of the local, state and federal standards to meet the goals of the CCSMP. This assessment is based on the stormwater management questionnaire that solicited responses on local, state and federal regulatory standards. Local ordinances and available water resources studies were used to complete the regulatory analysis.

### 3.3.1 Assessment

The assessment of existing regulatory programs covers five areas:

- Stormwater and Detention
- Floodplain Management
- Water Quality
- Soil Erosion and Sediment Control
- Stream and Wetland Protection

#### 3.3.1.1 Stormwater and Detention

Table 3.1 summarizes the stormwater standards for the municipalities responding to the questionnaire. Findings related to the 67 respondents to the questionnaire's section on stormwater drainage and detention standards are discussed below. These respondents represent 75% of the communities that returned the questionnaire.

**Stormwater and Detention Standards**

- The IEPA National Pollutant Discharge Elimination System (NPDES) stormwater program requires that all new construction activities disturbing over one acre prepare a stormwater pollution prevention plan. The plan is required to address stormwater runoff in addition to construction site runoff.
- The Chicago Metropolitan Agency for Planning (CMAP) has a model stormwater drainage and detention ordinance that stipulates 100-year and 2-year discharge rates for detention, and contains regulations about water quality and protection of onsite depressional storage and wetlands. Many communities have used this model as the basis for their ordinances.

**Questionnaire Findings**

Of the communities with stormwater drainage and detention standards,

- All require control of the 100-year event. Approximately 37% use a release rate of 0.15 cfs/acre. 31% of the remaining use a release rate equal to the 3-year pre-development discharge from the site, similar to the District's existing methodology. 7% of communities use a 100-year release rate of 0.10 cfs/acre, similar to DuPage County's ordinance. 25% use other release rate calculation methods.
- 69% use the modified rational method for determining detention requirements, 22% use the hydrograph routing methodology, and 9% use other methodologies.
- 25% regulate the two-year event; with approximately 82% of those using a release rate of 0.04 cfs/acre.
- Approximately 64% of the communities protect onsite depressional storage volume.
- 33% allow online detention; only 27% allow floodway detention.
- 31% allow detention in wetlands.

Table 3.1 Stormwater and Detention Regulatory Requirements

| **Regulatory Requirement** | **YES given by %*** | **NO given by %*** |
|---|---|---|
| Regulate Runoff Volumes | 81 | 19 |
| Regulate Runoff Rates | 91 | 9 |
| 100-year Allowable Release Rate | 100 | 0 |
| 3-year | 31 | |
| 0.15 cfs/acre | 37 | |
| 0.1 cfs/acre | 7 | |
| Other | 25 | |
| 2-year Allowable Release Rate | 25 | 75 |
| 0.04 cfs/acre | 21 | |
| Other | 4 | |
| Rainfall Data | 100 | 0 |
| Bulletin 70 | 63 | |
| Technical Paper 40 | 25 | |
| Other (or not specified) | 14 | |
| Methodology to Determine Detention | 100 | 0 |
| Modified Rational Method | 68 | |
| Hydrograph Routing Methodology | 22 | |
| Other | 10 | |
| Depressional Storage Compensation | 64 | 31 |
| Detention Allowed in Floodplain (online) | 33 | 67 |
| Detention Allowed in Floodway | 27 | 73 |
| Detention Allowed in Wetland | 31 | 69 |

*Percentages based on 67 respondents to stormwater section of questionnaire

#### 3.3.1.2 Floodplain Management

Table 3.2 summarizes the floodplain management standards for the local agencies within Cook County. Findings related to the 82 respondents that have a floodplain management ordinance are discussed below.

**Floodplain Management Standards**

- The minimum state floodplain ordinance requirements are sufficient to meet the standards for participation in the National Flood Insurance Program (NFIP).
- The minimum state floodplain ordinance requirements are not sufficient to prevent increases in flood stage since no compensatory storage is required for flood fringe fill activities.
- The state minimum requirements only protect mapped floodways, mapped floodplains without designated floodways, and floodplains with drainage areas greater than one square mile.

**Questionnaire Findings**

Of the communities that have a floodplain management ordinance,

- Approximately 91% have adopted a floodplain ordinance that meets the minimum state requirements.

- Approximately 46% included protection of hydrologic functions, water quality, aquatic habitat, recreation, and aesthetics in the floodplain ordinance's purpose statement. A breakdown of the percentages of communities protecting specific features is shown in Table 3.2.
- Approximately 95% require compensatory storage for fill in the floodplain (compensatory storage for fill in the floodway is mandated by IDNR-OWR). The majority of the compensatory storage ratios vary from 1.0:1 to 1.5:1.
- Approximately 29% require compensatory storage for fill of depressional storage areas.
- 23% are Community Rating System (CRS) communities in the NFIP. 33% are interested in learning more about the CRS program.

Table 3.2 Floodplain Regulatory Requirements

| **Regulatory Requirement** | **YES given by %*** | **NO given by %*** |
|---|---|---|
| Has community adopted IDNR-OWR model ordinance? | 91 | 9 |
| NFIP CRS Program | 23 | 77 |
| Does Purpose Statement Address: | | |
| Hydrologic Functions | 94 | 6 |
| Water Quality | 72 | 28 |
| Recreational Uses | 46 | 54 |
| Aquatic Habitat | 57 | 43 |
| Aesthetics | 54 | 46 |
| Appropriate Uses more restrictive than IDNR-OWR | 15 | 85 |
| Onstream Impoundments Discouraged? | 69 | 31 |
| Channel Modification Discouraged? | 76 | 24 |
| Compensatory Storage for Floodplain | 95 | 5 |
| 1.0:1 ratio | 27 | |
| 1.5:1 ratio | 51 | |
| Other | 22 | |
| Mitigation Ratios for Wetlands | 27 | 68 |
| 1.0:1 ratio | 27 | |
| 1.5:1 ratio | 32 | |
| Other | 41 | |
| Compensatory Storage for Depressional Storage | 29 | 71 |
| 1.0:1 ratio | 54 | |
| Other | 46 | |

*Percentages based on 82 respondents to floodplain section of questionnaire

### 3.3.1.3 Water Quality
The findings related to water quality standards for the 89 communities responding to the water quality section of the questionnaire are discussed below.

**Water Quality Standards**
The NPDES Phase II program is the main vehicle for water quality regulation within Cook County.

**Questionnaire Findings**
Of the communities responding to the water quality section of the questionnaire, 64% have an NPDES Phase II permit or are in the process of obtaining the permit.

### 3.3.1.4 Soil Erosion and Sediment Control
Table 3.3 summarizes the findings of the soil erosion and sediment control regulations among the Cook County communities. Findings related to the 64 respondents to the questionnaire’s section on soil erosion and sediment control are discussed below.

**Soil Erosion and Sediment Control Standards**
- Under the federal NPDES stormwater program, the IEPA requires the preparation of a stormwater pollution prevention plan to address construction site runoff for all new construction activities over one acre.
- CMAP has a model soil erosion and sediment control ordinance. The CMAP model recommends regulating development greater than 5,000 square feet. In addition, CMAP recommends regulating developments greater than 500 square feet when located in the vicinity of streams, lakes, and wetlands.

**Questionnaire Findings**
72% of the questionnaire respondents stated that they have soil erosion and sediment control standards. Of these communities,

- 77% apply soil erosion and sediment control standards to all development regardless of size. Most of the remaining communities have a one-acre disturbance limit; above this limit, soil erosion and sediment control must be applied.
- 75% have a list of principles or construction standards that serve as guidelines when preparing site development and erosion control plans.
- All but one community require maintenance of soil erosion and sediment control throughout the duration of the project. Of these, 30% require inspections at critical stages to confirm that the measures are working properly.

Table 3.3 Soil Erosion and Sediment Control Regulatory Requirements

| **Regulatory Requirement** | **YES given by %*** | **NO given by %*** |
|---|---|---|
| Is there an acreage threshold | 23 | 77 |
| List of Construction Standards | 75 | 25 |
| Scheduled Maintenance during Construction | 98 | 2 |
| Inspection at Critical Stages | 30 | 70 |

*Percentages based on 64 respondents to soil erosion and sediment control section of the questionnaire

#### 3.3.1.5 Stream and Wetland Management

Table 3.4 summarizes the stream and wetland management standards for the local agencies within Cook County. Findings related to the 35 respondents to the questionnaire's section on stream and wetland management are discussed below.

**Stream and Wetland Management Standards**

- Under Section 404 of the Clean Water Act, the United States Army Corps of Engineers (USACE) regulates the discharge of dredged or fill material into wetlands or other Waters of the United States. When a permit is required, the USACE has the authority to protect a range of wetland functions. The USACE authority does not extend to the protection of isolated wetlands.
- The Interagency Wetlands Policy Act of 1989 [20 ILCS 830 et seq.] (IWPA) is intended to "ensure that there is no overall net loss of the state's existing wetland acres or their functional values resulting from state-supported activities." The IWPA also gives State agencies the duty to "preserve, enhance and create wetlands where necessary to increase the quality and quantity of the State's wetland resource base." (20 ILCS 830/1-4). The Illinois Department of Natural Resources (IDNR) is the administrator of the IWPA and formulates rules and regulations necessary for its implementation. The IEPA is a member of the Interagency Wetlands Committee and the IDNR serves as the chair of the Committee. The Committee conducts numerous activities such as development of rules and regulations for the implementation and administration of the IWPA, development of technical procedures for wetland delineation, evaluation of wetland restoration, development of research programs for wetland function and restoration, preparation of reports regarding wetland status, and development of educational materials to promote wetland protection.

**Questionnaire Findings**

39% of the questionnaire respondents have stream and wetland protection standards. Of these communities,

- Approximately 71% require a setback or buffer for streams, lakes, and wetlands.
- 57% require mitigation measures for development within stream and wetland environments.

Table 3.4 Stream and Wetland Management Regulatory Requirements

| **Regulatory Requirement** | **YES given by %*** | **NO given by %*** |
|---|---|---|
| Modifications to Environment Prohibited | 37 | 66 |
| Development in Buffers Controlled | 71 | 29 |
| Mitigation for Modifications to Environment | 57 | 43 |

*Percentages based on 35 respondents to stream and wetland management section of questionnaire

#### 3.3.1.6 Permit Review and Enforcement

Most communities have a village engineer or engineering consultant responsible for stormwater management related permit review and enforcement. Public works, planning, and building and zoning departments are involved in permit reviews and enforcement in a number of communities. The regulatory standards most often cited as requiring the most enforcement action are soil erosion and sediment control and floodplain filling.

### 3.3.2 Gap Analysis for Regulatory Functions

The following discussion compares the CCSMP goals that relate to regulation with the questionnaire responses, and analyzes the gaps, overlapping authorities and inconsistencies. Again, the applicable goal from Section 1.8 is presented, followed by a summary of the findings:

Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.

> There is currently no uniform countywide, state or federal requirement for regulation of runoff volume or rates. Many communities have standards that they have developed based on CMAP model ordinances and other sources, but they vary in levels of protection. The WMO will set minimum uniform standards to be applied throughout the county.

Goal C) Establish comprehensive basin plans within each watershed, which quantify, plan for and manage stormwater flows within and among the jurisdictions in those watersheds.

> Some watershed plans have been developed in certain watersheds to plan for and manage stormwater flows. DWPs will be developed under the countywide stormwater management program and may lead to watershed specific stormwater regulations. The watershed planning program is described in Chapter 6.

Goal D) Promote responsible land use practices in all areas of the watersheds of Cook County, particularly within floodplains and floodways.

> Currently very few communities regulate land use practices beyond those stipulated in Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) floodplain regulations. The countywide regulations will address land use practices in floodplains and floodways across the county.

Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

> The WMO must develop countywide minimum stormwater management standards. Many communities have ordinances and regulations for stormwater programs, and the WMO will stipulate that communities may continue to regulate to a standard more restrictive than the WMO.

Goal F) Require cooperation and consistency in stormwater management activities between the government entities having stormwater jurisdiction, and clearly define the roles and responsibilities of each entity.

In some areas of stormwater management (for example, wetlands regulated by the USACE), state and federal agencies regulate development activities. These regulations must be accommodated in the countywide stormwater management program. Coordination between agencies is essential.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Protection of water resources from detrimental modifications is essential, but few communities fully regulate such activity. The WMO will, at a minimum, encourage the use of Best Management Practices (BMPs) to achieve this goal.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Many communities regulate runoff rates for stormwater detention. In order to achieve this goal, the use of BMPs will, at a minimum, be encouraged within the WMO.

Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.

Controlling soil erosion and sediment is a major concern for most communities. Many communities have an NPDES Phase II permit and have adopted a set of construction standards for sediment and erosion control. The minimum standards of the WMO will include regulations for sediment and erosion control for all communities.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

The NPDES program is designed to protect water quality by minimizing discharge of pollution from developments. Currently, IEPA permits are required for construction sites greater than one acre. The WMO may address developments on site areas of less than one acre.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

Only a few communities have regulations that limit or prohibit development of aquatic and riparian environments. The WMO will address this goal with minimum standards. Educational programs or other motivation may encourage restoration of degraded environmental areas.

Goal S) Be in compliance with all applicable state and federal laws.

The WMO must be in compliance with all state and federal laws.

## 3.4 Planning

This function of stormwater management represents the planning efforts that have been completed or are being completed in Cook County.

### 3.4.1 Assessment

An in-depth analysis of individual watersheds is not part of the CCSMP. This analysis will be completed in the DWPs to be developed under the countywide stormwater management program. This section summarizes local capital improvement projects from the communities that completed questionnaire responses.

The majority of the communities that responded to the questionnaire have watershed studies, stormwater master plans, or water quality studies. Higher percentages (up to 79%) reported water resources-related capital improvement projects.

**Watershed Studies**

- Approximately 51% of the questionnaire respondents stated that they had a study or master plan completed for their community.
- Of communities with studies or master plans, 76% of these efforts were completed by the individual community.
- 24% of the communities have watershed studies that were completed by state and federal agencies.

**Capital Improvement Projects**

- 79% of the responding communities completed capital improvement projects relating to stormwater management.
- The three most popular capital improvement projects were storm sewer infrastructure improvement and installation (72%), detention projects (27%), and channel stabilization and flood control projects (23%). Many communities have completed all three.

**Mapping**

Some communities have prepared maps for stormwater drainage planning purposes. These maps may be used to determine drainage problems and to identify the need for future studies.

Approximately 75% of the communities that keep stormwater infrastructure inventories update the inventory on a regular basis. The inventories include such items as storm sewer atlases, locations of natural features such as wetlands, lakes and streams, and detention pond locations.

### 3.4.2 Gap Analysis for Planning Functions

The following discussion compares the CCSMP goals that relate to planning activities with the questionnaire responses, and analyzes the gaps, overlapping authorities and inconsistencies. The applicable goal is presented, followed by a summary of the findings:

Goal B) Identify and remedy existing regional and local flooding problems to the extent feasible.

Some communities have addressed flooding problems with capital improvement projects, yet flooding remains a problem throughout Cook County. The focus of the DWPs will be to address regional flooding problems. The District will solicit input from the WPCs, various agencies, and stakeholders during the development of the DWPs to identify regional flooding issues. The District, through its Stormwater Management Phase II program, may assist municipalities and agencies within Cook County to address local drainage problems and set up a program for purchasing flood prone and flood damaged property.

Goal C) Establish comprehensive basin plans within each watershed, which quantify, plan for and manage stormwater flows within and among the jurisdictions in those watersheds.

While some communities have regional flood studies or other studies, there are many locales within Cook County where flood and stormwater information is unknown. For this reason, the countywide stormwater management program will prepare DWPs to identify and address regional flooding problems.

Goal G) Coordinate with surrounding counties to ensure minimal negative impacts of inter-county stormwater runoff flows.

Some communities that border other counties are already sharing or coordinating stormwater information, plans or stormwater projects. The preparation of DWPs will support coordination between communities and counties that share watershed boundaries.

Goal K) Develop and maintain a comprehensive hydrologic, hydraulic, demographic and cartographic database using the best available and most appropriate technology to manage the stormwater, flood and water quality data needs of the program.

Many communities have stormwater maps and databases for a variety of stormwater facilities and natural features. The goal to develop a comprehensive database will be addressed by establishing a countywide stormwater management GIS database. The District will make efforts to obtain GIS data from Cook County, state and federal agencies, municipalities and townships for incorporation into the countywide GIS database.

Goal S) Be in compliance with all applicable state and federal laws.

Development of a WMO that is in compliance with state and federal laws will ensure the same compliance for all planning efforts.

## 3.5 Maintenance

Maintenance involves the upkeep of property and equipment related to constructed stormwater infrastructure. It includes maintaining the natural function of streams, lakes and wetlands.

Approximately 64% of the responding communities indicated they had a regular stormwater infrastructure maintenance program.

### 3.5.1 Gap Analysis for Maintenance Functions

The following discussion compares the CCSMP goals that relate to maintenance standards with the questionnaire responses, and analyzes the gaps, overlapping authorities and inconsistencies. The applicable goal is presented, followed by a summary of the findings:

Goal B) Identify and remedy existing regional and local flooding problems to the extent feasible.

> Some communities have addressed flooding problems with capital improvement projects and associated maintenance. Uniform countywide maintenance standards have not been developed to decrease or remedy flooding problems. The countywide stormwater management program may establish recommendations for minimum standards for maintenance.

Goal H) Coordinate with watershed councils to provide for the short and long-term maintenance of natural waterways, manmade drainageways, and stormwater management facilities in new and existing developments.

> There is little coordination among communities and jurisdictions for maintenance activities. With the establishment of the WPCs, planning for maintaining stormwater infrastructure and natural environmental features within watersheds can be developed across jurisdictional boundaries.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

> The majority of maintenance activities that preserve and enhance aquatic and riparian environments are done by communities that have developed master plans. Efforts to identify those responsible for maintenance within these environments will be made during the preparation of the DWPs.

## 3.6 Summary

Despite the many programs within communities that address a number of the CCSMP goals, not all of these goals are being met within the existing stormwater management framework. Many stormwater management problems that communities face can be alleviated with the establishment of a countywide stormwater management program.

# CHAPTER 4
# ASSESSMENT OF STORMWATER CONDITIONS AND PROBLEMS

## Acronyms used in Chapter 4:

| | |
|---|---|
| Act | Public Act 93-1049 |
| BMP | Best Management Practice |
| CCHD | Cook County Highway Department |
| DWP | Detailed Watershed Plan |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| IEPA | Illinois Environmental Protection Agency |
| CMAP | Chicago Metropolitan Agency for Planning |
| NRCS | Natural Resource and Conservation Service |
| TARP | Tunnel and Reservoir Plan |
| TMDL | Total Maximum Daily Loads |
| USACE | United States Army Corps of Engineers |

CHAPTER 4

# ASSESSMENT OF STORMWATER CONDITIONS AND PROBLEMS

## 4.1 Introduction

In order to develop the countywide stormwater management program, knowledge of current conditions is needed. This chapter reviews the features and characteristics of Cook County as they relate to stormwater management including its watersheds (defined as all land drained by, or contributing water to, the same stream, lake or stormwater facility) and land uses. The findings in this chapter are from existing data and information for Cook County, Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) watershed planning studies, and Illinois Environmental Protection Agency (IEPA) water quality data.

## 4.2 County Overview

Cook County includes 138 municipalities spanning 946 square miles. According to the Chicago Metropolitan Agency for Planning (CMAP) 2030 *Forecasts of Population, Households and Employment* report, Cook County is expecting a population growth of 10% over the next 24 years from its current population of 5.3 million. Projections show the number of households increasing by 13% and employment increasing by 17%. The Cook County municipalities showing the largest percentage of population, household and employment growth border three collar counties—Lake, DuPage and Will. With these growth patterns, an increase in construction and development is expected. Uniform countywide standards developed as part of a countywide stormwater management program can address stormwater and watershed issues that can be expected with the County's continued growth.

## 4.3 Watershed Descriptions and Floodplains

This section describes the major watersheds in Cook County for the purpose of understanding existing and potential stormwater problems. The enacting legislation, Public Act 93-1049 (Act), in which authority was granted to the District for the responsibilities of stormwater management for Cook County, identifies the following six primary watersheds for the Chicago Metropolitan Area:

1. North Branch Chicago River
2. Lower Des Plaines Tributaries
3. Calumet-Sag Channel
4. Little Calumet River
5. Poplar Creek

6. Upper Salt Creek

A Watershed Planning Council was formed after the passage of the Act for each of the above watersheds. In addition, the Act requires a stormwater management planning council be created for the combined sewer areas of Cook County. The combined sewer area is the conglomeration of all combined sewer areas within Cook County, rather than a geographical feature of the county as are the six watersheds listed above. The combined sewer area encompasses a significant portion of the City of Chicago and overlaps areas of four of the six primary watersheds listed above. There are no combined sewer areas in the Poplar Creek and Upper Salt Creek watersheds.

The following sections provide a brief description for each of the six primary watersheds. The figures cited below for average annual flood damages for each primary watershed were obtained from the October, 1998 publication of “Our Community and Flooding.”

### 4.3.1 North Branch Chicago River

The North Branch Chicago River watershed area is approximately 180 square miles. The river originates in Lake County and flows south through northeastern Cook County. The North Branch Chicago River watershed area in Cook County is approximately 160 square miles, which includes over 50 miles of rivers and creeks. Average annual flood damages for the entire watershed were estimated to be $2,995,000. Eight flood control projects have been completed within the watershed by IDNR-OWR, United States Army Corps of Engineers (USACE), Natural Resources Conservation Service (NRCS), the District, and the Lake County Stormwater Management Commission. The approximate boundaries of the North Branch Chicago River watershed are shown in Figure 4-1.

### 4.3.2 Lower Des Plaines Tributaries

The Des Plaines River originates in Wisconsin and flows south through Cook County. The entire Des Plaines River watershed is 681 square miles. The Des Plaines River has been divided into two planning areas, the Upper Des Plaines watershed (from the Wisconsin headwater to Libertyville in Lake County) and the Lower Des Plaines Tributaries watershed (from Libertyville to Riverside). The Lower Des Plaines Tributaries watershed is nearly fully urbanized throughout Cook County. The Lower Des Plaines Tributaries watershed area in Cook County (excluding Upper Salt Creek watershed area) is approximately 330 square miles, with 250 miles of rivers and creeks. Average annual residential and business flood damages have been estimated to be $21,400,000 for the upper and lower portions of the watershed. Forty flood control projects have been completed within the watershed by IDNR-OWR, USACE, NRCS, the District, DuPage County Stormwater Management Committee, Lake County Stormwater Management Commission and the City of Chicago. The approximate boundaries of the Lower Des Plaines Tributaries watershed are shown in Figure 4-2.

### 4.3.3 Calumet-Sag Channel

The Calumet-Sag Channel originates in Cook County and accepts the flows from the Little Calumet River. The channel is located in southern Cook County and has historically served barge traffic through heavy industrial zones. The Calumet-Sag Channel watershed area is approximately 126 square miles (excluding the Little Calumet watershed area), with over 25 miles of rivers and creeks. Estimated average annual damages were approximately

$2,646,000 for residences and businesses. There have been 11 major flood control projects within the Calumet-Sag Channel watershed that have been completed by IDNR-OWR and the District. Exhibit 4-3 shows the approximate boundaries of the Calumet-Sag Channel watershed.

### 4.3.4 Little Calumet River

The Little Calumet River watershed originates in northwest Indiana. The Little Calumet River flows west into the Calumet-Sag Channel in Cook County. The Little Calumet River watershed area in southern Cook County is approximately 200 square miles, with over 100 miles of rivers and creeks. Average annual flood damages for residential and business properties have been estimated at $5,835,000. There have been 15 major flood control projects completed within the Little Calumet River watershed that have been completed by NRCS, USACE, IDNR-OWR, the District and the Cook County Highway Department (CCHD). The approximate boundaries of the Little Calumet River watershed are depicted in Exhibit 4-4.

### 4.3.5 Poplar Creek

The Poplar Creek watershed area in northwestern Cook County is approximately 40 square miles, with 26 miles of rivers and creeks. Poplar Creek flows generally west through Cook County until it reaches Kane County and its confluence with the Fox River. Between residential and business damages, estimated average annual flood damages were $125,000. There have been four major flood control projects within the Poplar Creek watershed that have been completed by IDNR-OWR and the District. Exhibit 4-5 shows the approximate boundaries of the Poplar Creek watershed.

### 4.3.6 Upper Salt Creek

Salt Creek originates in Cook County and flows south towards DuPage County. This portion of the Salt Creek watershed is considered Upper Salt Creek. The Upper Salt Creek watershed area in northwestern Cook County is approximately 52 square miles, with 17 miles of rivers and creeks. Estimated average annual residential and business flood damages were $46,000. There have been nine major flood control projects within the Upper Salt Creek watershed that have been completed by NRCS, IDNR-OWR and the District. The approximate boundaries of the Upper Salt Creek watershed are shown in Exhibit 4-6.

## 4.4 Soil Erosion and Sediment Control

Soil erosion and sediment control have become a concern in Cook County among regulatory agencies and municipalities alike. Sediment can cause stormwater infrastructure failure as well as jeopardize water quality within streams. Examples of causes of soil erosion are described below.

### 4.4.1 Construction Activities

Uncontrolled soil erosion from construction activities can generate large quantities of sediment. Measurements of sediment yields in streams have indicated that watersheds under development contribute 5 to 200 times as much sediment as stable urbanized watersheds (IEPA, 1987). The conveyance of eroded sediment offsite can cause severe problems downstream. These problems may include:

- Loss of Floodwater Conveyance and Storage – Excess sediment from construction sites can deposit and fill in roadways, storm sewers, ditches, detention basins, wetlands, streams and river channels, eliminating storage and conveyance capabilities, and damaging vegetation. This accumulated sediment can cause or exacerbate drainage and flood problems. Removal of deposited sediment can be expensive.

- Water Quality Impairment – Sediment from construction sites reduces water clarity that can limit the presence of game fish and reduce sunlight penetration, thereby limiting photosynthesis of aquatic plants. Sediment wash-off from roadways transfers nutrients and pollutants to downstream lakes and rivers, degrading habitats by burying natural substrates which causes damage to spawning areas of aquatic organisms. This increases water supply treatment costs where the water body is a source of drinking water.

- Safety and Nuisance Problems – Sediment on roadways, conveyed either by wash-off from construction sites or tracked by construction traffic, can be a hazard. Dust generated at uncontrolled construction sites is a nuisance, depositing on neighboring properties, clogging air filters, and aggravating respiratory difficulties.

### 4.4.2 Streambank Erosion

Erosion and deposition of sediment within a stream are natural processes. In a stable stream, erosion and deposition are generally in equilibrium, and stream characteristics remain relatively constant over time. The processes of erosion and deposition can be greatly accelerated as watersheds urbanize, causing stream characteristics to change rapidly while adjusting to the changing hydrologic conditions. Vegetation surrounding the stream and within the stream's watershed plays a critical role in erosion. Streambank erosion tends to originate at the toe when there is shallow-rooted or no vegetation to reduce the velocity of flow and protect the bank. Vegetation binds the soil together, and is needed to support a steep bank slope. For the vegetation to be effective in protecting streambanks, roots must extend deeply into the soil. Shallow root systems associated with lawns do not extend more than a few inches deep, binding only the top layer of soil and doing little to prevent bank failure.

Excessive woody vegetation, such as buckthorn thickets, suppresses the growth of desirable herbaceous groundcover that stabilizes the soil.

Armoring streams with hard materials, such as rip-rap, gabion baskets or concrete lining can solve local erosion problems, but the materials are generally not natural looking. These techniques may cause increased downstream erosion due to increased channel flow velocity. Armoring alone tends to transmit flow energy downstream rather than absorb the energy as vegetation will. An alternative to armoring streams can be to employ bioengineering methods. The method selected will be dependent on many factors, including flow velocity. For example, bioengineering methods may not be appropriate for streams with a high velocity of flow.

Excessive streambank erosion creates water quality and infrastructure concerns. In urban areas, severe streambank erosion can result in loss of adjacent property, threaten the structural stability of adjacent structures, and reduce habitat value.

New developments and redevelopments should be encouraged to restore, to the extent possible, eroded stream sections within the project area to their original condition to decrease streambank erosion.

## 4.5 Effects of Urban Development and Redevelopment

Urban development has characterized much of Cook County's history. Much of this development occurred many years ago, and redevelopment of urban areas is now common. Urban development and its associated stormwater runoff directly and indirectly affect water bodies and other valuable natural features both during and after construction. Some of these impacts occur from modifying or filling in streams, lakes and wetlands. Other impacts occur downstream of developments, resulting from changes in the quality and quantity of stormwater runoff. Some common impacts of urban development and redevelopment are listed below:

### 4.5.1 Development Activity in Streams, Lakes and Wetlands

Although less common due to current local regulations, some developments directly impact water bodies and wetlands. Development activity may include conversion of wetlands to detention basins, dredging of wetlands to create open water, removal of native vegetation, and elimination of adjacent buffers. Some streams are channelized, rerouted, or conveyed through extended culverts. These activities destroy critical aquatic habitats and impair other valuable environmental functions. These impacts are summarized below:

- Destruction of Aquatic and Terrestrial Habitat – Draining, straightening, filling and dredging of natural water bodies and wetlands adversely affect habitat for fish and wildlife. While natural streams help to preserve water quality, replenish water tables, and help maintain wetland hydrology, channelized streams tend to have the opposite effects.

- Loss of Habitat Diversity – In addition to short-term effects caused by construction, a reduction in habitat diversity is often long term as spawning and breeding areas are eliminated. Construction activities might address streambank erosion with stabilization technologies, but not the habitat needs of aquatic life and wildlife.

- Water Quality Impairment – As discussed in Section 4.4, construction activities within water bodies and wetlands can affect water quality. The long-term effects of construction activities relate primarily to the elimination of vegetation and other natural materials. The typical consequences of these alterations include reduced shading and an increase in water temperature, reduced capacity for pollutant filtering, and an increased propensity for soil instability and erosion.

- Alterations of Natural Storage and Conveyance – State and federal regulations place constraints on the degree of alteration in floodplains and wetlands, but even permitted activities can have adverse impacts by altering the function of a stream or wetland. Typical consequences include reduction in stream roughness and length caused by channel modifications and loss of stormwater storage caused by draining or filling of small wetlands and depressions.

With the increasing trend in Cook County to tear down aging buildings and redevelop the site, there are opportunities for restoring floodplains and wetlands. Rather than maintaining negative conditions that development has caused in a floodplain or wetland, redevelopment can create an opportunity for additional setback buffers or native restoration. The importance of redeveloping with an emphasis on stormwater management is further discussed in Section 7.11.

### 4.5.2 Changes to Runoff Rates and Volumes

Developments alter runoff patterns by converting pervious land to impervious land, as well as by changing the lay of the land and drainage patterns. When this results in a shift of groundwater-dominated hydrology to surface water-dominated hydrology, a dramatic increase in the rate and volume of stormwater runoff and a reduction in groundwater recharge also result. Along with changing land cover and layout, construction activities compact soils, smooth natural grades, diminish native vegetation, and add storm sewers and lined channels that convey greater volumes of runoff downstream at much faster rates. Changing runoff rates and volumes can create these typical impacts:

- Increase in Flooding – Without stormwater detention, flow rates have been shown to increase by 100 to 200 percent or more as a watershed is urbanized. Although detention basins can essentially eliminate increases in flow rates, cumulative increases in runoff volumes over the entire watershed decrease detention effectiveness.

- Stream Channel Erosion – Without the detention basins, increased rates of runoff create higher channel velocities, leading to destabilization of streambanks. The impacts are compounded as more development occurs in a watershed.

- Hydrologic Destabilization of Streams – Development generally results in higher and more frequent storm flows, and in dry seasons, lower flows of longer duration. The more frequent the high flows and accompanying high velocities, the more natural substrates and bottom dwelling organisms are flushed away. Reduced low flows tend to concentrate stream pollutants and reduce the stream depths on which aquatic life relies. Extended low flows can result in higher summertime water temperatures that further stress aquatic life. Previously perennial streams may dry up, killing resident organisms.

By implementing alternative development methods, the increase in runoff rates and volumes for a development may be minimized. This is further discussed in Section 7.9.

### 4.5.3 Degraded Quality of Runoff

Construction activities degrade the water quality of the runoff itself, causing increases in pollutants such as sediment, heavy metals, petroleum-based hydrocarbons, nutrients, pesticides, chlorides, bacteria, and oxygen-demanding organic matter.

Much of the pollutant load in runoff originates from impervious surfaces, particularly roadways and parking lots, and is related to automobile traffic. Higher density developments such as commercial, industrial and highway projects tend to contribute higher pollutant loads than lower-density residential developments. Another important factor that changes the level of pollutants in runoff from developments is the loss of natural filtering functions of the site.

Some common water quality impacts of stormwater runoff:

- Sediment Contamination – The bottom substrates of water bodies can become coated with a layer of contaminated sediment. The pollutants in the sediment may be toxic to some sensitive organisms due to elevated concentrations of pesticides, heavy metals and petroleum based organic compounds. These pollutants tend to attach to the smallest particles, the ones most readily entrained and transported by runoff and the most difficult to remove from it. Urban runoff sediments may have a high organic content that exerts a high oxygen demand as it decomposes in receiving water bodies.

- Nutrient Enrichment – Pollutant loads of phosphorus and nitrogen in urban runoff are substantially higher than in runoff from undeveloped lands. High levels of these nutrients in lakes and slow moving rivers can stimulate excessive growth of algae and other undesirable aquatic plants. This growth can impair aesthetics, water quality, and recreational uses of the water body.

- Toxicity to Aquatic Life – Pollutant concentrations in urban runoff often exceed water quality standards. Although data are not conclusive in showing that these pollutants occur in concentrations acutely toxic to aquatic life, evidence indicates adverse impacts from chronic exposure and accumulation of pollutants in the tissue of sensitive organisms. High water temperatures and low dissolved oxygen levels may increase the toxicity problem. Dissolved oxygen may be reduced to low levels by the decomposition of organic matter that is washed into the water by storm events, especially in summer.

- Bacterial Contamination – After storm events, the water quality standard for fecal coliform bacteria is frequently violated in urban water bodies. The violation of this standard generally reflects the presence of significant animal or human waste in the water, and is commonly used as a criterion for closing swimming beaches.

- Salt Contamination – Salts used for deicing roads can result in extremely high salinity levels in storm sewers, roadside ditches and downstream water bodies. While salinity levels are typically not high enough to be acutely toxic to fish and other aquatic organisms, they may adversely affect sensitive plant communities, particularly wetland species.

- Impaired Aesthetic Conditions – Urban runoff carries refuse and other discarded matter that may impair the visual appeal and clarity of receiving water bodies. Apart from sediment, trash and debris, this includes suspended solids, oil and grease that reduce the recreation potential of urban water bodies.

- Elevated Water Temperatures – Watershed urbanization causes increases in summertime temperatures of receiving streams. This effect is due to a number of factors, including the removal of natural shading and the reduction of baseflows. Runoff from impervious surfaces that have been heated by the sun raises the temperature. When streams are destabilized, the elevated water temperatures stress aquatic life and exacerbate water quality problems.

## 4.6 Flooding

Flooding is the primary motivator for preparing watershed plans and initiating countywide stormwater programs and projects.

Historical flooding prompted legislation for other northeastern Illinois counties and Public Act 93-1049. One such flood was the July 1996 flood that resulted from extremely heavy rainfall over northern Will County and the southern portions of Kane, DuPage, and Cook counties. The heaviest rainfall was centered over Aurora where 16.9 inches of rainfall was reported in less than 24 hours. This is the second highest rainfall ever recorded anywhere in the United States, excluding areas affected by hurricanes. Many of the creeks and rivers in northeastern Illinois reached record high stages. Over 400 residences were reported to have experienced first floor flooding.

Floods are a natural occurrence; flood damage is not. Floods create flood damages only when they cause destruction by inundating developed areas. Floods damage buildings and infrastructure, threaten health and safety, destroy agricultural crops, and disrupt business and traffic. Flooding is not limited to mapped floodplains. Flooding in Cook County can be caused from different sources and can happen any time of the year. Some examples of flooding include:

- Overbank flooding – The most common and most damaging floods occur along Cook County's rivers and streams. This is commonly called overbank flooding. This type of flooding occurs when flow in the stream exceeds the stream's capacity and flood waters spill into the floodplain. In highly urbanized areas of the county, flash flooding can occur where impervious surfaces, gutters and storm sewers speed runoff to the streams. Overbank flooding can cause property damage to structures built in the floodplain or near floodplains.

- Localized Drainage-Related Flooding – Many flooding problems occur from localized drainage problems. These problems are usually caused by heavy local rains and are often not related to overbank flooding or floodplain locations. In isolated depressional areas where water ponds with no gravity outlet, the area will remain flooded until the saturated ground drains and accepts additional water or the water evaporates. This problem is often exacerbated by high water tables where only a small amount of runoff can infiltrate into the ground.

  Other localized drainage problems stem from areas where flood routes are not well defined or have become blocked. Many subdivisions are designed with a reliance on side-yard or rear-yard swales that become filled or blocked by fences, gardens, pools and other incidental structures and landscaping. These obstacles lower the effectiveness of overland flow routes. Due to the relatively flat topography of Cook County and the level of urbanization, localized flooding is common.

- Combined Sewer Overflow – Combined sewer systems accept stormwater runoff in addition to normal sanitary flow. The combined flow can surcharge and backup into basements and roadways, and can overflow into water bodies, creating health and pollution risks.

  To prevent flooding within combined sewer areas, the District developed the Tunnel and Reservoir Plan (TARP). TARP consists of two phases, the tunnels (Phase I), which are a water pollution control project, and the reservoirs (Phase II), associated primarily with urban flood control. There are approximately 109 miles of tunnels ranging in size between 9 feet and 33 feet in diameter constructed 150 to 350 feet below grade. The tunnels intercept combined sewage from existing overflow points and convey the water to pumping stations. The pumps direct the flow to treatment plants where the water is treated before being discharged into adjacent waterways. There are three flood control reservoirs associated with TARP, O'Hare CUP Reservoir, Thornton Composite Reservoir, and McCook Reservoir. These three reservoirs will have a combined storage volume of approximately 47,850 ac-ft of flood storage upon completion.

Flooding must be distinguished from flood damages. Flooding is a natural, regularly occurring phenomenon. The aim of the countywide stormwater management program is to allow floods to occur while flood damage to property is minimized.

## 4.7 Water Quality and Water Body Use Impairment

Significant data is available from IDNR-OWR and IEPA on stream and water quality in Cook County. The information on stream and lake quality in the findings was generally taken from the April 2006 Illinois Integrated Water Quality Report and Section 303(d) List prepared by IEPA.

IEPA developed the list in Section 303(d) to:

- Identify waters that will not attain applicable water quality standards with technology-based controls alone.

- Identify waters for which controls on thermal discharges are not stringent enough to achieve water quality standards for the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife.

- Establish a priority ranking for such waters, taking into account the severity of pollution and the uses to be made of such waters.

- Target waters for development of Total Maximum Daily Loads (TMDLs) that should be initiated before the next biennial reporting period.

The list is updated every two years, with stretches of water added or subtracted based on an IEPA prioritization. The assessment of streams is based on a combination of data—chemical (water, sediment and fish tissue), physical (habitat and flow discharge), and biological (macroinvertebrate, macrophyte, algal and fish). Once a water body has been identified on the list with a high priority, a TMDL must be developed for each pollutant. Although every watershed named in Public Act 93-1049 is identified on the 303(d) list, only Upper Salt Creek has a TMDL.

The TMDL sets the pollutant reduction goal necessary to improve impaired waters. IEPA develops computer models with the sampling data to determine the amount of specific pollutants each source contributes, calculates the amount that each pollutant must be reduced, and specifies how the reduced pollutant load would be allocated among the different sources. An implementation plan can be developed for the watershed describing the actions necessary to achieve the goals, specifying limits for point source discharges and recommending Best Management Practices (BMPs) for non-point sources.

Common pollutants found in Cook County watersheds and their potential sources are summarized in Table 4.1. The IEPA 2006 report lists at least one stretch of the main branch river for all six Cook County watersheds. The 303(d) list is further summarized in Appendix B. It is expected during the development of the Detailed Watershed Plans (DWPs), a summary of this information will be provided.

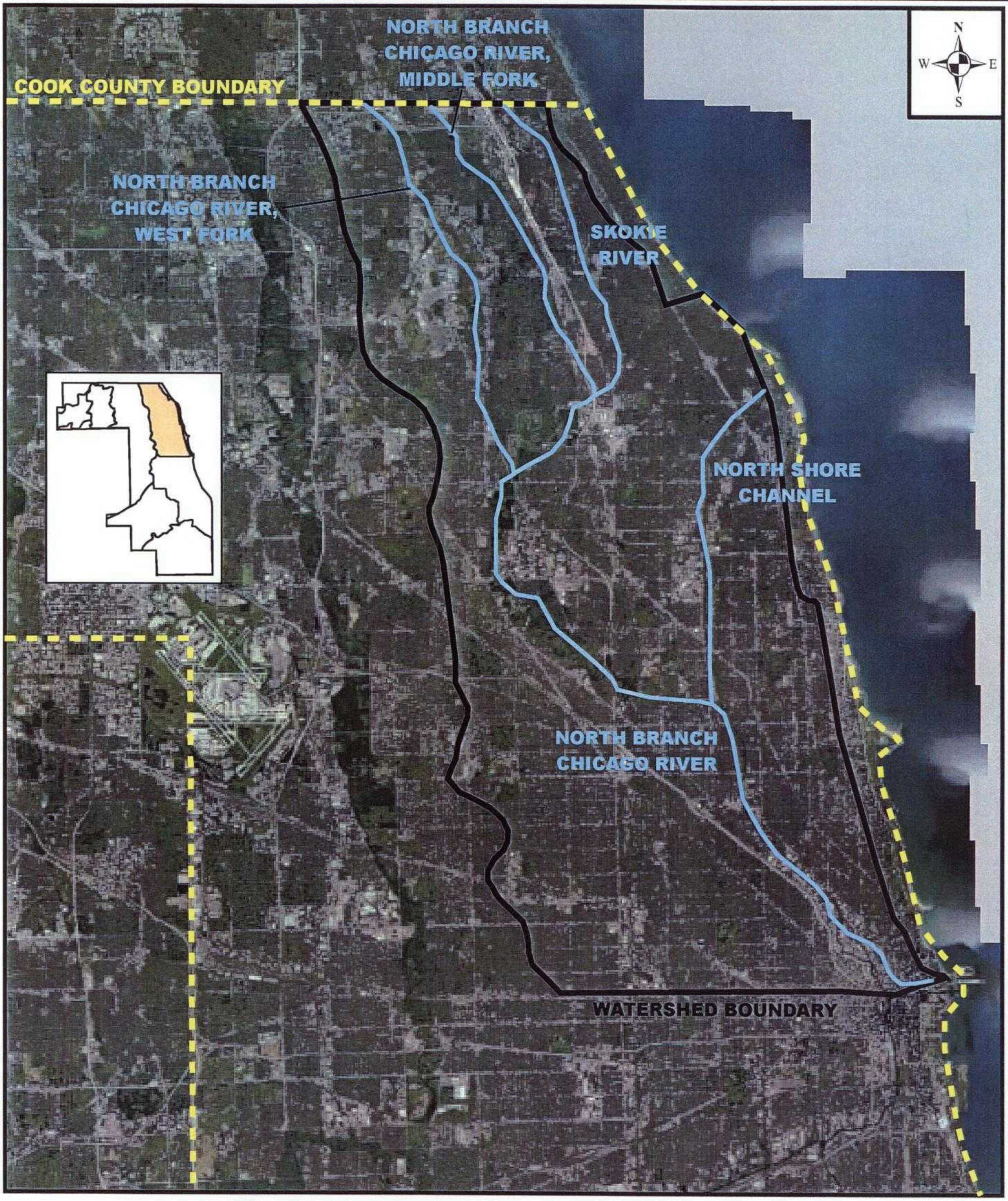
Table 4.1 Common Pollutants from Section 303(d) Listings for Cook County Watersheds

| Pollutant | Potential Source |
|---|---|
| Total Dissolved Solids | highway/road/bridge runoff (non-construction related), urban runoff/storm sewers, combined sewer overflows, municipal point source discharges, sanitary sewer overflows |
| Total Suspended Solids | combined sewer overflows, sanitary sewer overflows, site clearance (land development or redevelopment), urban runoff/storm sewers |
| Sedimentation/Siltation | combined sewer overflows, sanitary sewer overflows, site clearance (land development or redevelopment), urban runoff/storm sewers |
| Dissolved Oxygen | channelization, combined sewer overflows, upstream impoundments, impacts from hydrostructure flow regulation, sanitary sewer overflows |
| Nitrogen (Total) | combined sewer overflows, municipal point source discharges, sanitary sewer overflows |
| Phosphorus (Total) | combined sewer overflows, sanitary sewer overflows, municipal point source discharges, urban runoff/storm sewers |
| Chlorine | combined sewer overflows, highway/road/bridge runoff (non-construction related), municipal point source discharges, urban runoff/storm sewers |
| Iron | combined sewer overflows, industrial point source discharges, municipal point source discharges, urban runoff/storm sewer |
| Silver | combined sewer overflows, municipal point source discharges, urban runoff/storm sewers, contaminated sediments |
| DDT | contaminated sediments |
| Heptachlor | contaminated sediments |
| Hexachlorobenzene | contaminated sediments |
| Aldrin | contaminated sediments |

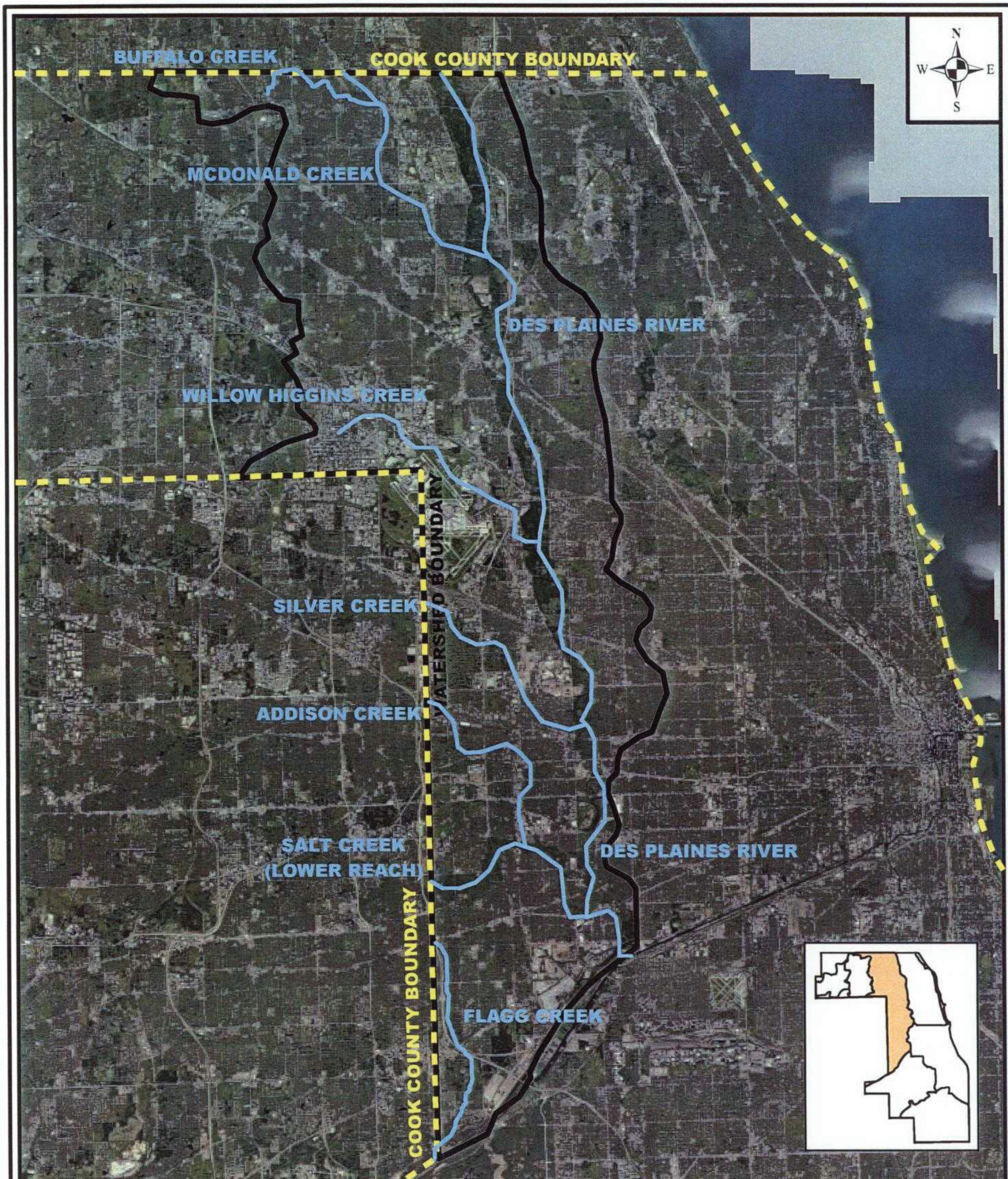
There is a strong relationship between stream quality and the level of urbanization in Cook County. The data suggests that stream quality has declined as urbanization has increased, and progressive new development standards should be encouraged that address the quantity and quality of runoff from urban development. Water quality standards will better protect the habitat of streams and wetlands to preserve high quality streams and protect their beneficial uses in the face of future urbanization and redevelopment.

## 4.8 Summary

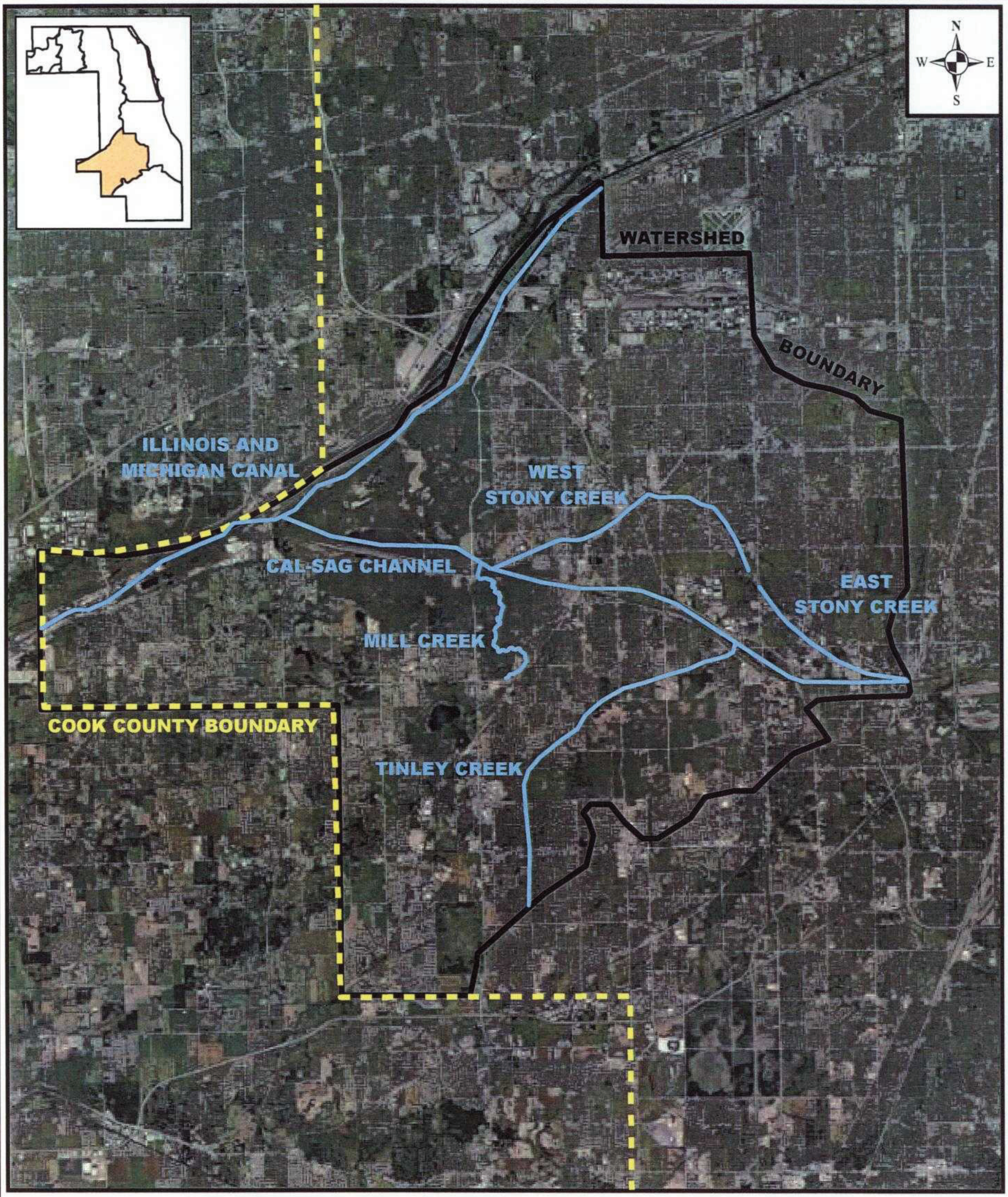
Significant flooding problems are generally limited to urbanized areas of Cook County though soil erosion, sedimentation and water quality problems are countywide. Without adequate stormwater controls, these problems are likely to continue as the county population grows, rural lands diminish, and developed areas continue to redevelop.




| | | |
|---|---|---|
| COOK COUNTY STORMWATER MANAGEMENT PLAN | NORTH BRANCH CHICAGO RIVER WATERSHED | EXHIBIT 4-1 |




| COOK COUNTY STORMWATER MANAGEMENT PLAN | LOWER DES PLAINES RIVER WATERSHED | EXHIBIT 4-2 |
|---|---|---|

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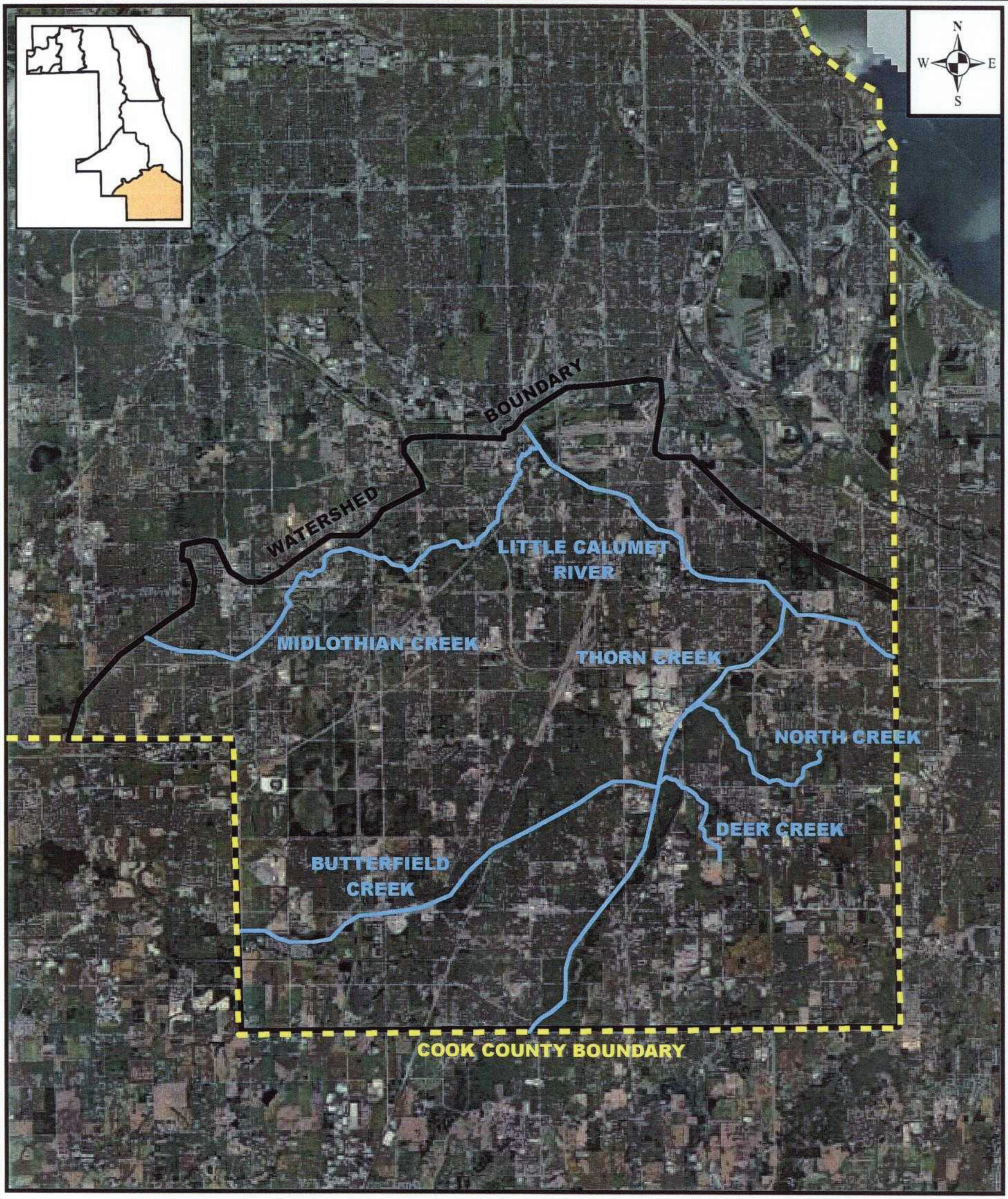
|---|---|---|
| COOK COUNTY STORMWATER MANAGEMENT PLAN | CAL-SAG CHANNEL WATERSHED | EXHIBIT 4-3 |

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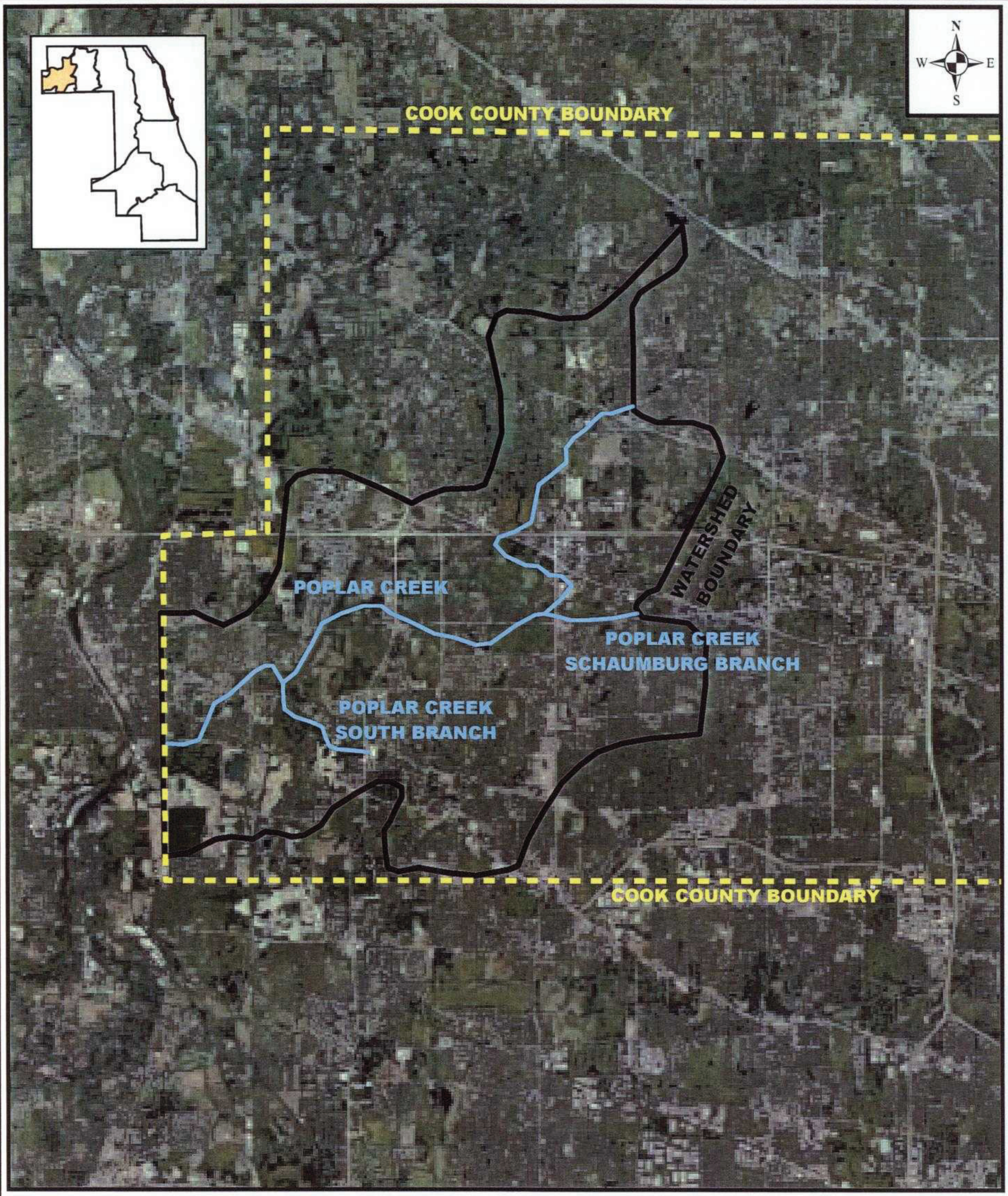
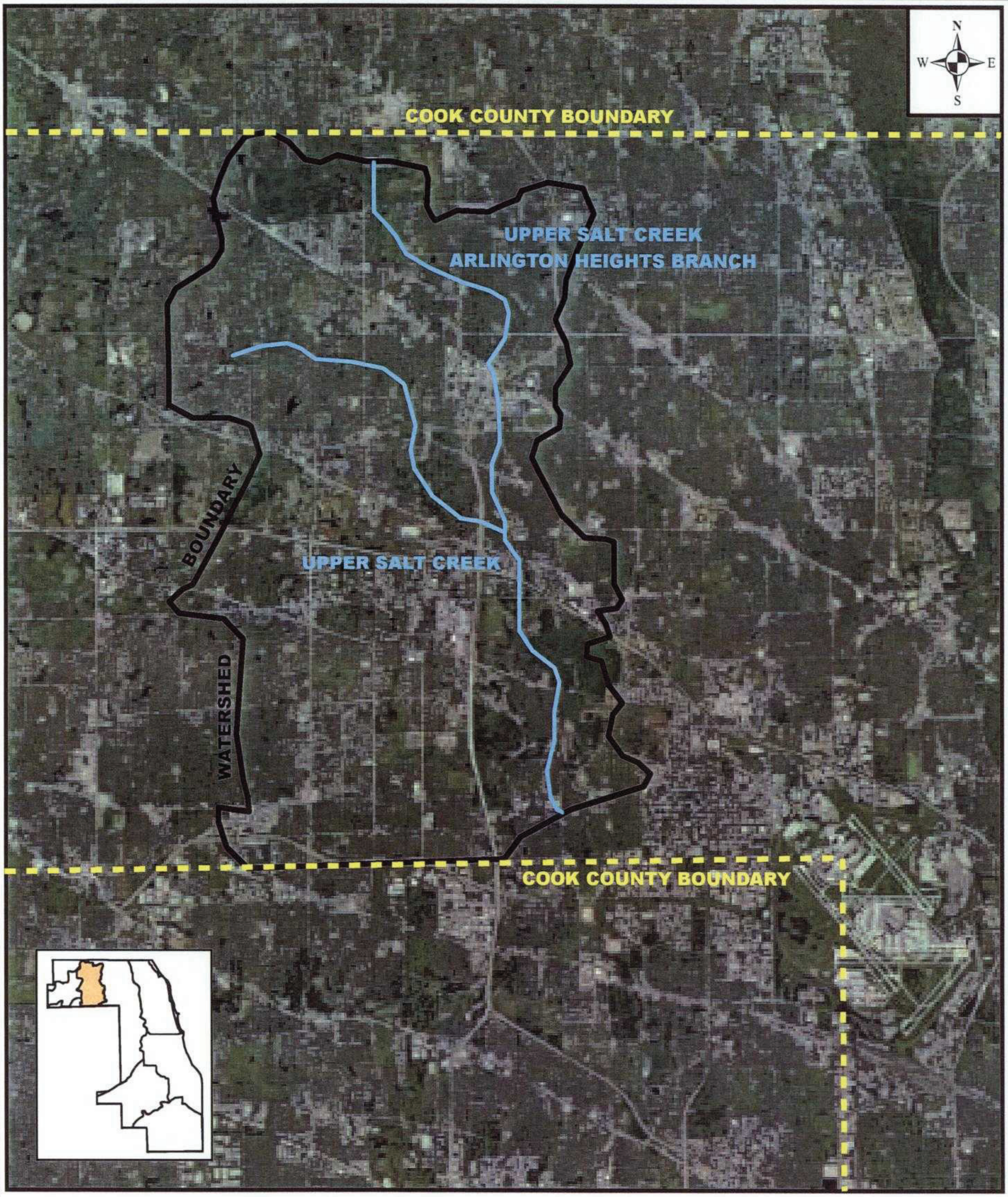
| COOK COUNTY STORMWATER MANAGEMENT PLAN | LITTLE CALUMET RIVER WATERSHED | EXHIBIT 4-4 |




| COOK COUNTY STORMWATER MANAGEMENT PLAN | POPLAR CREEK WATERSHED | EXHIBIT 4-5 |
|---|---|---|

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|---|---|---|
| COOK COUNTY STORMWATER MANAGEMENT PLAN | UPPER SALT CREEK WATERSHED | EXHIBIT 4-6 |

# CHAPTER 5
# COUNTYWIDE STORMWATER MANAGEMENT PROGRAM

## Acronyms used in Chapter 5:

| | |
|---|---|
| ADID | Advanced Identification of Wetlands |
| CCHD | Cook County Highway Department |
| CCSMP | Cook County Stormwater Management Plan |
| CRS | FEMA's Community Rating System |
| DWP | Detailed Watershed Plan |
| FEMA | Federal Emergency Management Agency |
| FCCC | Flood Control Coordination Committee |
| FPDCC | Forest Preserve District of Cook County |
| GIS | Geographic Information System |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| IDNR-SWS | Illinois Department of Natural Resources - State Water Survey |
| NFIP | National Flood Insurance Program |
| NWI | National Wetlands Inventory |
| SSMP | Small Stream Maintenance Program |
| TGM | Technical Guidance Manual |
| USACE | United States Army Corps of Engineers |
| USEPA | Untied States Environmental Protection Agency |
| USGS | United States Geological Survey |
| WMO | Watershed Management Ordinance |
| WPC | Watershed Planning Council |

CHAPTER 5

# COUNTYWIDE STORMWATER MANAGEMENT PROGRAM

## 5.1 Introduction

To accomplish the mission and the goals of this plan, which are presented in Chapter 1, a stormwater management program has been designed to provide comprehensive planning, uniform standards, and consistent levels of service throughout the county. The establishment of this countywide framework is important for several reasons:

- Local actions can have impacts throughout an entire watershed.
- There are economies of scale associated with coordinated countywide efforts such as watershed planning, public education and technical training.
- Federal and state funding agencies have emphasized the importance of watershed approaches.
- As the agency with responsibility for countywide stormwater management, the District is in a position to demonstrate that projects for which funding is being sought are appropriate and have been coordinated at the watershed level.

This chapter outlines the framework for the countywide stormwater management program for Cook County. The program includes these functional areas:

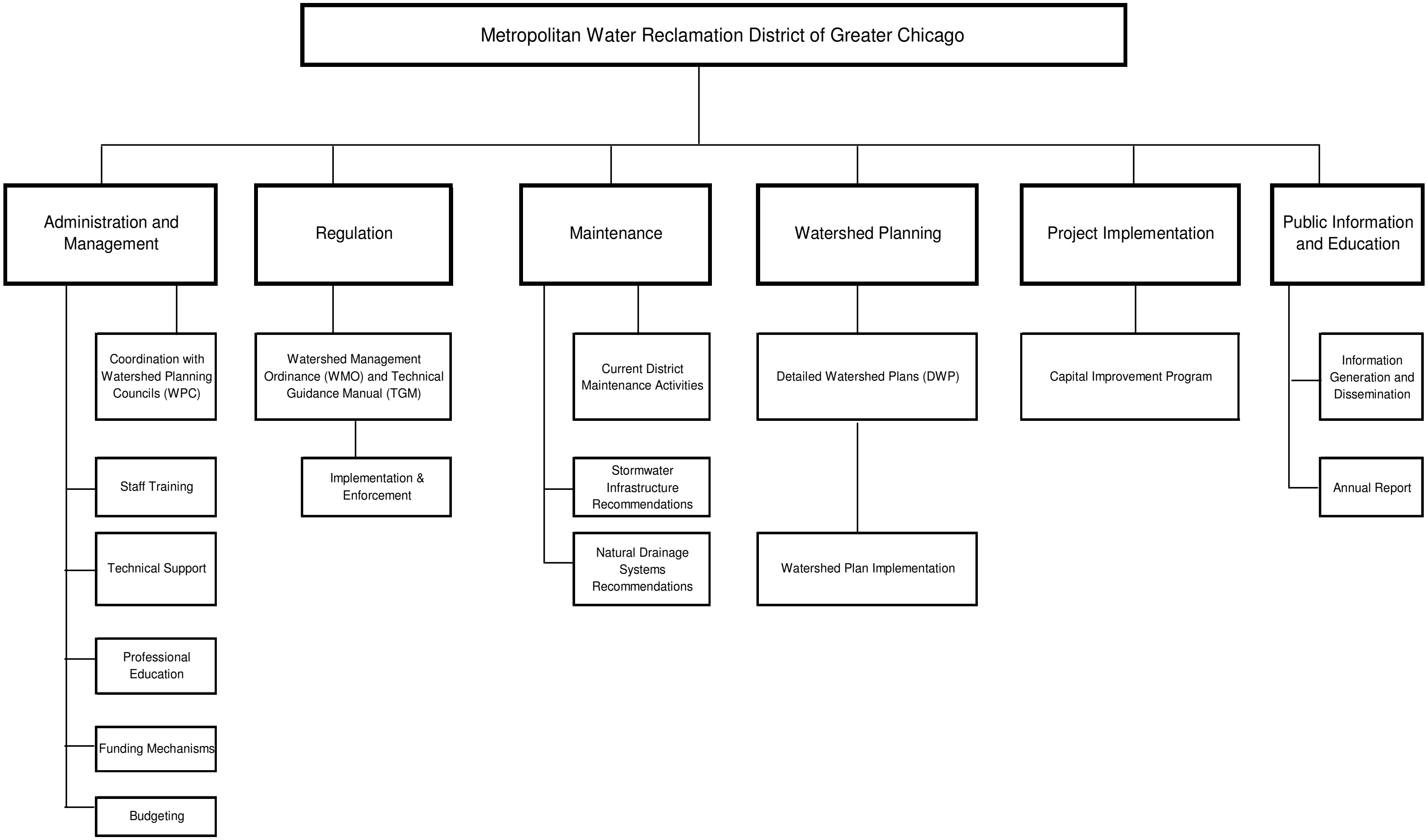
- Administration and Management
- Regulation
- Maintenance
- Watershed Planning
- Project Implementation
- Public Information and Education

Exhibit 5-1 presents the countywide stormwater management program framework. The program areas are discussed in the following sections.

## 5.2 Administration and Management

Several administration and management functions will support the countywide stormwater management program framework. The administration and management functions will provide countywide coordination of the stormwater management program, identify funding mechanisms for stormwater activities, and develop and maintain a program budget.

*Exhibit 5-1 Countywide Stormwater Management Program Framework*



### 5.2.1 Coordination with Watershed Planning Councils

The District will coordinate with the Watershed Planning Councils (WPCs) as the stormwater management program is developed. The WPCs will advise the District on regulatory, maintenance, and watershed planning issues as they relate to their respective watersheds. The District has the authority to provide cooperating organizations and agencies with funding for assistance in the stormwater program. The District currently provides funding to the municipal conferences for their roles in the coordination of the WPCs. Further discussion on the WPCs and municipal conferences can be found in Chapter 1.

### 5.2.2 Assign and Train Staff

The District will assign sufficient staff to manage the countywide stormwater management program and to implement the elements of the Cook County Stormwater Management Plan (CCSMP). Adequate resources will be allocated to provide for periodic training and participation in regional stormwater management forums to ensure the District's staff remains current on the latest technologies and practices.

### 5.2.3 Provide Technical Support

The District will provide important technical support to municipalities, townships, and developers, as well as to individual citizens. Technical assistance will be offered in such areas as ordinance review and implementation, and waterway/stormwater facility maintenance and management. It will be vital that the District have knowledgeable staff well trained in all areas of stormwater management to serve in this role.

### 5.2.4 Funding Mechanisms

This program element includes developing funding mechanisms to support the stormwater management program activities, developing an annual program budget, and implementing the capital program. The enacting legislation charging the District with the responsibility of stormwater management for Cook County, Public Act 93-1049, gives the District the authority to levy a tax and to issue bonds for the development and administration of countywide stormwater management. Although the District's authority for the program applies to all of Cook County, the tax levy is only applicable to commercial and private property located within the District's corporate limits. The District's stormwater management program is currently funded by the stormwater tax levy. The District will utilize the stormwater tax levy and additional funding mechanisms to finance the countywide program. Some specific activities and potential funding mechanisms are described below:

Countywide activities:

- Stormwater tax levy and fees
- Permit application fees (for permit review and enforcement)
- Project cost-sharing with federal and state agencies
- Project cost-sharing with municipalities and townships
- Grants from state and federal agencies

Watershed projects:

- Stormwater tax levy and fees
- Project cost-sharing with federal and state agencies
- Project cost-sharing with municipalities and townships

- Grants from state and federal agencies
- Bond issues

Developing adequate funding of the stormwater management program is a high priority. While grants may be used to supplement the program, other sources of funding will establish a consistent level of service and allow for long-term planning and implementation of the program. Some of the identified funding alternatives are discussed below:

Stormwater Taxing Authority - The District has the authority to levy a tax for the development and implementation of the stormwater management program within the District's corporate limits.

Stormwater Fees - The District has the authority to impose fees in areas outside the District's corporate boundaries, but within Cook County.

Permit Application and Review Fees - Once the Watershed Management Ordinance (WMO) is adopted, permit review and inspection will be funded through permit application and permit review fees. This is consistent with the way many communities fund permit review and enforcement activities. Fees will be established based on such factors as the type and complexity of permit and the area of development or disturbance. The fees will offset expected staff time to review permits, make routine site inspections and other enforcement activities.

Project Cost-Sharing with Federal and State Agencies - The District will work in cooperation with federal and state agencies to cost-share on stormwater management projects. In some cases, the District will pursue federal and state cost-share funds. In other cases, the District will serve as the local sponsor, or local match, for federal or state sponsored projects.

Project Cost-Sharing with Municipalities and Townships - The District will work in cooperation with municipalities and townships to cost-share on stormwater management projects. In some cases, the District will take the lead on the engineering and/or construction of local stormwater management projects. In other cases, the District will provide funding towards engineering and/or construction of local stormwater management projects to be led by a municipality or township.

Bond Issue - The District has the authority to issue bonds for funding stormwater management projects.

Grants and Other Outside Funding -The District will pursue grants and other outside sources to fund stormwater activities and projects. Grants will be a valuable supplement to enhance the activities of an ongoing program and to fund larger capital projects.

### 5.2.5 Budgeting

The stormwater management program budget is developed on an annual basis as part of the District's overall budget. As the District's countywide stormwater management program evolves, so will the elements of the program's budget.

The stormwater management program budget is used to finance the following:

- Administrative costs – includes employee salaries and training
- Planning – includes watershed plans, development of the countywide regulatory ordinance, and implementation of a geographic information system
- Maintenance – includes the Small Stream Maintenance Program (SSMP) and District's stormwater maintenance responsibilities which predated the enactment of Public Act 93-1049. The SSMP is further discussed in Section 5.4.
- Capital Improvement Projects

The allocation of stormwater management funds will change from year to year as the program grows and priorities shift. However, it is anticipated that a majority of the funding will be allocated to capital projects as the Detailed Watershed Plans (DWPs) are completed.

## 5.3 Regulation

Effective stormwater management requires a regulatory framework to support its program goals. Chapter 2 describes the existing framework for stormwater management in Cook County and the governmental resources available to implement the CCSMP. Given this framework, this section focuses on the procedures needed to develop and implement the regulatory program.

Most comprehensive regulatory programs make use of two primary types of regulatory controls: land use restrictions and design standards. The CCSMP has been developed utilizing combinations of both types.

Land use restrictions are generally used to protect sensitive landscape features such as floodplains and wetlands. The restrictions are intended to preserve the natural functions of these areas, such as stormwater storage and flow control, as well as to prevent damages to property should building occur in these areas. Design standards are primarily used to control the rate and volume of stormwater runoff and are intended to minimize the impact of development on downstream areas.

In the countywide stormwater management program, the stormwater goals from the CCSMP that require an action or response, such as establishing uniform, minimum, countywide stormwater management regulations, will be mandated by ordinance.

Developing a countywide regulatory program involves drafting and adopting a countywide ordinance which sets standards that apply to both incorporated and unincorporated areas, preparing a technical manual to support the ordinance, instituting a structure to enforce the ordinance, and establishing a means of funding the program. Stormwater management concepts that will be considered in the development of the regulatory program are outlined in Chapter 7 and the components of the program are described below.

### 5.3.1 Prepare and Adopt a Watershed Management Ordinance

To provide a consistent level of protection throughout the county, a program for uniform countywide regulation and enforcement will be developed. A WMO will be developed for countywide use. It is anticipated that the WMO will specify standards for stormwater drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection in a single document. The District will seek input from the WPCs along with various agencies and stakeholders as the WMO is developed. In addition, the District will review the model ordinances drafted by the Chicago Metropolitan Agency for Planning as well as the ordinances currently being enforced in neighboring counties.

### 5.3.2 Prepare Technical Guidance Manual

In support of the WMO, a Technical Guidance Manual (TGM) will be developed to provide guidance in meeting the ordinance. The TGM will include guidance on intent and interpretation of the ordinance as well as guidance on design methodologies and procedures. The TGM and the WMO may be updated from time to time as new information becomes available and as experience is gained in implementing the ordinance.

### 5.3.3 Institute Ordinance Implementation and Enforcement Structure

The WMO and TGM will be applicable for all of Cook County, including unincorporated areas and areas outside of the District's corporate limits. Municipalities will have the ability enact regulations which are more stringent than the WMO.

In implementing the WMO, the District will maintain responsibility for all permit and enforcement activities, and it will consider developing a mechanism for delegating that responsibility to interested municipalities. Interested municipalities that adopt requirements at least as stringent as the WMO, and have demonstrated qualifications, may receive certification from the District to implement the WMO, in whole or in part, including the responsibility for permit review and enforcement within their jurisdiction. The District would review permits and constructed facilities periodically and retain the authority to retract certification where enforcement problems exist.

This approach utilizes local knowledge and access to development sites combined with the District's responsibility to ensure that watershed perspectives are considered, to provide technical assistance, and to enforce the WMO consistently throughout the county. The District will be responsible for permit review and enforcement in those municipalities not desiring or qualifying for certification. The Cook County Highway Department may wish to continue to be responsible for permit review and enforcement in unincorporated Cook County.

For certain wetlands and floodplain modifications, permit applications are currently reviewed and enforced by the United States Army Corps of Engineers (USACE) and the

Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR), respectively. The District will continue to utilize the services of the USACE and IDNR-OWR for reviewing such modifications, however the District may develop arrangements with the USACE and the IDNR-OWR to coordinate and expedite reviews of the permits by undertaking some of the tasks of the review process. At the time of ordinance adoption, the specific wetland and floodplain activities that can be delegated to the municipalities will be established.

Although reviews of many permits may be delegated to the municipal level, there may be provisions for pre-application meetings involving developers and both municipal and District staff, particularly for larger developments. This will provide the necessary degree of watershed review and regional perspective as well as take advantage of the technical expertise of the District's stormwater staff. The District may maintain a database of all stormwater management permits issued within Cook County. This resource will be accessible for pre-application meetings and will streamline incorporation of development data into the watershed planning process.

### 5.3.4 Applicability to Dual-County Communities

A number of Cook County municipalities have corporate boundaries in Cook County and in adjacent counties and are considered to be dual-county communities. Cook County shares boundaries with Lake, McHenry, Kane, DuPage and Will Counties in Illinois. These five counties have established countywide stormwater management programs and have adopted countywide stormwater management regulatory ordinances. As the WMO is developed, consideration will be given to determine the most appropriate approach to address regulations within the dual-county communities. If a dual-county community has adopted an adjoining county's stormwater ordinance that is enforced through the entire municipality, and if that ordinance is at least as restrictive as the WMO, the existing ordinance may be allowed to stay in place in the Cook County portion of the community. The District will request advice on this issue from the WPCs during the WMO development process.

### 5.3.5 Coordinate Professional Education

To achieve the goals of this plan as well as the regulatory standards of the future WMO, training will be needed for site planners, design engineers, and landscape architects in site design to minimize stormwater-related impacts. Training will be provided by the District and may be coordinated with professional organizations in the region. In addition, the District will solicit input from and work with existing countywide stormwater programs to assist in achieving the goals of this plan.

### 5.3.6 Fund Regulatory Activities

Permit review and enforcement activities will be funded through permit application and review fees. Should a system for delegating certain permit review responsibilities be implemented, one way to fund municipalities' permit review activities would be to have certified municipalities receive permit fees, in an amount to be determined by the District, for activities within their jurisdiction. A percentage of each permit application fee could be used to fund the District's oversight role, including pre-application meetings and periodic delegation reviews. The District would retain the full permit fee for those developments that it reviews. Since the WMO and the TGM will apply countywide and must be prepared in advance of enforcement, preparation of these documents will be financed through the stormwater tax levy which supports the District's stormwater management program.

## 5.4 Maintenance

Maintenance of a stormwater management system is an important way to reduce damage that can occur during storm events and to preserve and enhance natural drainage systems. Newly constructed stormwater facilities must be maintained so they function as designed. Natural drainage systems need to be maintained to prevent excess debris accumulation and erosion, ensuring that they provide adequate conveyance and support a full range of natural functions.

Stormwater infrastructure includes structures such as reservoirs, detention basins, storm sewers and catch basins. Natural drainage systems include rivers, streams and channels. While some streams have been modified, they are considered part of the natural system of conveying flows through a watershed.

### 5.4.1 Current Maintenance Activities

The District periodically inspects 32 flood control facilities located within Cook County. In addition, the District shares responsibilities for the maintenance of some of these flood control facilities with communities, park districts and other agencies. The District also maintains certain reaches of waterways and streams located in Cook County. The District will continue to conduct these maintenance activities for the aforementioned flood control facilities, waterways, and streams as part of the countywide stormwater management program.

### 5.4.2 Maintenance for Stormwater Infrastructure

The District will work with the WPCs to ensure that infrastructure within the watersheds is maintained. The District will assist with the training of recommended maintenance procedures for municipalities, townships, and drainage districts. A variety of methods may be employed to carry out maintenance activities including working with public works staff, homeowner associations and park districts. Emphasis will be placed on maintenance being provided by the owner of the stormwater facility or by the parties that benefit from the stormwater facility.

Appropriate maintenance and inspection recommendations will be developed by the District for existing and new stormwater infrastructure. As an example, the recommendations could include a checklist of maintenance activities.

Planning for maintenance of stormwater infrastructure, such as identification of responsible parties and the development of preventative maintenance schedules, will be required for all new developments or redevelopments. In addition, provisions for accessibility and ease of maintenance will be required in all design plans.

### 5.4.3 Maintenance for Natural Drainage Systems

Maintenance of natural drainage systems is needed to counteract the impacts of increased runoff due to development, erosion, debris accumulation, and the growth of invasive plants that can reduce the stream's capacity.

### 5.4.4 Debris Clearing

Stream maintenance must address excessive accumulation of debris. Significant debris accumulation can increase flood heights, cause further erosion, and interfere with the operation of some flood control facilities.

Appropriate maintenance practices will be considered by the District and coordinated with the WPCs to foster consistent levels of service throughout watersheds and throughout the county. Appropriate management practices include regular inspections, reestablishing and maintaining plant communities, and establishing and protecting buffer zones.

### 5.4.5 Small Stream Maintenance Program

The District's Maintenance and Operations Department has implemented a SSMP to provide stream cleaning services within the District's corporate boundaries. The services of the SSMP are limited to removing debris and fallen trees within the streams that impede the flow of water. Projects involving sediment removal and streambank improvement or stabilization will be considered under the District's Capital Improvement Program described in Chapter 6 and will not be addressed under the SSMP. Further information on the SSMP can be found on the District's website, www.mwrd.org.

Mechanisms for implementing natural drainage system maintenance activities will be developed in coordination with the WPCs. The District, municipalities, townships, and drainage districts are the most likely entities to perform stream maintenance within their jurisdictions. Due to its inter-jurisdictional nature, stream maintenance may be coordinated by the District.

## 5.5 Watershed Planning

Planning will be carried out by the District both at the countywide level and at the watershed level. DWPs will be developed throughout the county in coordination with the WPCs. DWPs will be developed according to the methodology presented in Chapter 6 of the CCSMP. When DWPs are developed, the District will facilitate preventative and remedial projects to benefit both upstream and downstream interests. Projects will be identified during the DWP process and will be prioritized on a countywide basis. Funding decisions will be made based on the minimum criteria presented in Chapter 1, the prioritization process described in Chapter 6, and the decisions of the District's Board of Commissioners.

### 5.5.1 Watershed Planning and Coordination Activities

Watershed planning will be coordinated with floodplain and wetland mapping initiatives, with other planning efforts in the county, and with efforts in other counties. Below is a list of existing programs and activities of other agencies which are related to watershed planning:

#### 5.5.1.1 Cook County Planning Activities

The District will coordinate with other county planning activities. For example, transportation systems can have a significant impact on the drainage system and natural resources; but with coordinated planning efforts, flooding concerns can be addressed.

Other examples of this coordination range from working with the Cook County Bureau of Information Technology and Automation in order to share map information, to identifying opportunities for the Forest Preserve District of Cook County (FPDCC) to acquire areas of regional stormwater significance as part of its open space acquisition program.

The District will share any needed hydrologic data and flood information with Cook County agencies to support their efforts.

#### 5.5.1.2 Water Resources Agencies

Planning mechanisms will be developed to provide improved coordination and information dissemination between the District, the county, state and federal agencies, similar to past efforts with the Flood Control Coordination Committee (FCCC). The FCCC met regularly from the 1970's through 2000 to discuss current and planned flood control and watershed management efforts. The FCCC agenda included the identification of areas of flood concerns and discussions of potential cost sharing efforts. Various agencies were members of the FCCC including the District, IDNR-OWR, Cook County Highway Department (CCHD), and the USACE. The FCCC was reestablished in 2006 and will meet on a semi-annual basis.

#### 5.5.1.3 Active Drainage Districts

Active drainage districts have the potential to perform many functions consistent with the implementation of this plan. For example, drainage districts can levy assessments for stream maintenance and restoration activities. Drainage districts may also be able to help address existing and future drainage problems, so the District will encourage their participation in watershed planning efforts.

In accordance with the Act, "[a] drainage district that continues to exist within Cook County shall conform its operations to the county wide stormwater management plan." The District has the authority, upon the creation and implementation of the Cook County Stormwater Management Plan (CCSMP), to petition the circuit court to dissolve any drainage district located entirely within the District (70 ILCS 2605/7h(h)). For drainage districts located partially within the District corporate boundaries, the District may petition the circuit court to disconnect the portion of the drainage district that lies within the District boundaries.

#### 5.5.1.4 Community Rating System

The Federal Emergency Management Agency (FEMA) Community Rating System (CRS) was created as part of the National Flood Insurance Program (NFIP) to provide incentives to communities to reduce the potential for flood damages. Using flood insurance premium adjustments, the program encourages community and state activities beyond those required by the NFIP. The CRS has three goals: to reduce flood losses, facilitate accurate insurance ratings, and promote the awareness of flood insurance.

Involvement in the CRS program is voluntary and any community participating in the NFIP may apply for CRS classification. CRS credit is given to communities for activities such as:

- public information
- improved floodplain mapping
- improved standards for floodplain and stormwater management
- stream maintenance activities
- flood damage reduction activities
- flood preparedness activities

Many of the activities and standards in this plan will help NFIP-participating communities in Cook County to receive CRS credit. The District will assist municipalities in identifying CRS credits that will be available as a result of the countywide stormwater management program.

#### 5.5.1.5 Hydrologic Data Collection

Hydrologic data will be collected for use in watershed modeling. The District will share data with various agencies as needed. As required for calibration of watershed models or for operation of stormwater management facilities, the District will coordinate the identification of precipitation and streamflow gauge locations, and the installation and operation of gauges with the United States Geological Survey (USGS), IDNR-OWR and Illinois Department of Natural Resources – State Water Survey (IDNR-SWS).

#### 5.5.1.6 Surrounding Counties

Cook County watersheds extend beyond the county boundaries in both the upstream and downstream directions. The District will coordinate with surrounding Illinois counties and Lake County, Indiana, to identify their concerns related to the stormwater management program for Cook County. DWPs and any proposed regulatory ordinances will be circulated among the surrounding counties for review and comment.

#### 5.5.1.7 Floodplain Mapping

Many of the floodplains delineated on the FEMA floodplain maps are based on analyses and watershed conditions of the 1980s. Despite FEMA's current conversion of Cook County floodplain maps to Geographical Information System (GIS)-based digital maps, many of the maps are out-of-date due to changes in land use, changes in channel conditions, and out-of-date information on rainfall frequencies. As DWPs are developed, remapping opportunities will be identified and brought to the attention of FEMA and IDNR-OWR.

#### 5.5.1.8 Wetland Mapping

The current National Wetland Inventory (NWI) is generally out of date in Cook County. To augment the NWI, Advanced Identification of Wetlands (ADID) studies have been prepared for other northeastern Illinois counties. These studies have been comprehensive in identifying the location and boundary of existing wetlands, evaluating the functions provided by the wetlands, identifying exceptional quality wetlands, and developing wetland protection and public education strategies. An ADID study could benefit Cook County by providing up-to-date mapping of wetlands. In addition, the ADID functional evaluations can be invaluable in making permit decisions at the local level and federal (USACE) level. For these reasons, the District intends to request that the United States Environmental Protection Agency (USEPA) Region 5 initiate an ADID study in Cook County.

### 5.5.2 Prepare Detailed Watershed Plans

DWPs will be prepared to assess the specific conditions and needs of each watershed. DWPs will be prepared by the District to ensure consistency in planning and evaluation. The methodology for the development of DWPs is presented in Chapter 6.

### 5.5.3 Implement Watershed Plans

As DWPs are developed, the District will coordinate with the WPCs to implement the recommendations. DWP recommendations may include capital improvement projects and maintenance activities.

## 5.6 Project Implementation

Capital improvement projects will be identified in the DWPs~~.~~, or through the District's Phase II program via outreach to municipalities, townships and agencies having jurisdiction in Cook County to identify partnership opportunities on stormwater management projects. Further information related to the identification of Phase II Stormwater Management projects is provided below in this section. Funding for capital improvement projects will be prioritized on a countywide basis. Implementation of the capital improvement program will be addressed annually and will depend on budget constraints, priorities, and the availability of funding from outside agencies. The capital program is expected to grow as the DWPs are developed, the Phase II program is implemented, and funding mechanisms are identified.

### 5.6.1 Phase II Project Identification

Under the Stormwater Management Phase II program, the District collects information from stakeholders, including but not limited to, municipalities, townships, and regional agencies in Cook County to identify local stormwater problems along with potential projects to address them. Stakeholders may provide a list of all flooding concerns, applicable current studies, and potential projects including their status (i.e. conceptual, engineering study being developed, or construction plans ready).

The District categorizes the problem areas reported by the municipalities, townships, and agencies as structure flooding, roadway flooding, erosion, basement backups, isolated nuisance flooding, or maintenance. The types of local stormwater management projects to be considered for potential District assistance under the Phase II program may include green infrastructure, detention storage, upsizing critical storm sewers and culverts, pump stations, and establishing drainage ways.

Projects are prioritized for assistance by the District based on a variety of factors including the number and type of structures benefitted by the identified solution, the cost for implementing the solution including engineering and construction related costs, the benefit-to-cost (BC) analysis of the solution, and the severity of the problem. Projects unrelated to stormwater management, projects involving maintenance or replacement of flood damaged facilities or property, or isolated nuisance flooding, will not be considered for District assistance. Also excluded from consideration for District assistance are projects which are specifically intended to provide improved infrastructure for planned or future development, upsizing of local storm sewer systems in their entirety, and those that address issues associated with deficient private and public sanitary sewer systems.

The enacting legislation, Public Act 93-1049, in which authority was granted to the District for the responsibilities of stormwater management for Cook County, stipulates that BC analysis is required during deliberations for capital project selection. However, the District's Board of Commissioners is not required to select projects solely on BC analysis. The Board of Commissioners may also consider noneconomic criteria in the selection of alternatives for each problem area. The ultimate decision for funding of any capital project is at the discretion of the District's Board of Commissioners. Assistance from the District may be in the form of funding, engineering, or other assistance to be defined through the negotiations between the District and the involved entities.

### 5.6.2 Acquisition of Flood Prone Properties

As stated in P.A. 98-0652, "The District may acquire, by purchase from a willing seller in a voluntary transaction, real property in furtherance of its regional and local stormwater management activities." The District will set up a program for acquiring flood prone and flood damaged property which will consider factors such as the severity and frequency of flooding and/or whether or not any viable alternatives to acquisition are feasible. The District will establish guidance for the property acquisition process. Upon acquisition of the flood prone property, any existing buildings or other structures will be demolished and property interests will be conveyed to an appropriate jurisdiction with a deed restriction prohibiting future residential, commercial, and industrial development on the property.

## 5.7 Public Information and Education

A number of Cook County municipalities have public information programs related to stormwater management. Most of these efforts relate to floodplain and water quality issues. There is currently no countywide public information program for stormwater management.

A public information program will be developed as part of the countywide stormwater management program to inform and educate the public on the importance of watershed management. Public involvement is important because the cumulative actions of individuals can have significant watershed impacts. The public information program will communicate the essential stormwater management topics, and it will be based on the target audience and the most effective ways the information can be delivered.

### 5.7.1 Identify Public Information Topics

A broad range of stormwater management related topics can be included in an information and education program. The following topics have been identified for possible inclusion in the countywide stormwater management program public information effort:

- Stormwater management and the role of a watershed

- Importance of wetlands for mitigating the impacts of stormwater
- Importance of stream maintenance
- Floodplain management issues and flood-proofing ideas for property owners
- Water quality issues, such as lawn maintenance, proper use of household chemicals, and septic systems

### 5.7.2 Public Education Audiences

Although it is important to reach all citizens, key citizens' groups will be targeted. These groups include those that live next to water bodies and homeowners associations responsible for maintenance and management of water bodies and components of the stormwater management system, such as detention basins. Information materials may be developed with the WPCs, municipalities, townships, developers and business owners as target audiences. The public information program will be coordinated with other county agencies such as the FPDCC, schools and interest groups.

### 5.7.3 Public Information Generation and Dissemination

Based on the selection of stormwater management topics, the audience and the manner in which the message should be delivered, public information materials will be developed. The countywide stormwater management program public information effort will optimize current resources and methods used by federal, state and local agencies. For many topics, materials have already been developed by other agencies. These materials will be used or tailored to the needs of the countywide effort.

Public information materials will be disseminated in numerous ways to target audiences, including websites, flyers, brochures, workshops, and newsletters. Materials may be delivered to audiences through the District, WPCs, FPDCC, and municipalities.

### 5.7.4 Annual Report

The District will prepare an annual report on the countywide stormwater management program. The report will summarize the status of the implementation of the CCSMP. The annual report will be available to the public on the District's website (www.mwrd.org).

## 5.8 Summary

The countywide stormwater management program framework is based on the development of administration and management, regulation, maintenance, watershed planning, project implementation, and public information and education program elements. The efforts of the District in these areas will be coordinated with the WPCs. Exhibit 5-1 presents the countywide stormwater management program framework. The implementation of the countywide stormwater management program is discussed in Chapter 8.

# CHAPTER 6
# WATERSHED PLANNING

## Acronyms used in Chapter 6:

| | |
|---|---|
| $AA_B$ | Average Annual Benefits |
| $AA_C$ | Average Annual Costs |
| $AA_D$ | Average Annual Damages |
| ABM | Articulated Block Mat |
| BC | Benefit-to-Cost |
| CCSMP | Cook County Stormwater Management Plan |
| CDSA | Critical Duration Storm Analysis |
| CIP | Capital Improvement Program |
| CMAP | Chicago Metropolitan Agency for Planning |
| CUDD | Calumet Union Drainage District |
| DTM | Digital Terrain Model |
| DWP | Detailed Watershed Plan |
| FDA | Flood Damage Assessment |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| GIS | Geographic Information Systems |
| HEC | Hydrologic Engineering Center |
| H&H | Hydrologic and Hydraulic |
| HSPF | Hydrologic Simulation Program-Fortran |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| IDNR-SWS | Illinois Department of Natural Resources – State Water Survey |
| IDOT | Illinois Department of Transportation |
| IEMA | Illinois Emergency Management Agency |
| IEPA | Illinois Environmental Protection Agency |
| LCSMC | Lake County Stormwater Management Commission |
| NB | Net Benefits |
| NCDC | National Climactic Data Center |
| NRCS | Natural Resource Conservation Service |
| NWI | National Wetland Inventory |
| O&M | Operation and Maintenance |
| PV | Present Value |
| $PV_B$ | Present Value of Benefits |
| $PV_C$ | Present Value of Costs |
| RAS | River Analysis System |
| SCS | Soil Conservation Service |
| UAA | User Attainability Analysis |
| UDV | Unit Day Value |
| UNET | Unsteady NETwork Model |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USGS | United States Geological Survey |
| WPC | Watershed Planning Council |

# CHAPTER 6
# WATERSHED PLANNING

## 6.1 Introduction

A standardized approach to watershed planning is required throughout Cook County to coordinate the District's efforts to implement its Cook County Stormwater Management Plan (CCSMP). Detailed Watershed Plans (DWPs) will be developed for all major watersheds and will serve as standardized documents to help guide the District as it develops a Capital Improvement Program (CIP). Previous planning efforts have been conducted by various organizations, and will be used in the development of DWPs where applicable. This chapter provides guidance for merging findings from previous flood remediation efforts in Cook County with new data and evaluations done to develop effective and consistent DWPs.

## 6.2 Status of Watershed Planning in Cook County

Local, state, and federal agencies have conducted comprehensive stormwater planning (Table 6.1) efforts as a part of their watershed planning programs for the following watersheds within Cook County: the North Branch of the Chicago River, Lower Des Plaines Tributaries, Calumet-Sag Channel, Little Calumet River, Poplar Creek and Upper Salt Creek. Where possible, previous planning information should be included and built upon in developing DWPs to take advantage of earlier efforts.

## 6.3 Planning Methodology

### 6.3.1 Organization of Detailed Watershed Plans

DWPs will serve as the supporting documentation to the District's Stormwater Management CIP. The watershed planning methodologies and standards described herein will be used to develop a DWP for each major watershed in Cook County. The objective is to supply the District with information on existing conditions, stormwater problems, alternative improvements considered to address stormwater problems, and other relevant information necessary to prioritize projects on a countywide level. Table 6.2 is a standard outline of the content to be provided within DWPs.

### 6.3.2 Data Collection and Review

The initial step in DWP development is the collection and review of existing data. Data that will be collected and reviewed include stormwater problem data, existing watershed studies and models, monitoring data, geographic information systems (GIS) data and other sources of useful watershed mapping.

### 6.3.3 Use of Existing Data for Detailed Watershed Studies

The DWP report will include a summary of existing watershed data and information. As a part of DWP development, the District will collect and review watershed data from member communities, Watershed Planning Councils (WPCs), applicable state and federal agencies, available complaint records, and other relevant watershed stakeholders. Relevant stormwater data will be compiled within the DWP report. The following subsections provide means of summarizing data regarding stormwater problems (detailed in Section 6.3.3.1) and available studies that have compiled some of the existing stormwater data (detailed in Section 6.3.3.2).

Table 6.1 Summary of Watershed Planning In Cook County

| Agency | Description of Watershed Planning |
|---|---|
| Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR) | At the request of local governments, IDNR-OWR performs flood control studies to identify flooding problems, analyze alternative solutions, and determine the economic feasibility of those solutions. Plans developed by IDNR-OWR focus on structural flood control measures, but nonstructural flood mitigation alternatives are also examined. IDNR-OWR administers other funding assistance. It has a small-projects program that is often used to address local drainage problems and can fund flood related improvements up to $100,000. A less rigorous quantification of benefits is allowed under this program. Its flood mitigation program administers funds for the acquisition of flood-prone structures and flood mitigation planning. IDNR-OWR is involved in assisting FEMA with the map modernization for Cook County, as explained further in Section 2.5.1. |
| Illinois Environmental Protection Agency (IEPA) | IEPA collects water quality and biological data on streams and lakes throughout the state. The data are reported in the biannual *Illinois Water Quality Report,* which documents the level to which water bodies are supporting their designated uses (such as swimming, aquatic life). IEPA also maintains the Illinois Water Quality Management Plan, which offers recommendations for stormwater, soil erosion and sediment control, and stream and wetland best management practices (BMPs). IEPA also provides grants annually for implementation of nonpoint source control plans and demonstration projects. These projects can include BMPs to curtail urban runoff and also instream activities to reduce erosion, sedimentation, and degradation of water quality, as detailed in Section 319 of the Clean Water Act. On the preventive side, activities such as ordinance implementation and workshops on stormwater BMPs have been funded by IEPA. The IEPA Illinois Clean Lakes Program provides annual grants for lake remediation projects where there is a realistic opportunity for restoration and protection for high quality lakes. IEPA encourages a watershed approach in addressing lake remediation and protection. |
| Federal Emergency Management Agency (FEMA) | FEMA has several flood hazard mitigation funding programs, administered by the Illinois Emergency Management Agency (IEMA) and described in Section 2.5.8. Some FEMA regulatory floodplain maps for Cook County are inadequate. They do not include water surface elevations or they are out of date because of significant land use and other topographic changes. FEMA has initiated a Flood Insurance Rate Map (FIRM) Modernization Program, which compiles hydrologic and hydraulic (H&H) modeling data for selected map panels in Cook County. IDNR-OWR serves as a local sponsor for this project. The data will be included in a countywide modernization of floodplain maps. |
| Chicago Metropolitan Agency for Planning (CMAP) | CMAP has historically performed watershed planning, including the Area Wide Water Quality Management Plan developed for all the major watersheds in northeastern Illinois under Section 208 of the Clean Water Act. CMAP assists local governments in developing watershed planning. CMAP has produced a watershed inventory (http://www.nipc.org/environment/sustainable/water/watershed/) that includes a list of watershed plans from various sources and active watershed groups. |
| IDNR, State Water Survey (IDNR-SWS) | IDNR-SWS runs research centers that gather and maintain scientific data resources used in watershed planning. IDNR-SWS is also involved in planning activities for FEMA map modernization. |
| U.S. Army Corps of Engineers (USACE) | USACE administers a program for cost-sharing funding for the study, design, and construction of flood control projects. These projects generally are limited to structural flood control measures. If a reconnaissance level study shows that a project is likely to be cost-effective, USACE proceeds with a project analysis, which must be funded locally by 50% matching funds. For approved projects, USACE funds up to |

Table 6.1 Summary of Watershed Planning In Cook County

| Agency | Description of Watershed Planning |
|---|---|
| | 65% of design and construction costs; the remaining costs are funded by a local or nonfederal sponsor. Sponsors must furnish all required lands, easements, rights-of-way and utility relocations, and also operate and maintain the completed project in perpetuity. Cost-sharing agreements must be negotiated individually with USACE on a project-by-project basis. USACE also provides design services for floodproofing of residences as part of an overall flood control project. This work and most USACE studies are performed with in-house staff. |
| U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) | NRCS has planned, designed, and constructed flood control facilities to address overbank flooding in the Chicago metropolitan region with local sponsors, including the District. It also has performed floodplain management studies and updated floodplain mapping for local governments. In an effort partially funded by Section 319 of the Clean Water Act under the IEPA's direction, NRCS developed the *Illinois Urban Manual,* a technical reference for developers, planners, engineers, government officials and others involved in land use planning, building site development, and natural resource conservation. Applicable in rural, urban, and developing areas, the manual includes BMPs for soil erosion and sediment control, stormwater management, and special area protection. The manual was updated in 2002. |
| The District | The District designed and constructed the Tunnel And Reservoir Plan to address combined sewer overflow in the combined sewer areas of Cook County. The District has also been involved in many federal and state flood control projects, serving as the local sponsor or providing other forms of cost-sharing. |
| Municipalities and Townships | Most stormwater planning within a municipality is performed by the municipality itself or completed under its direction. Planning assistance on larger waterways may be initiated by state and federal agencies. Capital improvement projects that address local drainage problems are typically implemented by municipalities. Many communities within Cook County have ongoing stormwater planning efforts that could contribute to the development of DWPs. |
| Soil and Water Conservation Districts (SWCD) | Cook County has two Soil and Water Conservation Districts (SWCDs); the North Cook County Soil and Water Conservation District and the Will-South Cook Soil and Water Conservation District. The purpose of the SWCDs is to provide information, education and guidance on the conservation and wise use of natural resources. |
| Lake County Stormwater Management Commission (LCSMC) | SMC conducted a watershed assessment in conjunction with the Friends of the Chicago River. The watershed assessment pertains to the North Branch of the Chicago River within Cook County. |
| U.S. Geological Survey (USGS) | Through a cooperative program, in which the District participates, the USGS (Illinois Water Science Center) maintains a stream gauging network and publishes an annual report containing daily streamflow data and water quality information for selected sites around the state. The USGS administers funding for site-specific hydrologic and water quality data collection and analysis. Additionally, the USGS provides streamflow, stream elevations, and precipitation data in real-time at http://il.water.usgs.gov/nwis-w/IL/. Some mapping efforts may be fundable through the USGS. USGS funds up to 50% of a project's in-house labor and expenses. On this reimbursable basis, USGS provides technical assistance in developing watershed models and other hydrologic and water quality related assistance. In the past, the USGS has researched and completed studies on emerging technologies in the water resources field. |
| U.S. Environmental Protection Agency (USEPA) | USEPA provides grants for water quality related planning and demonstration projects under Section 319(h) and 104(b)(3) of the Clean Water Act, as discussed under IEPA's roles and resources in Section 2.5.7. USEPA routinely holds national conferences on stormwater-related topics. |

Table 6.2 DWP Standard Outline

Table 6.2 DWP Standard Outline

| | | | |
|---|---|---|---|
| | 4.5 | Future Conditions Evaluation | |
| 5. | Development and Evaluation of Alternatives | | |
| | 5.1 | Problem Definition and Damage Assessment | |
| | | 5.1.1 | Flood Damage Curves |
| | | 5.1.2 | Erosion Damage Curves |
| | 5.2 | Technology Screening | |
| | 5.3 | Alternative Development | |
| | | 5.3.1 | Flood Control Alternatives |
| | | 5.3.2 | Erosion Control Alternatives |
| | | 5.3.3 | Water Quality Improvement Alternatives |
| | | 5.3.4 | Natural Resources and Environment Improvement Alternatives |
| | | 5.3.5 | Alternative Cost Development Data |
| | 5.4 | Alternative Evaluation and Selection | |
| | | 5.4.1 | Data Required for Countywide Prioritization of Watershed Projects |
| 6. | Action Plan | | |
| | 6.1 | Recommended Improvements | |
| | 6.2 | Implementation Plan | |
| 7. | Summary and Conclusions | | |

#### 6.3.3.1 Stormwater Problem Data

DWPs will include a comprehensive summary of stormwater problem data within a standardized table. Table 6.3 summarizes the typical fields required within the DWP watershed problem summary table. The watershed problem summary table will include relevant stormwater problem data compiled as part of DWP development, and recommendations on the use of stormwater problem data. Table 6.4 provides descriptions of standard problem categories to be used as a part of the watershed problem summary table. Additional problem categories may arise and will be considered by the District as necessary during the watershed planning process, however problem categories will generally be consistent with those listed in Table 6.4.

Table 6.3 Structure of Watershed Problem Summary Table for DWPs

| Table Field | Description |
|---|---|
| Problem Category | *Refer to Table 6.4 for list of categories.* |
| Source of Information | Sources of problem information such as member communities, published reports, state and federal agencies, watershed stakeholders, complaints. |
| Date | Date upon which data were compiled or published. |
| Project Planned or Underway | In some cases, efforts are planned or underway to address the problem. Identify this in the table as a consideration on the path forward. |
| Resolution or Action Required | Describe how the data will be acted upon. Describe resolution or planned resolution of problem. |

Table 6.4 Problem Category Description

| Problem Category | Description |
|---|---|
| Intercommunity (regional) flooding | Flooding problems that affect more than one community. |
| Intracommunity (local) flooding | Flooding problems within a community that affect only part of a single community. |
| Streambank erosion on intercommunity waterways | Streambank erosion along regional waterways that threatens a structure or human health and safety. |
| Streambank erosion on intracommunity (local) waterways | Streambank erosion along local waterways that threatens a structure or human health and safety. |
| Stream maintenance problems | Debris jams, system failure, restrictions on waterways, etc. |
| Water quality problems | Observed water quality problems such as odor, spill-related pollution, aesthetically objectionable debris (such as toilet waste), etc. |
| Environmental degradation issues | Wetland or riparian impacts observed by watershed stakeholders. |

### 6.3.3.2 Existing Watershed Studies

Several local, state, and federal agencies have completed watershed studies and modeling for watersheds within Cook County. Studies and the models used to support them may contain data useful to the development of DWPs. Table 6.5 summarizes some known watershed studies developed by agencies such as IDNR-OWR, USACE, IEPA, or the Illinois Department of Transportation (IDOT). These studies and others will be reviewed as a part of DWP development.

Watershed modeling has been performed for many of the studies listed in Table 6.5. The models may be useful for the development of DWPs or other watershed planning activities to be coordinated by watershed stakeholder groups. Table 6.6 summarizes some of the existing models that were identified for watersheds within Cook County.

IDNR-OWR and IDNR-SWS personnel have identified several other models that have been developed for Cook County watersheds. Many of the models include data that are not fully documented to allow for a complete evaluation of their applicability to DWP development. As a part of developing each DWP, the District will review and discuss the usefulness of existing watershed models for supporting the definition of problem areas, the development and evaluation of improvement projects and possible floodplain mapping revisions. Table 6.7 lists key criteria to be considered in defining the scope of DWP modeling activities.

Table 6.5 Existing Watershed Studies Identified

| Watershed | Subwatershed | Title of Study | Agencies | Date | Summary |
|---|---|---|---|---|---|
| Calumet-Sag | Stony Creek | Stony Creek, Oak Lawn, Illinois Detailed Project Report | USACE | October 2001 | Completed USACE's planning process for a project to reduce overbank flooding along Stony Creek in Oak Lawn. The recommended plan consists of flow diversion, removal of a small weir, and channel clearing downstream. |
| Calumet-Sag | (Report addresses tributaries) | Calumet-Sag Watershed Floodwater Management Plan Environmental Assessment | The District, NRCS, IDOT (Division of Water Resources) | June 1979 | The study estimates floodwater damage in the watershed due to urbanization. It addresses erosion problems, lack of open space and recreational facilities, wetlands, and channel maintenance. Although somewhat dated, the report may be most useful in providing relevant background information. |
| Chicago River | Chicago River and Waterway System | Draft Use Attainability Analysis (UAA) | IEPA | November 2004 | The UAA will help the IEPA understand the changing circumstances of the Chicago River and Waterway System in order to better set water quality standards for the system. |
| Des Plaines River | Upper Des Plaines River | Final Feasibility Report and Environmental Impact Statement | USACE | June 1999 | Evaluated feasibility of, and federal interest in, implementation of a flood damage reduction plan for the Upper Des Plaines watershed located within Lake and Cook Counties. Recommended a plan consisting of the construction of two levee units, expansion of two reservoirs, construction of one lateral storage area, and modification of one earthen dam to add flood storage. |
| Des Plaines River | Salt Creek TMDLs | Total Maximum Daily Loads for Salt Creek, Illinois | IEPA | October 2004 | Describes methods and procedures used to develop chloride and dissolved oxygen TMDLs for Salt Creek. The focus of the report is on water quality, but it contains rainfall, hydrologic, hydraulic, and stream flow information. Salt Creek and its watershed span both Cook and DuPage counties. |
| Des Plaines River | Farmers/Prairie Creek | Farmers/Prairie Creek Preliminary Strategic Planning Study | IDNR-OWR | October 2005 | Studied alternatives for relieving flooding on Farmers/Prairie Creek, a tributary to the Des Plaines River with a watershed in areas of Des Plaines, Park Ridge, Niles, Glenview, and unincorporated Maine Township. |
| Des Plaines River | Addison Creek | Addison Creek Flood Control Study | IDOT (Division of Water Resources) | 1993 | Studied existing conditions and alternatives for relieving flooding on Addison Creek, a tributary of Lower Salt Creek. The affected area for the study includes Bellwood, Bensenville, Broadview, Elmhurst, Hillside, Maywood, Melrose Park, North Lake, North Riverside, Stone Park, and Westchester. |

Table 6.5 Existing Watershed Studies Identified

| Watershed | Subwatershed | Title of Study | Agencies | Date | Summary |
|---|---|---|---|---|---|
| Des Plaines River | (Report addresses tributaries) | Des Plaines River Watershed Floodwater Management Plan Environmental Assessment | The District, NRCS, IDOT (Division of Water Resources) | January 1976 | The purpose of the study was to reduce flood damage, reduce erosion and sedimentation, protect wildlife habitat, improve water quality, enhance fisheries, provide additional recreation sites and open space. The study includes Lower Salt Creek, located primarily in DuPage County. Recommended flood control facilities, some of which have since been built, are described, as are anticipated impacts. The report contains useful background information. |
| Little Calumet River | (Report addresses tributaries) | Little Calumet River Watershed Floodwater Management Plan and Environmental Assessment | The District, NRCS, U.S. Forest Service, Illinois Department of Conservation | May 1975 | The purpose of the study was to reduce flood damages, provide increased water based recreation, and provide watershed protection and environmental enhancement. Background information may be useful. |
| Little Calumet River | (Report addresses tributaries) | Little Calumet River Watershed Plan and Environmental Impact Statement | The District, Will-South Cook SWCD, Calumet-Union Drainage District (CUDD), Cook County Board of Commissioners, Villages, Park Districts, IDNR-OWR, NRCS, U.S. Forest Service | November 1978 | This study was developed to achieve goals similar to those of the May 1975 study. Planned projects and their impacts are described. Some of the projects have been implemented. Discussion of project impacts is included. Background information is potentially useful. |
| Lower Des Plaines Tributaries | (Report addresses tributaries) | Lower Des Plaines Tributaries Final Watershed Plan – EIS | The District, SWCDs, NRCS, U.S. Forest Service, Municipalities | September 1987 | The purpose of the study was to solve flooding and associated erosion and sedimentation problems, and to address the shortage of water-based recreation. Structural and nonstructural improvement measures are recommended, several of which have been built. Background information may be useful. |
| North Branch Chicago River | (Report addresses tributaries) | North Branch Chicago River Floodwater Management Plan | The District, NRCS, IDNR-OWR | October 1974 | The purpose of the study was to reduce flood damages, provide increased recreational uses, and provide watershed protection and environmental enhancement. The southern limit of the study is Touhy Ave. Alternatives are suggested, including construction of flood control reservoirs that have now been built. The report may be most useful in providing relevant background information. |

Table 6.5 Existing Watershed Studies Identified

| Watershed | Subwatershed | Title of Study | Agencies | Date | Summary |
|---|---|---|---|---|---|
| North Branch Chicago River | (Report addresses tributaries) | North Branch Chicago River Open Space (Green Infrastructure) Plan | LCSMC, Friends of the Chicago River, IDNR-OWR | June 2005 | Identifies high quality natural resources recommended for preservation, and open lands suitable for watershed improvement projects. Study is based on analysis of individual parcels. Includes listing of funding sources for land preservation and restoration. |
| Poplar Creek | (Report addresses tributaries) | Poplar Creek Watershed Floodwater Management Plan Environmental Assessment | The District, NRCS, IDOT (Division of Water Resources) | May 1976 | The study estimates floodwater damage in the watershed due to urbanization. It addresses erosion problems, lack of open space and recreational facilities, wetlands, and channel maintenance. Some flood control measures are recommended. Although somewhat dated, the report may be most useful in providing relevant background information. |
| Upper Salt Creek | (Report addresses tributaries) | Upper Salt Creek Watershed Floodwater Management Plan | The District, North Cook SWCD, Forest Preserve District of Cook County, Villages, Park Districts, IDOT (Division of Water Resources) | May 1973 | The purpose of the study was to reduce flood damages and create water related recreation facilities. Five flood control facilities, one multipurpose facility, and channel improvements were recommended and have been implemented. The report contains useful background information. |

Table 6.6 Existing Modeling Data For Watersheds Within Cook County

| Watershed | Subwatershed | Model Description |
|---|---|---|
| Chicago River | Chicago River and Chicago Waterway System | Unsteady flow and water quality model of entire 76-mile navigable waterway system, developed by Marquette University. More information is available at http://www.chicagoareawaterways.org/ Unsteady NETwork Model (UNET) and Hydrologic Simulation Program-Fortran (HSPF) model developed by the USACE. |
| Des Plaines River | Des Plaines River | Hydrologic Engineering Center-1 (HEC) and HEC-River Analysis System (RAS) |
| Des Plaines River | Farmers/Prairie Creek | HEC-1 and HEC-RAS |
| Chicago River | North Branch | HEC-1 and HEC-2 |
| Chicago River | Middle Fork and West Fork | HEC-1 and HEC-2 |
| Little Calumet River | Little Calumet River | HEC-1 and Unsteady-RAS; Illinois Department of Natural Resources-State Water Survey (IDNR-SWS) is updating |
| Little Calumet River | Stony Creek | HEC-1 and UNET |

Table 6.7 Existing Model Use Criteria for DWPs

| Category | Criteria for Use in DWPs |
|---|---|
| Date developed | Model must have been developed reflecting current conditions or have been updated to reflect current conditions unless otherwise accepted by the District to be used for DWPs. |
| Regulatory acceptance | Model must be the current regulatory model for watershed or otherwise accepted by the District to be used as a part of DWPs. |
| Data development requirements | Documentation of H&H model data are available and show that the data were developed to be consistent with District and IDNR-OWR minimum standards. |
| Calibration requirements | Must have been calibrated to a network of rainfall and stream monitoring gauges. Calibration must be documented and show that minimum District standards were met. Alternatively, radar derived precipitation could be used as approved by the District. Exceptions to the calibration requirement must be approved by the District. |
| Consistency with District modeling application requirements | Must have been developed using a modeling application that meets the District's minimum requirements, or is otherwise approved by the District. |

**Existing Monitoring Data.** Rainfall, stream flow (and stage), and water quality data are available for all the major watersheds within Cook County. Some of the data may be used to support DWP modeling evaluations. Table 6.8 summarizes sources of existing monitoring data. In addition to the data listed, the District collects monitoring data that will be reviewed and utilized as appropriate as a part of DWP development.

Descriptions of USGS stream flowmeters and National Climactic Data Center (NCDC) rain gauge data are provided in Appendixes C and D, respectively.

**Geographic Information Systems Data.** Several sources of GIS data exist and are available to support watershed planning activities that will occur as a part of DWP development. One primary source of GIS data is Cook County. GIS data from Cook County will be obtained and used as appropriate as a part of DWP development. Section 6.4 identifies several Cook County GIS data sets to be used in DWP development.

Table 6.8 Sources of Existing Monitoring Data

| Data | Owning Agency | Description |
|---|---|---|
| USGS Stream Flow Data | USGS | USGS stream flow data are available at http://waterdata.usgs.gov/nwis/sw. Appendix C contains a comprehensive list of gauge locations. |
| IDNR-OWR Stage Data | IDNR-OWR | The IDNR-OWR maintains a network of stage gauges that may have data useful for model calibration. |
| Rain Gauge Data | IDNR-SWS, NCDC, and USGS | The Cook County Precipitation Network is a dense rain gauge network that the IDNR-SWS has operated in Cook County since the fall of 1989 to provide accurate precipitation data for use in simulating runoff for Lake Michigan diversion accounting. The network consists of 25 rain gauges throughout Cook County, approximately every 5 to 7 miles and representative of the various watersheds within the county. The data are available in digital format at hourly increments from 1989 through 2000, and at 10-minute increments from 2001 to the present.<br>There are 74 locations of rainfall gauges for which data are available within Cook County through the NCDC. Some gauges are no longer active, but past data are available. The time increments of the data vary from gauge to gauge. Table B-1 in Appendix D lists all gauges and information related to the type of data available. Information about obtaining data from all these gauges and associated fees can be found at the NCDC website: http://www.ncdc.noaa.gov.<br>The USGS operates and publishes data from approximately 42 rain gauges in northeastern Illinois, of which 6 are located in Cook County. This data, almost all available in real-time, together with data from other agency rain gauges can be found at http://il.waterdata.usgs.gov/nwis/current/?type=precip&group-key=NONE. |
| Water Quality Monitoring Data | IEPA | Available from the IEPA Ambient Water Quality Monitoring Network of 213 monitoring sites. More information is available at: http://www.epa.state.il.us/water/surface-water/river-stream-mon.html |

## 6.4 Watershed Data Development

New data developed for DWPs must meet the District standards and specifications described in Table 6.9.

Table 6.9 Watershed Data Development Standards And Specifications

| Data Type | Standards Documentation | Summary |
|---|---|---|
| GIS Data | District GIS Data Development Standards | Data developed to support DWPs will be consistent with latest available District GIS Standards and Specifications. |
| Survey Data | District Vertical Datum | Survey data will be developed using the NAD 1983 coordinate system with the Chicago City Datum (CCD) for vertical coordinates (579.48 feet above 1925 mean sea level). DWPs will contain a survey standards document subject to District review prior to initiating any field surveys. If necessary, the District may allow changes to these standards in order to be consistent with unique conditions in watersheds such as those that have upstream or downstream boundary condition models that have been developed in a different coordinate system. |
| Survey Data | FEMA Guidelines | Survey standards will be consistent with FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A, "Guidance for Aerial Mapping and Surveying*," available at WWW.FEMA.GOV/FHM/DL_CGS.SHTML |
| DWP Data | Cook County Stormwater Management Plan | All data developed to support DWPs will be consistent with standards provided as a part of this document, or other scoping documents provided by the District. |

### 6.4.1 Watershed Analysis and Floodplain Mapping

The District has developed the following goals for watershed analysis and floodplain mapping that will be applied to the development of DWPs. It is understood that meeting some of these goals may not be possible as a part of DWP development. These goals will be considered and applied wherever the District deems applicable:

- H&H analyses must be consistent with IDNR-OWR and FEMA map revision requirements.
- Hydrology for watershed plans will be determined by a hydrologic model that, where necessary, considers online and offline storage, infiltration, interflow, depressional storage, overland flow, nonuniform rainfall distribution, evapotranspiration, and soil moisture. The output from the hydrologic model must be compatible with the hydraulic model.
- Hydrologic analyses may require cooperative plans for water bodies that cross the District's corporate boundaries, such as the North Branch Chicago River, Little Calumet River, Des Plaines River, Poplar Creek, and Upper Salt Creek.
- Hydraulic conditions for the major watershed plans will be determined by a model that can, at a minimum, analyze the effects of floodplain encroachment, online and offline storage, diversions, channel improvements, bridges, culverts, dams, weirs, and other impediments to flow. The input to the hydraulic model will be compatible with the output from the hydrologic model. Fully dynamic models will be used when channel conditions are extremely flat (for example, slope is less than 5 feet per 1,000) and subject to backwater conditions that make it difficult to approximate storage accurately.

### 6.4.2 Watershed Modeling

The object of a DWP is to support the development and documentation of a countywide CIP. Understanding stormwater problems and evaluating scenarios to correct them requires the use of models and other watershed analysis tools. The following includes standards for application selection, data development, and calibration of H&H models.

Several steps are involved in applying models to the development of DWPs. First, a model of existing conditions is developed to support calibration and an understanding of existing problems. Second, a baseline conditions model is developed to reflect the conditions expected to be current when the District begins to implement the countywide CIP. This may include modifications to the existing conditions model that reflect projects that are under way and near completion. Finally, the model is modified to evaluate the effectiveness of alternative improvement projects. The guidance provided in Section 6.4.2 applies to all these steps.

#### 6.4.2.1 Screening Considerations

Several H&H modeling applications in the public and private domain are accepted by FEMA and IDNR-OWR to determine floodplain and floodway areas for the National Flood Insurance Program. The applications are summarized in Tables 6.10 and 6.11. Table 6.12 summarizes considerations in the selection of H&H modeling applications. For DWPs, the District will specify the most appropriate H&H modeling application based on the considerations listed in Table 6.12 and specific watershed modeling requirements. In some cases, it may be acceptable to use two or more separate H&H modeling applications within the same DWP.

#### 6.4.2.2 Hydrologic Model Data Development

Hydrologic model data developed as a part of a DWP will be consistent with minimum District standards. District standards have been developed to be consistent with the countywide stormwater management program needs and wherever possible with IDNR-OWR preferences.

**Subarea Delineations.** Subarea Delineations will be performed using the best available topographic mapping to a level necessary to accurately simulate hydrologic conditions within the watershed. The best available topographic data are those developed by Cook County. Cook County GIS photogrammetry data includes a digital, geospatial GIS file that depicts (through the use of a digital terrain model (DTM), and modeled by a triangulated irregular network) a general surface description for Cook County with a 300-foot buffer beyond the county boundary. The data have been made available to the District and will be used to support Subarea Delineations.

Table 6.10 Hydrologic Models Accepted by FEMA for the National Flood Insurance Program

| Type | Program | Developer | Public Domain? |
|---|---|---|---|
| Single event | HEC-1 4.0.1 and upa (May 1991) | USACE | Yes |
| | HEC-HMS 1.1 and up (March 1998) | USACE | Yes |
| | MIKE 11 UHM | DHI Water and Environment | No |
| | PondPack v.8 | Haestad Methods, Inc. | No |
| | SWMM (RUNOFF) 4.30 (May 1994), and 4.31 (January 1997) | USEPA and Oregon State University | Yes |

Table 6.10 Hydrologic Models Accepted by FEMA for the National Flood Insurance Program

| Type | Program | Developer | Public Domain? |
|---|---|---|---|
| | SWMM 5 Version 5.0.005 (May 2005) | USEPA | Yes |
| | TR-20 (February 1992) | USDA NRCS | Yes |
| | TR-20 Win 1.00.002 (Jan. 2005) | USDA NRCS | Yes |
| | TR-55 (June 1986) | USDA NRCS | Yes |
| | WinTR-55 1.0.08, (Jan. 2005 ) | USDA NRCS | Yes |
| | XP-SWMM 8.52 and up | XP Software | No |
| Continuous event | DR3M | USGS | Yes |
| | HSPF 10.10 and up | USEPA, USGS | Yes |
| | MIKE 11 RR | DHI Water and Environment | No |
| | PRMS Version 2.1 | USGS | Yes |
| Interior drainage | HEC-IFH 1.03 and up | USACE | Yes |

[a]Enhancement of these programs in editing and graphical presentation can be obtained from several private companies.

Note: FEMA periodically updates its list of approved hydrologic models.

Table 6.11 Hydraulic Modeling Applications Accepted by FEMA for the National Flood Insurance Program

| Type | Program | Developer | Public Domain? |
|---|---|---|---|
| One-dimensional steady flow models | Culvert Master v.2.0 | Haestad Methods, Inc. | No |
| | HEC-2 4.6.2a(May 1991) | USACE | Yes |
| | HEC-RAS 3.1.1 and up | USACE | Yes |
| | HY8 4.1 and up (November 1992) | U.S. Department of Transportation, Federal Highway Administration | Yes |
| | PondPack v.8 | Haestad Methods, Inc. | No |
| | QUICK-2 1.0 and up (January 1995) | FEMA | Yes |
| | StormCAD v.4 and v.5 | Haestad Methods, Inc. | No |
| | WSPGW 12.96 (October 2000) | Los Angeles Flood Control District and Joseph E. Bonadiman & Associates, Inc. | No |
| | WSPRO (June 1988 and up) | USGS, Federal Highway Administration | Yes |
| | XP-SWMM 8.52 and up | XP Software | No |

Table 6.11 Hydraulic Modeling Applications Accepted by FEMA for the National Flood Insurance Program

| Type | Program | Developer | Public Domain? |
|---|---|---|---|
| One-dimensional unsteady flow models | FEQ 9.98 and FEQUTL 5.46 (2005, both), FEQ 8.92 and FEQUTL 4.68 (1999, both) | Delbert D. Franz of Linsley, Kraeger Associates; and Charles S. Melching, USGS | Yes |
| | FLDWAV (November 1998) | National Weather Service | Yes |
| | FLO-2D v. 2003.6 (July 2003) and 2004.10 (November 2004) | Jimmy S. O'Brien | No |
| | HEC-RAS 3.1.1 and up | USACE | Yes |
| | ICPR 2.20 (October 2000) and 3.02 (November 2002) | Streamline Technologies, Inc. | No |
| | MIKE 11 HD | DHI Water and Environment | No |
| | Storm Water Management Model (SWMM) 4.30 and 4.31 | USEPA and Oregon State University | Yes |
| | SWMM 5.0.005 (May 2005) | USEPA | Yes |
| | UNET 4.0 | USACE | Yes |
| | XP-SWMM 8.52 and up | XP Software | No |
| Two-dimensional steady/unsteady flow models | FESWMS 2DH 1.1 and up | USGS | Yes |
| | FLO-2D v. 2003.6 (July 2003) and 2004.10 (November 2004) | Jimmy S. O'Brien | No |
| | MIKE Flood HD 2002 D and 2004 | DHI Water and Environment | No |
| | TABS RMA2 v.4.3 RMA4 v4.5 | USACE | Yes |
| Floodway analysis | PSUPRO | Pennsylvania State University/USACE/FEMA | Yes |
| | SFD | USACE/FEMA | Yes |

[a] Enhancement of these programs in editing and graphical presentation can be obtained from several private companies.

Note: FEMA periodically updates its list of approved hydraulic models.

Table 6.12 H&H Modeling Application Selection Considerations

| Consideration | Description |
|---|---|
| Familiarity to regulatory community | FEMA requirements for modeling to support regulatory floodplain mapping do not exclude the use of many models, but it is clear that many are more acceptable to regulatory review staff than others. The familiarity of regulatory staff at IDNR-OWR and FEMA will be considered as a part of specific H&H modeling application selection. |
| User base for consistent type of projects | It is common for modelers to look to a broader community of users for advice and support as a part of modeling projects. For example, a SWMM users' e-mail group is commonly used to troubleshoot problems with the application and draw upon the experience of a broad group of users. SWMM users commonly are focused on the application of SWMM to sewer system evaluations. Similar user groups exist for Hydrologic Engineering Center (HEC) modeling applications. Local, regional, and national training seminars and conferences focus on some applications more than others. The existence of an active user base will be considered in the selection of a modeling application. |
| History of use on floodplain mapping projects | This will be considered as part of the modeling application selection to project ease of permitting for any regulatory activities. The use of an application for projects similar to those faced by the District likely will lead to tools and support programs developed by others that will benefit the District. HEC is the most commonly used national tool for supporting flood control programs similar to the District. |
| Number of options for simulating open channel hydraulics | Having several options for modeling open channel hydraulics allows for a more accurate representation of field conditions. HEC applications have extensive bridge and culvert crossing options that allow users to develop confidence in results through the application of alternative hydraulic simulation approaches. |
| Consistency with data developed for existing regulatory models | It may be important to integrate new modeling with existing models. The ability of model output to be used between models may be important. Conversations with IDNR-OWR and experience in the area confirms that HEC software is the most commonly applied modeling application for flood control projects and regulatory floodplain mapping. This is an important consideration in the selection of any modeling application for the District's Stormwater Management Program. |
| Ability to perform fully dynamic unsteady flow analysis | This may be an important feature that could affect the model results and magnitude of flood control projects identified as a part of this program. Because of the flat terrain of Cook County and surrounding areas, the regulatory floodplains and floodways contain significant storage volumes. Traditional modeling applications use approaches that simulate this storage in a simplified and typically conservative manner. Fully dynamic unsteady flow modeling applications allow for a more explicit simulation of this storage that often leads to results showing more accurate lower floodway elevations. |
| Availability of vendor provided proprietary interface applications that enhance usability of product | Some models include proprietary modules to increase the functionality of the model. This may be useful as modeling exercises become more complex. |
| GIS interface capabilities | An important component of watershed modeling will be to integrate the application with GIS software. Most modeling applications listed in Tables 6.10 and 6.11 have GIS interfaces that have been developed to support data development and visualization. |

Subarea boundaries will be developed as closed polygons with attribute data that at a minimum include their watershed designation, model name, total area and source of data used for delineation and any other fields specified by the District. Subarea delineation data will be in a format compatible with the District's stormwater GIS. The overall watershed delineation developed as a part of DWPs will be used as the District's official watershed delineation for administrative as well as technical purposes.

**Rainfall Data.** Observed and design event rainfall data may be used to support H&H modeling performed as a part of a DWP. Observed rainfall data are used as a part of hydrologic model data calibration. Two approaches are typically used to define observed rainfall data. These are the use of rain gauge data or rainfall data developed using radar technology. Both approaches are acceptable and will be used where appropriate as a part of DWPs developed by the District. Table 6.13 specifies how observed rainfall data will be used. Design event rainfall data are used to define flood damages, evaluate alternative improvement projects, and recommend capital improvements. Observed and design event rainfall data developed and used as a part of a DWP will be organized in a database format. Fields required in the table where rainfall data are stored will include year, month, day, hour, minute, and depth (inches).

GIS applications will be used to determine influence areas for rainfall data. For rain gauges, GIS applications will be used to develop Theissen polygon areas that can be intersected with subarea delineations to assign rainfall data for hydrologic modeling. Theissen polygon areas will be created in a GIS format consistent with District standards. If radar derived rainfall data are used, influence areas of rainfall data sets will be provided to the District in a GIS format consistent with District standards.

Table 6.13 Observed Rainfall Data Utilization Criteria

| Source of Observed Rainfall Data | Criteria for Application |
|---|---|
| Rain gauges | Rain gauges that log rainfall data on a 10- to 15-minute increment will be used to support hydrologic model data calibration during storms where spatial distribution of rainfall appears to be adequately captured by the rain gauge network in place. The Cook County Precipitation Network operated by IDNR-SWS records data at 10-minute increments at 25 rain gauges (see Table 6.8). Research was developed to determine the appropriate minimum spacing and coverage requirements, which determined the locations of the rain gauges. |
| Radar-derived rainfall data | Radar derived rainfall data may be used in large watersheds where the rain gauge network in place is unlikely to sufficiently define the spatial distribution of rainfall occurring over the watershed. The District will review the existing and proposed rain gauge network and historic spatial rainfall distribution patterns to provide justification for the use of radar derived rainfall data. |

**Design Event Rainfall Data.** Design event rainfall data are used as a part of the H&H modeling that is performed to support the identification of flooding problem areas, flood damage curves and the development and evaluation of alternative improvement projects. The standard source of rainfall depth and distribution data for H&H model evaluations will be the sectional frequency distribution of rainfall for given recurrence intervals as listed in Bulletin 70 or Bulletin 71 with Huff Distribution or the data most recently adopted by IDNR-OWR for use in hydrologic modeling. Bulletin 71 provides guidance on which Huff distribution will be used (1st, 2nd, 3rd, or 4th quartiles) with storms of various durations.

To determine the critical or most extreme duration storm for each recurrence interval storm considered as a part of DWP development, a critical duration analysis will be conducted. To be consistent with IDNR-OWR requirements, the critical duration analysis must include at least the simulations of 1-, 3-, 6-, 12- and 24-hour duration storms.

**Infiltration Rates and Capacities.** The most common method used to determine loss rates and runoff volumes in Cook County has been the Soil Conservation Service (SCS) Curve Number method. The method is acceptable for the hydrologic modeling that is performed as part of a DWP. Other methods may be used when appropriate at the discretion of the District. When using the SCS Curve Number method, the modeler will follow guidance contained in Urban Hydrology for Small Watersheds (USDA NRCS, TR-55, June 1986) or as approved by the District.

**Runoff and Overland Flow Parameters (Existing and Future).** Impervious area coverage, aerial photography, topographic mapping, soils groups mapping and other soils data, land use mapping, and other land use data all will be used to determine watershed areas, flow paths, slopes, lengths, time of concentration, and any other parameters necessary to support developing stormwater runoff hydrographs consistent with the guidance within USDA NRCS TR-55 or as approved by the District.

**Unit Hydrograph/Routing.** Unit hydrographs acceptable for routing runoff include SCS dimensionless, Clark, or Snyder. A user-specified unit hydrograph may be used for a watershed if enough quality data are available for it to be properly derived from observed rainfall and runoff.

### 6.4.2.3 Hydraulic Model Data Development

**Channel Cross Section Data.** Channel cross sections used within hydraulic modeling applications will be obtained through field surveys that meet survey standards described in Table 6.9. Field survey efforts will include the determination of the appropriate Manning's roughness parameters based on observations of characteristics that include surface roughness, vegetation, channel size, channel shape, channel alignment, and obstructions. If observed water surface profile information is available in the form of gauge data, calibration of Manning's "n" values is possible and desirable.

*Open Channel Hydraulics* by V. T. Chow (McGraw-Hill 1959; reissued 1988) contains excellent guidance for determining Manning's "n" values for a wide range of rivers and streams. The USGS Illinois Water Science Center has computed Manning's "n" values at many representative urban and rural sites in Illinois, available at http://il.water.usgs.gov/proj/nvalues/. Figure E-1 in Appendix E is an example of the type of form to be used to document Manning's "n" values in the field. Separate Manning's "n" values are generally appropriate to be used for the channel and the overbanks. The typical channel cross section template form in Figure E-2 in Appendix E is an example of the type of form that will be used to gather cross-sectional data during a survey.

**Bridge and Culvert Crossings.** Bridges and culverts generally will be modeled as existing. For the baseline conditions model, bridge or culvert replacement projects that are under construction or in the late stages of the planning process and unlikely to be revised may be modeled as proposed. The model must account for bridge deck, piers, abutments, and embankment side slopes.

**Storage Areas.** Storage areas that are simulated as a part of hydraulic modeling will be represented with stage-area or stage-volume relationships developed from best available topographic information and discharge rating curves developed according to hydraulic properties of the controlling device.

**Downstream Boundary Conditions.** Downstream boundary conditions for hydraulic analysis will be based on known water surface elevations when available. If the water surface elevation is unknown at the downstream end of the study reach, normal depth will be used at a location further downstream so as not to have influence on the profile. To test whether the starting cross section is sufficiently downstream for a given discharge, the distance is varied until the water elevation at the project boundary does not change appreciably, which indicates that the profile will not be affected by the starting elevation.

#### 6.4.2.4 Steady State vs. Unsteady Flow Analysis

If there is reason to believe that a steady-state model would inadequately represent actual hydraulic conditions, such as extremely flat slopes (Froude number < 0.1) or flow restrictions that may cause significant storage within the channel or situations with reverse flow, then unsteady-state modeling will be considered and used where necessary.

#### 6.4.2.5 Critical Duration Storm Analysis

A critical duration storm analysis (CDSA) will be performed and documented as a part of design event simulations performed to develop flood damage curves. A CDSA is performed for each problem area to identify the duration storm that produces the critical water surface elevation and level of damage. CDSA involves running a range of duration storm events for a given recurrence interval to determine which duration storm is critical. Generally, this duration is somewhere near the time of concentration of the watershed tributary to a given point. The IDNR-OWR generally requires a CDSA as a part of the regulatory map revision process.

#### 6.4.2.6 Model Calibration and Verification

Calibration must be performed in developing defensible H&H models representative of actual conditions. High water marks, historic floods, or other stream gauge data will be used to compare with model results and adjust model parameters, typically the roughness coefficients. The final calibrated model must not contain model parameters outside their “reasonable” bounds, although it may be permitted when performing model sensitivity analyses. If enough data exist, the model will be validated by comparing calibrated model results to a set of data that was not included in the calibration.

H&H model data will be calibrated to a point where the runoff volume and stream flow rates are within roughly 30 percent of the data recorded at stream gauges. Water surface elevations will match within 6 inches. In some cases, where rain gauge data are used to support calibration, it is not possible to adjust H&H model data with confidence when the spatial distribution of rainfall appears to be inadequately captured and reflected in the model.

### 6.4.3 Floodplain Mapping

To ensure that H&H modeling performed as a part of a DWP can be utilized for future FEMA FIRM remapping efforts, the District will require that all modeling performed be consistent with current IDNR-OWR and FEMA standards. Both agencies have published standards that will be followed: *Floodplain Map Revision Manual* (March 1996) published by IDNR-OWR and *Guidelines and Specifications for Flood Hazard Mapping Partners* published by FEMA, available at http://www.fema.gov/fhm/gs_main.shtm. It is not a specific goal of the DWPs to replace or revise the current FEMA FIRM maps. However, if a substantial error in the current regulatory maps is identified during a DWP, the District may consider requesting a map revision from FEMA. As the CIP progresses, a decision will be made as to whether the District or the benefiting local government entity will pursue map revisions necessary to reflect the implementation of future flood control projects.

## 6.5 Problem Area Identification

Stormwater problem areas will be identified through stakeholder involvement, such as WPC meetings, discussion with other agencies, and logs of complaints. They will also be identified and confirmed as a part of the DWP. DWP reports will summarize relevant and known stormwater problem areas and also watershed analyses to confirm the magnitude of flooding problems.

### 6.5.1 Flooding Problem Areas

Flooding problems are defined as flooding of residential, commercial, industrial and public buildings, or transportation facilities that are critical to the economy and emergency services. H&H models will be the primary method for evaluating flooding problem areas. H&H models will be used to define water surface elevations for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year recurrence interval design storms. These elevations will be compared with top of foundation and first floor elevations for properties within the floodplain to develop flood damage curves. The methodology for developing flood damage curves and data required to support them are described in Section 6.6.

In some instances flooding may result from non-riverine sources, such as depressions in the ground surface that are inundated by the water table. The majority of such depressional flooding instances are expected to be confined to a single community, and therefore will not be addressed in a DWP. However, cases where depressional inundation results in inter-community flooding will be addressed with the DWP, in conjunction with the District, on a case by case basis.

### 6.5.2 Erosion Problem Areas

Erosion problems are defined as streambank erosion along waterways that could result in property damage or a risk to human health and safety. As part of a DWP, the District will require an evaluation of streambank conditions to generally identify areas where erosion appears to meet these criteria. Special attention will be paid to areas where the District or other stakeholders have received complaints about erosion problems that are threatening structures or posing a risk to human health and safety. The District will visit the erosion problem areas identified and document existing conditions to support the evaluation of alternatives. Site visits will include the collection of survey data that is necessary to prepare conceptual level plans and cost estimates for alternative improvement scenarios.

### 6.5.3 Maintenance Problem Areas

Maintenance problems are defined as restrictions on drainage caused by accumulation of debris. They will be identified through field visits by District staff or through stakeholder identification. Further information on maintenance can be found in Section 5.4. Efforts to identify the agencies responsible for maintenance within the watershed will be undertaken in the DWPs.

### 6.5.4 Water Quality Problem Areas

Water quality problem areas are identified in the IEPA's 303d Report. As discussed in Chapter 4, the report provides a comprehensive summary of waterways within the state of Illinois where water quality standards or listing criteria are not met. Water quality benefits provided by projects planned as a part of DWPs will be shown in qualitative terms as a part of the documentation of improvement projects identified. During development of the draft CCSMP, the District went to great lengths to identify methods accepted by other agencies, such as the USACE and the IDNR-OWR, for determining the economic value of ecosystem impacts and water quality improvement to no avail. Therefore, until an acceptable method is identified and approved by the District, the water quality improvement and ecosystem impact facets of a project will be considered as non-economic factors.

### 6.5.5 Wetlands, Floodplains, and Riparian Environment at Risk

Wetland, floodplain, and riparian areas will be identified as a part of a DWP. Wetland areas are identified on National Wetland Inventory (NWI) mapping. GIS data for NWI mapping are available on the Web (http://www.fws.gov/nwi/) for download and incorporation into DWPs. Floodplain areas are delineated for many of the Cook County regional waterways and will be summarized as a part of a DWP.

Riparian zones generally are not delineated for Cook County waterways and will be defined as a part of a DWP. Wherever possible, a desktop evaluation of aerial photography or other available field data will be the method for identifying riparian zones. Riparian zones generally are defined as the interfaces between terrestrial and aquatic ecosystems. For the purpose of DWP development, riparian areas will be defined as any vegetated area adjacent to a waterbody that is occasionally inundated by floodwaters resulting in periodic hydric soil conditions. The frequency of inundation impacts the nutrient loads of riparian areas, as well as the soil conditions and plant community composition. The 10-yr delineated floodplain will be used to characterize inundation. For stream reaches where flood frequency data is not available, riparian delineation will attempt to capture the functional relationship between periodic inundation and species diversity in the floodplain.

## 6.6 Estimates of Existing Damage

Estimating existing damages is the first step in defining the extent of problem areas. Damage estimates defined as a part of a DWP will focus on the economic damages caused by flooding and streambank erosion. Economic damages are estimated by summing damages from four categories:

- Property damage resulting from flooding (residential and commercial)
- Streambank erosion damage
- Transportation damage
- Recreation damage

The following subsections provide guidance on the economic valuation of damages and benefits that will be included as a part of DWP development.

### 6.6.1 Property Damage

Property damage caused by flooding includes structural damage to buildings (residential, commercial, industrial, and public) and loss of building contents (equipment, furnishings, raw materials, and inventory). The extent of property damage depends on the severity of the flood. For riverine flooding typical of Cook County, severity is dictated primarily by flooding levels and by high flow velocities and the duration of flooding. A floodplain inventory is necessary to understand the assets that are at risk. H&H modeling is used to define water surface elevations for several storm events of varying probability of occurrence and to understand the impact on properties within the floodplain.

Table 6.14 summarizes data requirements for this analysis and suggested data sources. Several public domain applications are available to support the development of average annual damages ($AA_D$) curves using the data listed in Table 6.14 and consistent with the USACE's National Economic Development (NED) methodology.

Table 6.14 Property Damage Calculations

| Data Requirement | Source |
|---|---|
| Flood stage elevations for 2-, 5-, 10-, 25-, 50-, and 100-year storms. | H&H modeling based on guidance contained in Section 6.4. For DWPs, flood stage elevation (floodplain boundaries) will be developed consistent with GIS standards and specifications provided by the District. |
| Surveyed property and structure Locations | Based on surveys performed during DWP development or acceptable estimates based on topographic data and visual inspections. |
| Zero-damage elevations for each structure | Based on surveys performed during DWP development or acceptable estimates based on topographic data and visual inspections. |
| Assessed value of each asset | Cook County tax parcel data. |
| Valuation of contents of structures | Recommended assumptions: For residential structures, contents are 50% of the replacement value of the structure. For commercial, industrial, or public facilities, contents are 90% of the replacement value of the structure. More specific information can be substituted, if it can be easily obtained through interviews or additional data gathering. |

In general, based on the flood stage calculated using H&H models, damages are calculated for six storm events: 2-, 5-, 10-, 25-, 50-, and 100-year. Once the damages are calculated, a damage curve is developed by plotting the value of damages versus the exceedance probability. The $AA_D$ value, which can be determined by calculating the area under the damage curve, is essentially the sum of all the damages weighted by their probability of occurrence.

Appendix F contains a more detailed description of the NED methodology for determining property damages including the development of damage curves and performing benefit-to-cost (BC) analysis.

### 6.6.2 Streambank Erosion Damage

Streambank erosion damage will be calculated in a manner similar to property damage calculations. Surveys performed by the District will determine where streambank erosion is likely to cause property damage. In such cases, the valuation of the structure and the contents of structures deemed to be at imminent risk will be included. Therefore, frequency determinations are unnecessary, and evaluations will focus on effectiveness for the full range of expected flows, particularly bank full-flow ranges. Only actual property damage to structures will be included in the damage calculation. Loss of land will not be considered.

### 6.6.3 Transportation Damage

The following damages in the transportation category will be quantified for the purposes of damage assessment:

- Physical damages to roads, bridges, traffic signal installations, and sewers
- Emergency response costs
- Traffic delay or disruption

Transportation damages will be calculated using the following tiered approach:

**Tier 1—**If avoided transportation damages are not expected to be a significant component of the project, then a 15 percent markup of total property damage should be used to account for indirect damages. This methodology is consistent with the IDNR-OWR's common approach to damage assessment, which includes physical damages, emergency response costs, and traffic delays or disruptions, and is intended to cover such costs as public works staff time, lost wages for residents, and other associated damages.

**Tier 2—**If the traffic delay component of the project is expected to be more significant, then a more detailed traffic delay analysis will be performed and included as an addition to the 15 percent markup. The methodology used for this analysis will be site-specific and will be approved by the District.

**Tier 3—**If historic information obtained during DWP preparation shows that flooding in the area has been known to cause significant transportation damage, then project-specific transportation damage curves will be developed in place of the 15 percent markup. An example of this may be that bridges in a particular project area are of high value and vulnerable to flood damages; therefore, the 15 percent markup would not be high enough to account for the damage expected to these bridges. These project-specific damages will be calculated using the formula

$$D_x = F_x Q_x$$

where:

$D_x$ = the monetary damages derived from a particular flood event; e.g., damages for a 2-year flood

$F_x$ = multiplication factor incorporating cost; e.g., cost of project-specific bridge replacement

$Q_x$ = the quantity of the particular facility affected by the flood event; e.g., number of bridges affected by the flood

Specific cost factors and inputs to be used to calculate damages for each transportation cost component will be developed using historic information. As with property damages, transportation damages will be calculated for each flooding event, developed into a damage curve, and then converted into an $AA_D$. The $AA_D$ is determined by calculating the area under the damage curve. Appendix F contains a detailed explanation of this procedure.

### 6.6.4 Recreation Damages and Benefits

Recreation damages are incurred through the loss of the use of parks, forest preserves, or other recreational facilities. Recreation benefits can accrue from damages avoided and by the creation of recreation areas as part of a flood control project. Several methods have been developed to calculate recreational damage/benefit. The unit day value (UDV) method will be used for recreational damage or benefit calculation as a part of DWPs. The UDV method relies on annually published studies by the USACE that estimate dollar damages per day ($ person-day) that are accrued based on a point rating. The point rating system includes five criteria related to: available activities, facilities, relative scarcity, ease of access, and aesthetics. Appendix G contains USACE's 2006 published study, which is updated annually. The general formula for calculating damages is:

$$D_x = F_x V_x L_x$$

where:

$D_x$ = the monetary damages derived from a particular flood
$F_x$ = multiplication factor incorporating the UDV
$V_x$ = the average number of daily visitors to a recreational facility
$L_x$ = Length of impact in days

Unless site-specific information can be readily developed, the values contained in Appendix H (Table H-1) will be used to calculate recreational damages or benefits. This table will be evaluated annually to determine if updates are required.

Similar to property and transportation damages, recreation damages must be calculated for each flood event, developed into a damage curve, and then converted into an $AA_D$ for recreation facilities. The $AA_D$ can be determined by calculating the area under the damage curve. Appendix F contains a detailed explanation of the procedure.

### 6.6.5 Final Calculation

Once damages are calculated for each flood event, a damage curve will be developed for the sum of all damages from each category, and then converted into an overall $AA_D$. The $AA_D$ can be determined by calculating the area under the damage curve. Appendix F contains a more detailed explanation of this procedure. Table 6.15 summarizes the valuation of damages and benefits proposed in the sections above.

Table 6.15 Summary Recommendation for Economic Valuation

| Type of Damage and Benefit | Description | Valuation Method |
|---|---|---|
| **Property Damage from Flooding** | | |
| Residential property —structural damage | Avoided structural damage to residences. | Follow USACE NED guidance. Use HEC-Flood Damage Assessment (FDA) or IDNR-OWR's damages model. Property valuation will be based on assessed value obtained from Cook County tax records. |
| Residential property—contents | Avoided damage to contents within residences. | Assume 50% of structural damage to account for residential contents. |
| Industrial commercial property—structural damage | Avoided structural damage to industrial/commercial property. | Follow USACE NED guidance. Use HEC-FDA software or IDNR-OWR's damages. Research individual building types through interviews and other data collection. |
| Industrial/ commercial property—contents | Avoided damage to contents within industrial/commercial property. | Assume 90% of structural damage unless information can be obtained through interviews and other data collection. |

Table 6.15 Summary Recommendation for Economic Valuation

| Type of Damage and Benefit | Description | Valuation Method |
|---|---|---|
| **Streambank Erosion Damage** | | |
| Erosion damage | Damages from erosion. | Similar to structural damage, except include damage in areas where erosion is the cause of structural damage rather than flooding. Only structural damage will be included in the valuation, loss of land will not be considered. |
| **Transportation Damage** | | |
| Transportation—physical damage and emergency response costs | Physical damage to roads, bridges, and utilities, as well as damages resulting from police, fire and emergency rescue costs. | Assume 15% of property damages (structural plus contents) for indirect transportation damages (this includes both physical damage and emergency response costs). |
| Transportation damage—operation and delay costs | Damage from additional vehicle operation, and loss of productivity. | Operational delay is considered when the flood elevation reaches 0.5 foot above the low roadway elevation. If significant, estimate damages based on estimated cost of delay. |
| Transportation damage—vehicles | Damage to vehicles. | Not included for District transportation damage calculations. Assume most vehicles will be removed from flooded areas before damage can occur. |
| Other damages—income loss | Damage from lost wages of workers that cannot be transferred out of a flooded area. | Not included. Assume that work can be transferred out of the flooded area. (*Note:* The likelihood of an event extreme enough to cause income loss is small.) |
| Other damages — relocation costs | Damages from additional living expenses of residences required to temporarily relocate. | Not included for District transportation damage calculations. Assume that living expenses are small relative to property damage. |
| **Recreation Damage and Benefit** | | |
| Parks and forest preserves | Damage incurred from the loss of use of parks, forest preserves, or other recreation areas. Benefits accrued from the development of new recreation areas created by an alternative will be valued (see Section 6.6.4) | USACE Economics Guidance Memorandum, 07-03 dated November 20, 2006, unit day values for recreation, fiscal year 2007, which estimates $/person-recreation day. This calculation can be used to calculate damages in recreation areas as well as benefit from recreation area created. |
| **Wetland and Riparian Areas** | | |
| Wetlands and riparian habitat | Existing damage to wetlands and riparian habitats will not be included in the baseline damages valuation. Damage caused by an alternative will be mitigated and included in the overall cost of an alternative. Benefit from additional wetlands or riparian habitat created by an alternative will be valued (see Section 6.7.3.1). | Not included in damage calculation. For benefit calculations use the market rate of wetlands and riparian habitat from a wetland bank in the appropriate watershed. |
| **Water Quality** | | |
| Water quality | Damages from impaired water quality, both ecological and regulatory. | Not included until an acceptable method is developed. |

## 6.7 Alternative Development and Evaluation

Once problem areas are defined (Section 6.5) and damages quantified (Section 6.6), then alternatives to reduce the damages associated with the problems will be developed and evaluated. Several alternatives will be developed and evaluated for each problem area. For flooding problem areas, alternatives will provide a varying level of protection. In other words, some alternatives will address lower recurrence interval storms such as the 15-year storm, and others will address higher recurrence interval storms such as the 100-year storm. Once alternatives are developed, they will be evaluated based on their BC ratio or net benefit.

The enacting legislation, Public Act 93-1049, in which authority was granted to the District for the responsibilities of stormwater management for Cook County, stipulates that BC analysis is required during deliberations for capital project selection. However, the District's Board of Commissioners is not required to select projects solely on BC analysis. They may also decide to consider noneconomic criteria in the selection of alternatives for each problem areas. Information about noneconomic criteria will be summarized for each project so that it can be included as a consideration in the countywide prioritization of stormwater improvement projects. The ultimate decision for funding of any capital project is at the discretion of the District's Board of Commissioners.

Section 6.7 is generally organized according to the steps to be followed as a part of alternative development and evaluation. Alternative development and evaluation will be performed as a part of DWPs. Table 6.16 summarizes the general steps for development and evaluation of alternatives.

Table 6.16 Summary of Alternative Development Sections

| CCSMP Section Number | Alternative Development and Evaluation Step | General Overview |
|---|---|---|
| 6.5 | Define problem areas | Use guidance in Section 6.5 to identify and define the magnitude of problem areas. |
| 6.7.1 | Identify alternatives | Use technology guidance provided in Section 6.7.1 and information on watershed to identify alternatives that can help resolve problems in problem areas. |
| 6.7.2 | Evaluate alternatives | Evaluate alternatives for effectiveness addressing problem areas. This will primarily focus on the evaluation of the effectiveness of flood control alternatives using H&H modeling consistent with protocol established in Section 6.4. Streambank erosion control alternatives will focus on bank-full conditions. |
| 6.7.3 | Estimate conceptual cost of alternatives | Use unit costs, markups, and other guidance provided by the District to estimate the conceptual cost of alternatives. |
| 6.7.3 | Evaluate cost-effectiveness of alternatives | Use the damages defined in Section 6.6 and the conceptual cost estimates to determine the BC ratio for each alternative. Use the BC ratio to determine whether alternatives address problem areas cost-effectively. |
| 6.8 | Summarize recommended projects for each problem area and define noneconomic criteria | Develop lists of projects recommended throughout the watershed for each problem area. Alternatives that have the highest BC ratio (net benefit) generally will be recommended for each problem area. Also summarize noneconomic data for each problem area to be used as a part of District's countywide prioritization of improvement projects. |

### 6.7.1 Technology Guidance and Alternative Identification

Many acceptable technologies can be used alone or in combination to form project alternatives to remediate existing stormwater problems. Where opportunities exist, projects funded by the District will incorporate BMPs that provide secondary water quality benefits. Section 6.7.1 provides guidance on the use of technologies in developing alternatives to remediate flooding and erosion problems.

#### 6.7.1.1 Flood Control Technologies

As described in Section 6.5, flooding problems occur when flood waters reach structures, transportation facilities, utilities, critical facilities, or recreation areas. Damages arise from the effects on the facilities and their contents, as well as the consequences of loss of service. Table 6.17 contains descriptions of technologies that can remediate flooding problems and also general guidance on their use for the development of alternatives. The technologies will be used as appropriate for the development of flood control alternatives as a part of a DWP.

Technologies listed in Table 6.17 are summarized in terms of their ability to remediate flooding problems. It is assumed that these technologies would be implemented along with a regulatory program that requires measures to prevent future flooding problems. Without measures to prevent future flooding problems, such as site discharge restrictions, the technologies may not prove as effective in the future as when they originally were designed and implemented.

Table 6.17 Summary of Flood Control Options

| Flood Control Option | Description |
|---|---|
| **Detention/Retention** | |
| Detention facilities | Impoundments to temporarily store stormwater. This centralized technology includes wet basins, stormwater wetlands, regional facilities, and flood control reservoirs. |
| Retention facilities (Wet basins) | Impoundments to permanently store stormwater and remove it through infiltration and evaporation. Retention facilities generally have an outfall to the receiving waterway that is located at an elevation above the permanent pool. |
| Underground detention | A specialized form of storage where stormwater is detained in underground facilities such as vaults or tunnels. |
| Bioretention | Decentralized microbasins distributed throughout a site or watershed to control runoff close to where it is generated. Runoff is detained in the bioretention facilities and infiltrated into the soil and removed through evapotranspiration. |
| **Conveyance Improvement** | |
| Culvert/bridge re-placement | Enhancement of the hydraulic capacity of culverts or bridges serving as stream crossings through size increase, roughness reduction, and removal of obstacles (for example, piers). |
| Channel improvement | Enhancement of the hydraulic capacity of channels by enlarging cross sections (for example, floodplain enhancement), reducing roughness (for example, lining), or channel realignment. |
| **Flood Barriers** | |
| Levees | Earth embankments built along rivers and streams to keep flood waters within the channel. |
| Floodwalls | Vertical walls typically made of concrete or other hard materials built along rivers and streams to keep flood waters within the channel. |
| **Relocation** | |
| Buyouts | Acquisition and demolition of properties in the floodplain to eliminate flood damages. |
| Building relocation | Relocation of buildings (typically houses) to higher ground to remove them from the floodplain. This technology requires purchasing new land and transporting buildings to new locations. |
| Elevation | Modification of a structure's foundation to elevate the building above a given flood level. Typically applied to houses. |
| **Floodproofing** | |
| Dry floodproofing | Installation of impermeable barriers and flood gates along the perimeter of a building to keep flood waters out. Typically deployed around commercial and industrial build-ings that cannot be elevated or relocated. |
| Wet floodproofing | Implementation of measures that do not prevent water from entering a building but minimize damages; for example, utility relocation and installation of water resistant materials. |

Note that sometimes applications of flood control technologies to address problems in one location may aggravate problems in another location (for example, conveyance improve-ments reduce flooding upstream but may worsen conditions downstream). Therefore, the potential applications of flood control technologies to address problems will not be analyzed in isolation. No alternative recommended as a part of a DWP may create negative impacts within the watershed or outside of the watershed, including areas lying outside of Cook County.

### 6.7.1.2 Erosion Control Technologies

As described in Section 6.5, streambank erosion can result in property damage or a risk to human health and safety. Damages arise from the effects on the facilities and their contents, as well as the consequences of loss of service. A description of appropriate technologies that can remediate existing streambank erosion problems and general guidance on their utilization for the development of alternatives, is presented in Table 6.18.

Table 6.18 Streambank Erosion Control Options

| Control Option | Description |
|---|---|
| Natural (vegetated or bioengineered) stabilization | The stabilization and protection of eroding overland flow areas or streambanks with selected vegetation using bioengineering techniques. The practice applies to natural or excavated channels where the streambanks are susceptible to erosion from the action of water, ice, or debris and the problem can be solved using vegetation. Vegetative stabilization is generally applicable where bankfull flow velocity does not exceed 5 ft/sec and soils are more erosion resistant, such as clayey soils. Combinations of the stabilization methods listed below and others may be used. |
| Vegetating by sodding, seeding or planting | Establishing permanent vegetative cover to stabilize disturbed or exposed areas. Required in open areas to prevent erosion and provide runoff control. This stabilization method often includes the use of geotextile materials to provide stability until the vegetation is established and able to resist scour and shear forces. |
| Vegetated armoring (joint planting) | The insertion of live stakes, trees, shrubs and other vegetation in the openings or joints between rocks in a riprap or articulated block mat (ABM). The object is to reinforce riprap or ABM by establishing roots into the soil. Drainage may also be improved through extracting soil moisture. |
| Vegetated cellular grid (erosion blanket) | Lattice-like network of structural material installed with planted vegetation to facilitate the establishment of the vegetation, but not strong enough to armor the slope. Typically involves the use of coconut or plastic mesh fiber (erosion blanket) that may disintegrate over time after the vegetation is established. |
| Reinforced grass systems | Similar to the vegetated cellular grid, but the structural coverage is designed to be permanent. The technology can include the use of mats, meshes, interlocking concrete blocks, or the use of geocells containing fill material. |
| Live cribwall | Installation of a regular framework of logs, timbers, rock, and woody cuttings to protect an eroding channel bank with structural components consisting of live wood. |
| Structural stabilization | Stabilization of eroding streambanks or other areas by use of designed structural measures. Structural stabilization is generally applicable where flow velocities exceed 5 ft/sec or where vegetative streambank protection is inappropriate. |
| Riprap | A section of rock placed in the channel or on the channel banks to prevent erosion. Riprap typically is underlain by a sand and geotextile base to provide a foundation for the rock, and to prevent scour behind the rock. |
| Interlocking concrete | Interlocking concrete may include A-Jacks®, ABM, or similar structural controls that form a grid or matrix to protect the channel from erosion. A-Jacks armor units may be assembled into a continuous, flexible matrix that provides channel toe protection against high velocity flow. The matrix of A-Jacks can be backfilled with topsoil and vegetated to increase system stability and to provide in-stream habitat. ABM can be used with or without joint planting with vegetation. ABM is available in several sizes and configurations from several manufacturers. The size and configuration of the ABM is determined by the shear forces and site conditions of the channel. |

Table 6.18 Streambank Erosion Control Options

| Control Option | Description |
|---|---|
| Gabions | Gabions are wire mesh baskets filled with river stone of specific size to meet the shear forces in a channel. The gabions are used more often in urban areas where space is not available for other stabilization techniques. Gabions can provide stability when designed and installed correctly. |
| Grade Control | Grade control measures may be used to prevent stream incision into the channel bed or upstream nickpoint migration. Grade control measures involve some means of stabilizing the channel bed at a desired elevation with natural materials such as rocks or logs, or in some situations concrete. Rock vortex weirs, rock cross vanes, and log drops are means of grade control that impede channel incision and often result in scour pools developing downstream of the grade control measure. |
| Concrete channels | A constructed concrete channel designed to convey flow at a high velocity (greater than 5 ft/sec) where other stabilization methods cannot be used. May be suitable in situations where downstream areas can handle the increase in peak flows and there is limited space available for conveyance. |
| Outlet stabilization | Prevent streambank erosion from excessive discharge velocities where stormwater flows out of a pipe. Outlet stabilization may include any method discussed above. |

USDA NRCS and IEPA. *Illinois Urban Manual.* 2002

Sometimes applications of streambank erosion control technologies to address problems in one location may aggravate problems in another location (for example, lining a channel in one location may exacerbate streambank erosion at another location). Therefore, application of streambank erosion or grade control technologies to address problems must not be analyzed in isolation. As stated previously, no alternative recommended as a part of a DWP may create negative impacts in the watershed or outside of the watershed including areas outside of Cook County.

Bioengineering techniques for stabilizing water body shorelines provide more natural solutions than hard armoring. Hard armoring, which protects the bank with concrete, riprap, or other nonnatural materials, is sometimes necessary when a bioengineered solution will not provide the necessary level of protection or cannot withstand flow velocities. In preparing a DWP, consideration will be made to allow only the minimum necessary amount of hard armoring. The DWP will consider the use of bioengineering techniques where appropriate. A combination of treatments will likely be suggested to maximize durability.

### 6.7.2 Alternative Evaluation

Alternatives developed to address flooding will be evaluated using H&H modeling consistent with methodologies described in Section 6.4. Modeling will determine the avoided damages or benefit for each alternative. The avoided damage or benefit will be used to calculate the BC ratio for each alternative.

Frequency determinations are unnecessary in evaluating alternatives developed to address erosions problems. Evaluations will focus on effectiveness for the full range of expected flows, particularly the bank full flow ranges. Costs will be considered, but not using the multistorm approach applied for flood damages.

### 6.7.3 Evaluating Cost Effectiveness of Alternatives

BC ratio is determined by calculating the benefit of a project in terms of avoided damages or benefit added, and the construction and operation and maintenance (O&M) costs associated with a project. Section 6.6 provides a description of the process to be followed to determine the benefit or damages for problem areas. Benefits are then divided by the cost to obtain an indicator of the cost effectiveness of each project. Net benefit can also be calculated by subtracting the cost from the benefit.

#### 6.7.3.1 Benefit Calculation

In economic terms, benefit is the dollar value of the damages avoided because of implementation of an alternative (flood control project, soil stabilization project, buyouts). Benefits are calculated by determining damages without a project minus damages with a project; that is, damages avoided. Benefits can include the added value of recreation facilities, wetlands, or riparian areas. As explained in Appendix F, benefits can be expressed as a present value, $PV_B$, or can be annualized to obtain the average annual benefits $AA_B$.

**Recreation Areas.** If the project creates recreation areas, the value will be included as a benefit to the project using the economic valuation method described in Section 6.6.4. Recreation benefit, once created, can be assumed to accrue annually over the life of the project.

**Wetlands and Riparian Areas.** If the project creates wetlands or riparian areas, their value will be included as an economic benefit of the project. The value of wetlands and riparian areas is calculated based on the market rate of wetlands in the watershed. Appendix H provides the 2006 market rate for wetlands by watershed (Table H-2). The values are variable and will be confirmed annually.

#### 6.7.3.2 Costing Assumptions

Project costs involve all expenditures necessary for implementation. For traditional flood control projects such as levees or reservoirs, they include study, design, land acquisition, construction, and O&M costs. For a residential buyout, there is a one-time cost to purchase structures in the floodplain, including demolition of the structures, restoration of the land, relocation and closing costs. Floodproofing costs may be represented by one-time costs of utility relocation and the occasional complete replacement of flood shields.

Flood protection projects provide benefits throughout a defined period of time that depends on the useful life of a project. A levee may have a useful life of 50 years, whereas relocation of a house outside the floodplain is a permanent solution. Every year that the project performs its functions, it provides benefits and, in principle, requires some expenditure, although most of the cost is incurred during construction. Therefore, the concept of annualizing is applied to compare these unevenly distributed benefits and costs.

Annualizing benefits and costs is a basic concept of engineering economics that accounts for the time value of money. To calculate the annual payment, benefits accrued and the costs incurred every year are discounted using compound interest procedures. The typical discount rate is set by the federal government and is also used by IDNR-OWR. Recently it has varied between 3 and 7 percent. In 2005, the value used by IDNR-OWR for discounting was 5.375 percent. The District will validate the discount rate annually. If the life expectancy of facilities is less than the period for which benefits are calculated, then replacement costs must be incorporated to account for the total cost of facilities for the entire time period.

Standard engineering economics textbooks provide formulas for converting a present value or a future value into a uniform series of “payments.” For example, a capital expenditure can be converted into an annual payment using the formula

$$AAc = PV \frac{i(1+i)^n}{(1+i)^n - 1}$$

where:

AAc = annual cost
n = useful life of the project in years
PV = total cost or benefit in the present
i = discount rate

To calculate costs accurately, it is necessary to have an assumption of the life expectancy of a project. Table 6.19 lists the standard assumptions to be used to estimate project life for purposes of alternative evaluation.

Table 6.19 Life Expectancy and O&M Requirements for Alternative Evaluation

| Project | Life Expectancy (yr) | Inspection and Routine O&M (yr) | Additional O&M (YR) |
|---|---|---|---|
| **Flood Control Projects** | | | |
| Detention pond | 50 | Every 2-3 | Every 10 |
| Underground detention | 50 | Every 2-3 | Every 5 |
| Levee with detention | 100 | Every 3 | Every 15 |
| Channel enlargement with detention | 50 | Every 2-3 | Every 5 |
| Floodproofing | 20 | Every 1 | Every 2 |
| Buyouts | Permanent | | |
| Detention pond | 50 | Every 2-3 | Every 10 |
| Underground detention | 50 | Every 2-3 | Every 5 |
| **Soil Stabilization Projects** | | | |
| Natural stabilization | 30 | Every 1 | Every 2 |
| Riprap | 30 | Every 2-3 | Every 5 |
| Reno gabions | 30 | Every 1 | Every 5 |
| Basket gabions | 30 | Every 1 | Every 5 |
| Sloped vertical concrete wall | 30 | Every 2-3 | Every 5 |
| Rectangular concrete channel | 50 | Every 2-3 | Every 5 |
| Trapezoidal concrete channel | 50 | Every 2-3 | Every 5 |

#### 6.7.3.3 Unit Costs for Alternative Development

The District will develop a current list of unit costs to use as part of alternative cost estimation. Unit cost items will be developed by the District and evaluated annually to determine if updates are required. In addition to the list of unit costs, the District will also establish consistent markups for items such as mobilization, engineering, and contingencies. Unless a customized or site-specific approach to include these costs is approved by the District, standard unit cost items and markups will be used for DWP alternative development to provide for consistency during the countywide prioritization of projects.

#### 6.7.3.4 Calculating Benefit-to-Cost Ratio

Once the average annual benefits ($AA_B$) and average annual cost ($AA_C$) have been estimated, the BC ratio is computed using the formula:

$$BC = \frac{AA_B}{AA_C}$$

where:

$AA_B$ = the average annual benefit
$AA_C$ = the average annual costs

Note that the BC ratio can also be computed using benefits and costs expressed as present values:

$$BC = \frac{PV_B}{PV_C}$$

where:

$PV_B$ = the present value of the benefits
$PV_C$ = the present value of the costs

The BC ratio will be used to evaluate whether a project is cost-effective. If the BC ratio is greater than one, the project benefits exceed the costs and the project can be considered cost-effective. Other factors may be considered that would favor a project that did not have a BC ratio greater than one.

Similarly, the net benefits of the project are equal to:

$$NB = PV_B - PV_C$$

If the net benefits are positive, the project is cost-effective and the BC ratio greater than one.

### 6.7.4 Alternative Selection for Problem Area

As stated previously, the District is required to consider the BC ratio when selecting projects for implementation. In addition the District will consider noneconomic criteria in selecting alternatives. All projects which meet the District's absolute requirements for capital project funding will be prioritized on a countywide basis, with final decision for funding made at the discretion of the District's Board of Commissioners.

## 6.8 Summary of Recommended Alternatives

Recommended projects will be summarized to describe the economic and noneconomic data to be used as a part of the District's countywide prioritization of improvements. The economic data will focus on the BC ratio defined for each problem area, consistent with the documentation provided in Sections 6.6 and 6.7. Noneconomic data to be developed for each project are summarized in Section 6.8.1.

Exhibit 6.1 depicts the documentation that will be prepared as a part of each DWP to support the countywide prioritization of projects. Only alternatives that meet the District's minimum criteria for funding (see Chapter 1) will be developed and evaluated. For each project that meets the minimum criteria, a BC analysis will be developed, as will information on the development of noneconomic data. That information will be summarized in a manner consistent with what is shown in Exhibit 6.1 for incorporation into the District's countywide prioritization of improvement projects. Note that all costs and net benefits shown in Exhibit 6.1 shall be expressed as present values.

### 6.8.1 Other Noneconomic Evaluation Criteria

In addition to the BC ratio, the following information will be compiled for the District to use as a part of the countywide prioritization of projects:

- Total cost to the District
- Area (in acres) removed from the floodplain
- Number of structures protected
- Probability that funding will be provided by outside agencies (identify funding source, and percent of project to be funded, if known)
- Implementation time (in months)
- Water quality benefit, based on the qualitative scale described in Section 6.8.2
- Cook County communities involved
- Wetland or riparian area protected (ac)

### 6.8.2 Water Quality Benefit

To determine the water quality benefit of a flood control or erosion control project, the following questions must be addressed:

- Does the project contribute to the implementation of a TMDL established for the watershed?
- Does the project improve water quality concerns identified as a part of an NPDES Phase II Stormwater Permit?
- Does the project improve water quality related to a pollutant or pollution identified in the state's 303(d) Report?
- Does the project have an effect on habitat?

Once these questions are addressed, water quality benefit will be evaluated qualitatively using the scale in Table 6.20.

Table 6.20 Water Quality Benefit Evaluation Scale

| Rating | Description |
|---|---|
| No Impact | No notable impact on water quality. |
| Slightly Positive | Project partly addresses or affects an NPDES Phase II Stormwater Permit, a TMDL established for the watershed, violations in water quality standards or listing criteria, or habitat. |
| Positive | Project fully addresses or impacts an NPDES Phase II Stormwater Permit, a TMDL established for the watershed, violations in water quality standards or listing criteria, or habitat. |

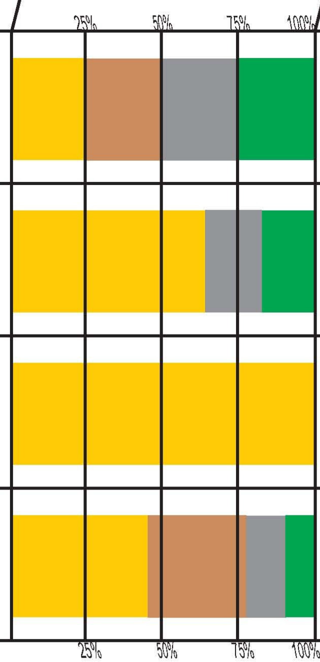
## 6.9 Implementation Plan

Each DWP will include an implementation plan that identifies issues critical to implementation of watershed recommendations. The recommendations will include stormwater improvement projects to address watershed problems, data management needs and responsibilities, special coordination requirements identified as a part of DWP development, scheduled updates to DWPs, and any other issues identified as critical to the District.

## Exhibit 6-1 Example CIP Prioritization Matrix

### Metropolitan Water Reclamation District of Greater Chicago
### Example Prioritization Matrix

| | B/C Ratio | Total Benefits ($) | Total Project Cost ($) | Total Cost To MWRDGC ($) | Relative Damage Averted (%) | Area Removed from Floodplain (ac) | Wetland or Riparian Area Protected (ac) | Number of Structures Protected | Possibility of Funding Provided by Outside Agencies | Implementation Time (months) | Water Quality Benefit | Communities Involved |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project A** | 1.25 | 5.0 M | 4.0 M | 3.2 M | | 5.0 | 40 | 6 | Very Likely | 6 | Positive | Oak Park<br>Berwyn<br>Cicero |
| **Project B** | 2.5 | 7.5 M | 3.0 M | 3.0 M | | 2.6 | 8 | 10 | Not Likely | 28 | Slightly Positive | Park Ridge<br>Des Plaines<br>Mount Prospect |
| **Project C** | 1.2 | 12.0 M | 10.0 M | 7.8 M | | 13.0 | 0 | 50 | Somewhat Likely | 3 | No Impact | Oak Lawn<br>Chicago Ridge |
| **Project D** | 1.0 | 15.0 M | 15.0 M | 14.0 M | | 3.9 | 15 | 25 | Not Likely | 24 | Slightly Postive | Buffalo Grove<br>Wheeling<br>Des Plaines<br>Mount Prospect<br>Prospect Heights |




*Note: This prioritization matrix may be expanded to include additional non-economic criteria. All values are hypothetical and for demonstration purposes only.*

# CHAPTER 7
# REGULATORY CONCEPTS

## Acronyms used in Chapter 7:

| | |
|---|---|
| BMP | Best Management Practice |
| CCSMP | Cook County Stormwater Management Plan |
| CMAP | Chicago Metropolitan Agency for Planning |
| DWP | Detailed Watershed Plan |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| IEPA | Illinois Environmental Protection Agency |
| IDNR-OWR | Illinois Department of Natural Resources - Office of Water Resources |
| IDNR-SWS | Illinois Department of Natural Resources - State Water Survey |
| NFIP | National Flood Insurance Program |
| NRCS | Natural Resource Conservation Service |
| NWI | National Wetlands Inventory |
| TGM | Technical Guidance Manual |
| USACE | United States Army Corps of Engineers |
| WMO | Watershed Management Ordinance |
| WPC | Watershed Planning Council |

# CHAPTER 7
# REGULATORY CONCEPTS

## 7.1 Introduction

The Cook County Stormwater Management Plan (CCSMP) proposes preparation of a Watershed Management Ordinance (WMO) to apply to all of Cook County, including unincorporated areas. The regulatory program supporting the countywide stormwater management program and the WMO will utilize the existing stormwater management framework in Cook County and draw on the expertise of federal, state and local agencies. The program will establish a countywide uniform baseline from which all activities impacting stormwater will be regulated.

The development of the WMO follows the adoption of the CCSMP. This chapter introduces the regulatory concepts to be considered during the preparation of the WMO. Concepts are presented along with short descriptions. This chapter does not propose how the concepts will be incorporated into the WMO, as these decisions will be made during the WMO preparation process. The chapter also describes common Best Management Practices (BMPs) and site design alternatives which can serve to protect and enhance the water resources of Cook County.

The language of this chapter is intentionally non-committal as the District will solicit advice and input from the Watershed Planning Councils (WPCs), various agencies and other stakeholders prior to reaching a decision as to what will be regulated and to what extent. Once a draft version of the WMO is completed, the District will provide a reasonable period of time for public review of the document. During preparation of the WMO, the District will review the stormwater management ordinances of neighboring counties and solicit input from these entities in order to learn from their experience in administering a countywide regulatory program. In addition, the District will also review model stormwater management ordinances developed by the Chicago Metropolitan Agency for Planning (CMAP).

## 7.2 Comprehensive Purpose Statement

While almost fully urbanized, Cook County also contains areas of undeveloped open space and farmland. A comprehensive regulatory program is necessary to address the stormwater issues of such a diverse county. Regulations must address a wide spectrum of stormwater issues ranging from redevelopment within older and well-established communities to new development in undeveloped areas.

The regulatory approach directly addresses 9 of the District's 19 stormwater management program goals. The WMO will include a comprehensive purpose statement addressing the goals listed below.

Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.

Goal D) Promote responsible land use practices in all areas of the watersheds of Cook County, particularly within floodplains and floodways.

Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

Goal Q) Encourage the public to consider stormwater as a resource rather than as a nuisance.

## 7.3 Floodplain Management

The floodplain management aspects of the regulatory program will be guided by the following five stormwater management program goals:

Goal D) Promote responsible land use practices in all areas of the watersheds of Cook County, particularly within floodplains and floodways.

Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

Communities that participate in the National Flood Insurance Program (NFIP) must adopt the Federal Emergency Management Agency (FEMA) minimum floodplain protection and building standards that have been incorporated into the model floodplain ordinance developed by the Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR). This model ordinance includes the additional standards for floodplain management established by IDNR-OWR. Public Act 93-1049 mandates that the rules and regulations of the countywide stormwater management program for floodplain management shall meet the standards for floodplain management established by FEMA and IDNR-OWR. The state and federal requirements, at a minimum, will be incorporated into the WMO. The District recognizes that many Cook County communities have floodplain management requirements more restrictive than IDNR-OWR and FEMA requirements. The WMO will not require such communities to adopt less restrictive floodplain management standards.

The following regulatory concepts related to floodplain management will be considered during the preparation of the WMO. Standards required to maintain eligibility in the NFIP or to meet the regulations of IDNR-OWR are indicated with an asterisk (*) throughout this chapter.

### 7.3.1 Floodplain Requirement Applicability

The WMO will address drainageways and depressional storage areas through all parts of Cook County including portions of watersheds with drainage areas less than one square mile. This focus fills a void in the current regulatory framework. IDNR-OWR does not regulate streams with drainage areas less than one square mile, ***unless a floodway has been defined***, leaving the possibility that development in these areas could lead to significant flood damages, loss of floodplain storage, and increases in flood flows downstream.

### 7.3.2 Floodplain Requirements and Floodplain Mapping

The floodplain requirements in the WMO will be most effective if based on the most up-to-date mapping and modernized databases. Some of the current FEMA regulatory floodplain maps for Cook County are outdated due to land use and other topographic changes or are inadequate since they do not include water surface elevations. FEMA has initiated a Flood Insurance Rate Map (FIRM) modernization program, and is currently compiling available, updated, existing hydrologic and hydraulic modeling data for selected waterways in Cook County. This data will be incorporated into a countywide modernization of floodplain maps. The WMO will require use of the most recent revisions of regulatory floodplain maps.

### 7.3.3 Restrict Floodway Development to Appropriate Uses *

IDNR-OWR defines appropriate uses for the floodway in Title 17 Ill. Adm. Code, Ch. I, Sec. 3708.70. Development must be restricted to those appropriate uses to meet minimum state standards. Appropriate uses applicable to the WMO are quoted directly from the regulation:

*1. Flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding or erosion (Section 18g of the Act) or water quality or habitat for fish and wildlife (e.g. Section 3708.80(a)(3) and(4));*

*2. 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 dependent uses (Section 18g of the Act);*

*3. Storm and sanitary sewer outfalls;*

*4. Underground and overhead utilities;*

*5. Recreational facilities such as playing fields and trail systems including any related fencing built parallel to the direction of flood flows;*

*6. Detached garages, storage sheds, or other non-habitable accessory structures to existing buildings that will not block flood flows. This does not include the construction or placement of any other new structures, (Section 18g of the Act) fill, building additions, buildings on stilts, fencing (including landscaping or plantings designed to act as a fence) and the storage of materials;*

*7. Bridges, culverts, roadways, sidewalks, railways, runways and taxiways and any modification thereto;*

*8. 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 parking lot is for short-term outdoor recreational use facilities where the applicant agrees to restrict access during overbank flooding events and agrees to accept liability for all damage caused by vehicular access during all overbank flooding events;*

*9. Aircraft parking aprons built at or below ground elevation where the depth of flooding at the 100-year frequency flood event will not exceed 1.0 foot;*

*10. Regulatory floodway regrading, without fill, to create a positive slope toward a watercourse;*

*11. Flood proofing activities to protect existing structures such as, but not limited to, constructing water tight window wells, and elevating;*

*12. The replacement, reconstruction or repair of a damaged building, provided that the outside dimensions of the building are not increased, and provided that, if the building is damaged to 50% or more of the building's market value before it was damaged, the building will be protected from flooding to or above the 100-year frequency flood elevation; and*

*13. 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.*

### 7.3.4 Mitigate Floodway Construction Activities *

Any activity in the floodway can have a negative impact. Floodway modifications such as those to channel geometry may unintentionally lead to increased conveyance capacity and accelerate downstream flood flows. Channel modifications can create erosion problems as the stream attempts to re-establish its natural course or features including its equilibrium, stream length, slope, and sinuosity. Impoundments placed directly on the stream act as sediment and nutrient traps and can lead to degraded aesthetic conditions such as low water clarity (due to high turbidity) and extensive algae blooms. Impoundments can impede the natural movement of fish, and periodic dredging may be needed to maintain desired water depths.

Avoidance and mitigation standards for activities in the floodway will be developed to address the potential negative impact from such activities. If permitted properly, construction activities should not create adverse impacts to the flow characteristics of the floodway.

### 7.3.5 Compensation for Lost Storage in the Flood Fringe

To prevent the loss of watershed storage, which can result in increases in flood flows and stages, hydraulically equivalent, incremental compensatory storage may be required for all fill activities in the flood fringe.

### 7.3.6 Compensation for Lost Storage in Depressional Storage Areas

The loss of watershed storage can result in increases in flood flows and stages. To prevent those increases, compensatory storage may be required for all fill activities in depressional storage areas.

### 7.3.7 Require Flood Protection Elevation *

To provide a factor of safety and minimize flood damages to those properties within the floodplain, a flood protection elevation above the base flood elevation will be required for the lowest floor of all structures built after the effective date of the WMO. IDNR-OWR recommends a flood protection elevation of at least one foot above the base flood elevation (called one foot of freeboard). The Chicago Metropolitan Agency for Planning (CMAP) recommends two feet of freeboard and recommends the flood protection elevation for the lowest floor of structures inside and adjacent to the floodplain.

### 7.3.8 Require that a Map Change be Obtained for Floodplain Modifications *

As land in the floodplain is developed, permitted site grading or flow control may reduce the size or change the shape of the floodplain. Permitted changes in the floodplain will be required to be submitted to FEMA to obtain an official letter of map change. Requiring that an official map change be obtained will provide property owners with proper flood insurance coverage. Flood insurance must be purchased for insurable structures within floodplains if the owners apply for loans and mortgages from federally insured or regulated lenders. A structure that is no longer in a floodplain is not required to purchase flood insurance, but flood insurance is made available at a substantially reduced premium. When filed with FEMA, map changes provide official records for floodplain modifications.

## 7.4 Stormwater Drainage and Detention

The stormwater drainage and detention aspects of the regulatory program will be guided by the following four stormwater management program goals:

> Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.

Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

Goal Q) Encourage the public to consider stormwater as a resource rather than as a nuisance.

The following regulatory concepts related to stormwater drainage and detention will be considered during the preparation of the WMO.

### 7.4.1 Stormwater Drainage and Detention Requirement Applicability

The stormwater drainage and detention standards of the WMO will apply to all development, regardless of size. As a practical matter, the requirement that a permit be obtained and detention be provided may be limited only to developments exceeding a specified size. The size categories will be based on practicality and, if utilized, will be set during the development of the WMO.

### 7.4.2 Consider Control of the 100-year Release Rate

Control of the 100-year release rate, by either establishing a uniform release rate or using some other means, will be considered during the preparation of the WMO. As a watershed develops and redevelops, the 100-year discharge rate from development sites should be sufficiently low to prevent increases in instream flood flow rates and the enlargement of 100-year floodplains. As Detailed Watershed Plans (DWPs) are prepared, the onsite release rate for preventing unacceptable increases in instream flow rates may be computed.

### 7.4.3 Consider Control of Low Flow Release Rate

A low flow release rate will be considered in the WMO to prevent increases in streambank erosion, largely the result of increases in the magnitude of low flow and the frequency of runoff events. A low flow release rate helps to prevent damages in areas prone to flooding by events smaller than the 100-year event.

### 7.4.4 Detention Design Using Appropriate Hydrologic Methods

The WMO will require detention basin design to use appropriate hydrologic methods. Rainfall data most recently adopted by IDNR-OWR for use in hydrologic modeling, which currently is from the Illinois Department of Natural Resources – State Water Survey (IDNR-SWS) Bulletin 70 and 71 publications, will be required.

### 7.4.5 Consider Steps to Minimize Increases in Runoff Volumes

Increases in runoff volumes can be minimized through use of a runoff volume reduction hierarchy which specifies the minimization of impervious surfaces and the maximization of infiltration opportunities and natural drainage. Detention is not part of the hierarchy. Even though detention prevents increases in runoff rates, it does not prevent increases in runoff volumes. The effectiveness of detention has been shown to decrease with increasing watershed size. In large watersheds, the only means for keeping instream flow rates to a minimum is to restrict increases in runoff volumes.

Minimizing increased runoff volume enhances pollutant filtering and decreases the chances for hydrologic impacts to downstream streams, lakes, and wetlands. Infiltration practices, which minimize the potential for the contamination of groundwater resources, will be considered.

### 7.4.6 Consider Detention Designs which Maximize Water Quality Benefits

The WMO may express a preference for wet bottom basins. Wet bottom detention basins have been shown to be more effective than dry bottom basins in removing pollutants from stormwater. Wet basins landscaped with native wetland and prairie vegetation are particularly effective at removing pollutants and preventing shoreline erosion on the sides of basins.

### 7.4.7 Preservation of Onsite Depressional Storage

The WMO will consider measures to preserve existing onsite depressional and wetland storage volumes. This concern is reinforced in the goals for floodplain management as noted in Section 7.3. Flood volumes and rates can be significantly increased if watershed depressional storage is lost, even if there is no change in land cover.

### 7.4.8 Detention in the Flood Fringe

It is difficult to design detention facilities in flood fringe areas so that they will function properly under all flood stage conditions. The WMO will consider whether to allow this practice and will clarify analysis required in application submittals.

### 7.4.9 Detention in the Floodway

The design of detention facilities placed in the floodway is complex. Detention basins in the floodway could block flood flows and reduce the conveyance capacity of the floodway. Similar to design of facilities in the flood fringe, it is difficult to design such floodway detention facilities so that they will function properly under a range of flood stage conditions. The WMO will consider whether to allow this practice and will clarify the type of analysis required in permit applications.

### 7.4.10 Onstream Detention

Even more complex, proposed detention which is both in the floodway and onstream is difficult to design so that it functions properly under all flood stage conditions. Onstream detention facilities often have high maintenance costs and require a high level of operational expertise. During preparation of the WMO, a determination of whether to allow onstream detention will be made. The factors to be considered while making this determination include regional flood control benefits, public interest, and the implementation of BMPs in upstream portions of the watershed.

### 7.4.11 Direct Discharge of Stormwater Runoff to Wetlands

Untreated and uncontrolled stormwater runoff that directly discharges to natural and mitigation wetlands can damage wetlands' environmental functions. Excessive pollutant loads and significant increases in the magnitude and frequency of water-level fluctuations within wetlands can severely stress wetland plants and wildlife communities. While wetlands are able to provide significant pollutant filtering benefits, excessive pollutant loads can exceed wetlands' assimilation capacity. During the preparation of the WMO, requirements for pre-treatment of stormwater runoff will be considered.

### 7.4.12 Formal Maintenance Agreements for New Stormwater Facilities

For stormwater infrastructure to function properly, it must be maintained in its design condition. Maintenance agreements should identify responsible parties, maintenance requirements and schedules, and funding arrangements for perpetual maintenance. During the preparation of the WMO, the need for formal maintenance agreements will be considered.

### 7.4.13 Address Subsurface Tile Systems

Subsurface tile systems were generally designed to drain groundwater under free flow conditions. They were not constructed with maintenance access in mind. Many of the tile systems were installed decades ago and were constructed of lower strength materials than those manufactured today. Surcharging of subsurface drain tiles from increases in surface stormwater runoff can easily rupture these tiles resulting in difficult maintenance and repair. Tiles can easily be disrupted during any construction process and damage can create significant drainage problems both on- and off-site, including basement flooding and septic system failure. Since information on the location of subsurface tiles is very limited, the WMO may require a condition survey for tile systems on developing and adjoining properties.

## 7.5 Wetland Protection

The wetland protection aspects of the regulatory program will be guided by the following stormwater management program goals:

> Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.
>
> Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.
>
> Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.
>
> Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.
>
> Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.
>
> Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

A useful resource for overview of existing wetlands in Cook County can be found on the National Wetlands Inventory (NWI), prepared by the U.S. Department of the Interior in 2001. The NWI serves only as a large-scale guide and actual wetland locations often vary from the mapped locations.

The following concepts related to wetland protection will be considered during preparation of the WMO:

### 7.5.1 Protection of All Wetlands from Damaging Modifications

Under its current policy, the United States Army Corps of Engineers (USACE) regulates only those wetlands that are ultimately tributaries to waters of the United States. The USACE protects jurisdictional wetlands and waters of the United States against direct discharge of dredged or fill material. The USACE does not regulate wetlands that are not connected to the hydrology of the surface stream system, commonly known as isolated wetlands.

To cover that gap in protection, the WMO may be written to require protection of all wetlands including isolated wetlands. Impacts to wetlands occur directly, such as through the placement of fill, and indirectly, such as through diversion of tributary runoff. The WMO preparation process will consider protection for wetlands and their associated buffers. In cases where a USACE permit is required, the District will defer to that agency for review of a proposed impact. The District may review wetland impacts not subject to USACE review.

### 7.5.2 Modification of High Quality Aquatic Resources

Some high quality aquatic resources are essentially impossible to mitigate, if impacted. Therefore modification of such resources may be discouraged under most circumstances. During preparation of the WMO, consideration will be given to the protection of high quality aquatic resources.

### 7.5.3 Modification of Wetlands for Stormwater Management Purposes

The dual use of an existing wetland as a detention basin and natural habitat can significantly degrade the wetland’s functions and values. Modification can present problems unless the wetland is significantly degraded or the change in hydrology anticipated will have a negligible effect on the area. To avoid degradation, runoff that is directed to a wetland for detention should be significantly pre-treated before discharging into the wetland. Such care helps maintain or improve the existing wetland functions. Limits on modification of wetlands for stormwater management purposes will be considered as the WMO is prepared.

### 7.5.4 Buffers along Lakes and Wetlands

The establishment of buffers of appropriate width along the perimeters of all lakes and wetlands serves to protect natural functions and values. Appropriate buffer widths for individual areas vary based on size and quality.

In most cases, established buffers contain native vegetation. A requirement for native vegetation will be considered in the WMO. Exceptions to the native vegetation requirement could be allowed to facilitate maintenance or water dependent activities such as recreational access (beaches, boat launches, etc.). In some situations, establishing a buffer could be an unfair burden on the applicant, such as requiring a homeowner to convert mowed lawn to native landscaping. Requirements for buffers will be considered as a part of the WMO. Exemptions to the buffer requirement may be considered for certain activities, such as road crossings.

### 7.5.5 Minimum Buffer Width and Encroachments

Encroachments upon the buffer zone may be considered for specified purposes. For example, if a lake or wetland has an established buffer width of 50 feet, the following development types may be considered as acceptable encroachments:

- Minor improvements such as pedestrian or bicycle trails and educational signs
- Maintenance access for utilities
- Parks and recreational areas
- Private and public lawns
- Stormwater management facilities

Nonetheless, encroachments may be discouraged within the buffer. A reduced buffer width may be allowed under certain specified circumstances. Exemptions to the minimum buffer width requirement may be considered for certain activities, such as road crossings.

### 7.5.6 Consider Allowance for Buffer Averaging along Lakes and Wetlands

The complexities of some sites may make minimum buffer widths difficult to achieve. During the preparation of the WMO, consideration will be made to permit buffer averaging, which allows reductions in buffer width or area provided compensations are made up on an equal basis somewhere else along the lake or wetland.

### 7.5.7 Mitigation for Wetland Modifications

Considerations for wetland mitigation, maintenance and monitoring will be evaluated during the preparation of the WMO. Mitigation can alleviate the losses and impacts resulting from wetland modification. A hierarchy can be established which defines what types of mitigation will be allowed given the particulars of the application.

Maintenance and monitoring are important to the success of constructed mitigation areas. The appropriate monitoring period varies based on the type and size of mitigation proposed and the type of habitat being impacted. The maintenance, management and monitoring periods generally range from three to ten years, with five years being common. Mitigation is often provided through the purchase of wetland mitigation bank credits. Generally a hierarchy is established within regulatory programs related to the purchase of mitigation bank credits. During the preparation of the WMO, consideration will be given related to the allowance of the use of bank credit as mitigation.

## 7.6 Stream Habitat and Riparian Environment Protection

The stream habitat and riparian environment protection aspects of the regulatory program will be guided by the following stormwater management program goals:

> Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

The following concepts related to stream habitat and riparian environment protection will be considered during preparation of the WMO.

**7.6.1 Watercourse Relocation or Modification**

Relocations or modifications of watercourses can negatively impact stream habitats and riparian environments. Limitations on watercourse relocation or modification will be considered in the WMO. The WMO may contain an exception list to define situations allowing modifications to watercourses. Exemptions may be allowed for projects such as stream restoration or re-meandering projects, regional stormwater management projects, and streambank stabilization projects intended to create or restore environmental benefits.

**7.6.2 Mitigation for Unavoidable Stream Modifications**

Mitigation requirements will be considered for stream modification projects which achieve a higher public purpose such as a regional flood control project. The environmental mitigation criteria outlined in the preceding floodplain and wetland regulation sections of Chapter 7 will be considered for application to mitigation for stream modification during development of the WMO.

**7.6.3 Armoring of Channels and Banks**

Bioengineering techniques for stabilizing water body shorelines provide more natural solutions than hard armoring. Hard armoring, which protects the channel or bank with concrete, rip-rap or other non-natural materials, is sometimes necessary when a bioengineered solution will not provide the necessary level of protection or cannot withstand the flow velocities of the project area. During the preparation of the WMO, consideration will be made to allow only the minimum necessary amount of hard armoring. The WMO will consider the use of bioengineering techniques where appropriate. A combination of treatments will likely be suggested to maximize durability.

**7.6.4 Culvert Crossings of Streams**

Enclosed stream crossings detract from the natural character and values of stream corridors. During the preparation of the WMO, restrictions will be considered regarding the number and extent of culvert crossings to be allowed. Consideration will be made for requiring analyses on the potential for culverts to increase downstream damages, such as scouring. Mitigation requirements will be considered for impacts caused by the installation of unavoidable culverts.

### 7.6.5 Onstream Impoundments

Impoundments placed directly on streams are detrimental to natural stream functions such as fish passage. The WMO will consider a requirement for analysis of overriding public interest relating to onstream impoundments. The environmental mitigation criteria outlined in the floodplain and wetland regulation sections of the WMO will be considered for application to onstream impoundments.

### 7.6.6 Buffers along Streams

Similar to buffers along wetlands (Section 7.5.4), buffers of appropriate width along streams protect natural functions and help maintain water quality. Appropriate buffer widths vary along the limit of all streams, based on tributary area and stream quality. Established buffers often contain native vegetation. The appropriate use of native vegetation will be considered during the preparation of the WMO. Exceptions to requirements for native vegetation may be similar to those considered for buffers along lakes and wetlands. The exceptions may apply to activities such as providing access for maintenance and stream-related recreation. The exceptions may be needed to avoid placing unfair burdens on applicants. Certain exemptions, such as road crossings, will be considered if buffers are established by the WMO.

### 7.6.7 Minimum Buffer Width and Encroachments

Encroachments upon the buffer zone may be considered for specified purposes. For example, if a stream has an established buffer width of 50 feet, the following development types may be considered as acceptable encroachments:

- Minor improvements such as pedestrian or bicycle trails and educational signs
- Maintenance access for utilities
- Parks and recreational areas
- Private and public lawns
- Stormwater management facilities

Nonetheless, encroachments may be discouraged within the buffer. A reduced buffer width may be allowed under certain specified circumstances. Exemptions to the minimum buffer width requirement may be considered for certain activities, such as road crossings.

### 7.6.8 Consider Allowance for Buffer Averaging along Streams and Riparian Areas

The complexities of some sites may make minimum buffer widths difficult to achieve. For example, space may be limited in a highly developed community when removing culverts to daylight the stream. During the preparation of the WMO, consideration will be made to permit buffer averaging, which allows reductions in buffer width or area provided compensations are made on an equal basis somewhere else along the stream.

## 7.7 Soil Erosion and Sediment Control

The soil erosion and sediment control aspects of the regulatory program will be guided by the following stormwater management program goals:

> Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

The following concepts related to soil erosion and sediment control will be considered during preparation of the WMO. These approaches are intended to prevent loss of stormwater capacity in culverts, sewers, channels, and floodplains due to sediment accumulation. The goals of protecting water quality as well as aquatic and riparian habitat are addressed by these approaches through preventing excessive sediment loads.

### 7.7.1 Soil Erosion and Sediment Control Measure Applicability

Soil erosion and sediment control measures will be considered for land disturbances of all sizes. As a practical matter and for ease of regulation, permits may only be required for activities disturbing soil in a large area of land surface unless adjacent to a water body or wetland. Development adjacent to a wetland may have a lower size threshold.

### 7.7.2 Comprehensive Principles to Minimize Sediment Transport from the Site

Sediment is one of the most common and most easily recognized of the nonpoint source pollutants. The set of principles considered during the preparation of the WMO will include provisions to minimize sediment transport from sites of soil disturbance. Consideration will be given to minimize the time and area of disturbance, to follow the natural contours of the site and to avoid sensitive areas.

### 7.7.3 Soil Erosion and Sediment Control Measures Consistent with Established Guidance

Practices related to soil erosion and sediment control are well established in northeastern Illinois due to the widespread use and acceptance of an established set of principles. The accepted practice generally references the latest versions of the Illinois Urban Manual - A Technical Manual Designed for Urban Ecosystem Protection and Enhancement prepared by the Natural Resources Conservation Service (NRCS) for the Illinois Environmental Protection Agency (IEPA). The principles are embodied in the latest amendment of Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control (Northeastern Illinois Soil Erosion and Sedimentation Control Steering Committee, 1988). During preparation of the WMO, the accepted practices will be considered along with explicit design and operational recommendations for soil stabilization, sediment control measures, and channel conveyance.

### 7.7.4 Consider Individual Site Soil Erosion and Sediment Control Plans and Stormwater Pollution Prevention Plans

A plan that provides a project layout with specific erosion and sediment control measures is an important tool in successful erosion control and sediment containment. The plan should indicate measures to be taken before construction and should consider the phasing of installation of other measures during construction. The plan should cover the stabilization of exposed surfaces upon construction completion. The WMO will consider a requirement for a separate soil erosion and sediment control plan for every development.

### 7.7.5 Installation of Sediment Control Measures Prior to Land Disturbance

Effective sediment control measures, such as sedimentation basins and silt fences, must be installed before significant land disturbance occurs. These preventative measures make sure that sediment generated during site clearing and construction is captured and held on the site. During the preparation of the WMO, a requirement will be considered for the installation of sediment control measures before the land is disturbed.

### 7.7.6 Early Implementation of Soil Erosion Control Measures

To be effective, soil erosion control measures such as temporary seeding, mulching, and placement of blankets must be in place soon after the end of active disturbance of the land. This includes the stabilization of soil stockpiles. Requirements for early implementation of soil erosion control measures will be considered during the preparation of the WMO.

### 7.7.7 Routine Inspection and Maintenance of all Soil Erosion and Sediment Control Measures

It is not uncommon for erosion blankets, silt fences, and sediment traps to require maintenance or replacement several times during the construction process. For these and other soil erosion and sediment control measures to be effective, they must be regularly inspected and maintained. Routine inspection and maintenance requirements will be considered during the preparation of the WMO.

### 7.7.8 Enforcement Tools

Enforcement measures are useful tools so that soil erosion and sediment control measures are implemented and appropriately maintained. Effective enforcement tools include stop-work orders and fines that specify each day and each incident as a separate violation. Procedures for enforcing soil erosion and sediment control regulations will be considered as a part of the WMO.

## 7.8 Water Quality

The Water Quality aspects of the regulatory program will be guided by the following stormwater management program goals:

> Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

Goal Q) Encourage the public to consider stormwater as a resource rather than as a nuisance.

The following concepts relating water quality to stormwater drainage and detention will be considered during preparation of the WMO.

### 7.8.1 Water Quality Protection Applicability

The water quality protection standards will apply to all development, regardless of size.

### 7.8.2 Preservation of Natural Hydrologic and Pollutant Filtering Functions of Sites

Natural drainage systems provide hydrologic functions such as absorbing runoff or storing floodwaters. They provide pollutant-filtering functions by allowing pollutants to be collected in vegetated areas adjacent to water bodies before they enter the streams, lakes, or wetlands. Preserving natural drainage areas and reducing the impervious area in developments and redevelopments can reduce stormwater runoff volumes and pollutant loads. The effects of impervious areas can be reduced by designing these areas to drain to vegetated, pervious areas for infiltration and filtration of runoff. Preservation of natural features is often less costly than mitigation. During the preparation of the WMO, the protection of natural hydrologic conditions will be considered.

### 7.8.3 Incorporate Best Management Practices in Site Design

The proper selection, design, construction and maintenance of BMPs aids pollutant capture and runoff infiltration yielding positive impacts on water quality. The WMO may suggest incorporating BMPs into design aspects of new development and redevelopment. WMO sections may recommend or require using key BMPs including compensatory storage for depressional storage, settling basins, wet detention basins, extended detention, infiltration devices, filter strips, media filters, water quality inlets, catch basins, and vegetated swales. BMPs are covered further in Section 7.9.

### 7.8.4 Consider a Requirement for a Maintenance Plan for Best Management Practices

BMPs, like constructed stormwater management facilities, benefit from regular and ongoing maintenance. The WMO will consider the requirement of a maintenance plan for site features and practices that need regular maintenance to perform as designed.

**7.8.5 Minimize Impervious Surfaces**

Impervious surfaces are directly related to increased runoff rates, reduced infiltration, and increased water quality degradation. The WMO will consider steps to reduce the amount of impervious land surface. The WMO may encourage development and redevelopment that minimizes the placement of additional impervious surfaces and reduces the amount of existing impervious surfaces.

**7.8.6 Encourage Sustainable, Low Maintenance Water Quality Improvement Operations**

The ease with which water quality improvements are maintained leads to more successful maintenance over the life of the improvement. The WMO may encourage the use of BMPs which can be served by less-intensive maintenance.

## 7.9 Best Management Practice Alternatives

BMPs are techniques used to offset the impacts of development and redevelopment, including those impacts on water quality. The following stormwater management goals reinforce the need and utility for incorporating BMPs into the regulatory framework of the stormwater management program:

Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.

Goal J) Protect existing water resources, including lakes, streams, floodplains, wetlands, and groundwater, from detrimental and unnecessary modification so that their beneficial functions are maintained and public expenditures and damages are minimized.

Goal M) Reduce or mitigate the environmentally detrimental effects of existing and future runoff in order to improve and maintain water quality and protect water related environments.

Goal N) Control sediment and erosion in and from any source, such as drainageways, developments, construction sites, and agricultural areas.

Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.

Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

Goal Q) Encourage the public to consider stormwater as a resource rather than as a nuisance.

The task of quantifying the benefits and performance of BMPs has not risen to a level of standard engineering practice. During the preparation of the WMO, the District will collect data on the performance of BMPs. The decision to require or encourage the use of BMPs will be made after the District receives input from all stakeholders, including municipalities and various agencies. A description of some common BMPs follows.

### 7.9.1 Natural Drainage Measures

Drainage swales, vegetated filter strips, and other natural drainage approaches (in contrast to storm sewers, lined channels, curbs and gutters) reduce runoff volumes and remove pollutants from runoff water. Site plans that place roads and parking areas higher in the landscape and locate swales along back lot lines within drainage easements help to accomplish this objective. Impervious surfaces should be designed to drain to pervious surfaces rather than the reverse.

### 7.9.2 Natural Detention Basin Designs

Natural detention basin designs incorporate features of natural wetland and lake systems, such as gradual shoreline slopes, a border of wetland vegetation, and areas of open water. Conventional designs feature dry bottoms or rip-rap edged wet bottom basins that may achieve the storage requirement but do not take advantage of water quality improvement opportunities that exist in natural basin designs. Natural designs are much more effective in removing stormwater pollutants than conventional wet and dry bottom basins.

### 7.9.3 Infiltration Practices

Where soils are sufficiently permeable, infiltration trenches and basins reduce surface runoff volumes and naturally recharge groundwater.

### 7.9.4 Natural Landscaping

Natural landscape approaches assist in reducing stormwater runoff and maintenance. Natural landscaping features native plants, particularly wildflowers, prairie grasses, and wetland species, as more effective alternatives to conventional turf grass and ornamental plants. Native prairie plant species have substantially deeper root systems (up to 10 feet) than conventional turf grasses (2 to 6 inches). Although data is limited on the runoff volume impact of native plant species in urban landscapes, available information suggests that infiltration capacity may be increased by a factor of two or more. Natural landscaping can be particularly beneficial when incorporated into drainageways and other areas that receive runoff from impervious surfaces.

### 7.9.5 Preservation of Natural Depressional Storage

Depressional storage areas have no surface outlet. They drain or evaporate very slowly following a storm event. Traditional development practices eliminate these depressions by filling or draining, thereby eliminating their benefits of reducing surface runoff and trapping pollutants. The volume and release rate characteristics of depressions should be protected in the design of the development site, as discussed in Section 7.4.7. This can be accomplished by avoiding the depression or by incorporating its storage as additional capacity in detention facilities.

### 7.9.6 Rain Gardens

A rain garden is a natural or constructed depression in the ground that is used as a landscape tool to improve water quality. The rain garden forms a "bioretention area" by collecting water runoff, storing it, and permitting it to be filtered and slowly absorbed by the soil. In order to achieve water quality benefits, the site for the rain garden should be placed to intercept runoff.

### 7.9.7 Rain Barrels or Cisterns
Rain barrels are aboveground storage containers utilized to manage rooftop runoff from residential, commercial, and industrial facilities. Cisterns are storage tanks that are typically larger than rain barrels and are also utilized to manage rooftop runoff. Cisterns may be stored above or below ground level. Both rain barrels and cisterns provide a means of collecting and reusing stormwater. The collected stormwater is mainly used for lawn and garden watering or other uses such as a supplemental domestic water supply.

### 7.9.8 Vegetated Roofs
A vegetated roof is a living ecosystem of lightweight soil and self-sustaining vegetation. Vegetated roofs provide another example of a runoff reduction and water quality protection technique. Vegetated roofs provide protective covers on buildings and have been shown to produce long lasting and low maintenance rooftops in some settings. Some older urban communities are planting vegetated roofs as part of new development, redevelopment, and retrofitting of existing development.

### 7.9.9 Permeable Paving Materials
The use of permeable paving materials can reduce the imperviousness of sites and thereby result in water quality improvements and promote infiltration. Materials such as paving blocks can be considered as alternatives to asphalt and concrete, especially for low-use surfaces such as driveways, overflow parking lots and emergency access roads.

## 7.10 Implementation of Design Alternatives

Site design considerations vary widely when addressing stormwater management for new development, redevelopment and retrofitting of existing communities. The following goals address the need for flexibility in site design for existing and new development and in restoration of degraded areas:

> Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.
>
> Goal O) Consider water quality and habitat protection measures in all stormwater management activities within Cook County.
>
> Goal P) Preserve and enhance existing aquatic and riparian environments and encourage restoration of degraded areas.

Application of the site design alternatives and techniques presented in this section may be considered among the many tools available to meet the goals of the stormwater management program. The design techniques described here may be applied to new development and redevelopment. In some circumstances, they may also be retrofitted to existing development. Municipal governments and developers may elect to implement some or all of the following techniques.

### 7.10.1 Sensitive Site Analysis

A number of important features of a site can be identified before preparing a site plan. These include stream corridors, shorelines, wetlands, woodlands, and steep slopes. The first steps in protecting these sensitive features are to identify and map them. Overlay mapping techniques can be used to identify the areas most suited for development activities and those areas that should be avoided.

### 7.10.2 Cluster Developments

Development and redevelopment of sites can be accomplished in such a way to cluster buildings, driveways and streets onto one portion of a site thereby leaving a remaining portion of the site as open space. Cluster developments can reduce the amount of impervious area for a given number of lots. Cluster developments often yield a savings in street length and development costs.

### 7.10.3 Reducing Building Setbacks

Reducing building setbacks minimizes the amount of impervious surfaces for a development by reducing the length of driveways and entry walks. The best areas to incorporate reduced setbacks are along low traffic streets where traffic noise is not an issue.

## 7.11 Development and Redevelopment

The following goals recognize the need for the stormwater management program to address the variety of new and existing development while preparing uniform regulations where feasible:

> Goal A) Protect existing and new development by minimizing the increase of stormwater runoff volume beyond that experienced under predevelopment conditions and by reducing peak stormwater flows.
>
> Goal E) Establish uniform, minimum, countywide stormwater management regulations while recognizing and coordinating with those stormwater programs effectively operating within Cook County.
>
> Goal Q) Encourage the public to consider stormwater as a resource rather than as a nuisance.

Redevelopment and infill development is continuously occurring in developed urban communities within Cook County. Redevelopment activities afford opportunities for incorporating recent trends and site design alternatives in stormwater management. Standards must consider the existing site development conditions. In redeveloping communities, it is often very difficult, and sometimes prohibitively expensive, to meet the standards that are applied to new development. For example, space for new detention basins may require removal of existing facilities. It is nonetheless important that the opportunities for improved stormwater management are captured during the redevelopment process. Informed and creative redevelopment of the intensively developed urban areas in Cook County could form part of the solution to watershed problems while helping to revitalize older communities. Design alternatives described in this chapter may be applicable to redevelopment as it occurs across Cook County.

The WMO will be developed considering the host of new development and redevelopment issues and concerns. Redevelopment will be encouraged to accomplish the goals of the countywide stormwater management program. Accommodation of redevelopment will be accomplished by clearly defining how the regulatory standards will be applied to redevelopment. The regulatory standards and the WMO may provide exemptions for older and previously developed sites.

## 7.12 Summary

The WMO will provide a comprehensive set of rules and regulations that will be prepared by the District with advice from the WPCs. The WMO will set a minimum level of standards that will apply to all portions of Cook County. The standards will meet the IDNR-OWR requirements for floodplain management and the FEMA requirements for participation in the NFIP. Municipalities may enforce standards that are more restrictive within their corporate boundaries. The specific standards for the WMO will be defined during its preparation process and a supporting detailed Technical Guidance Manual will be prepared to support and explain the procedures for permit applications and reviews under the WMO. Implementation of portions of the WMO may be delegated to interested and capable municipalities.

# CHAPTER 8
# PLAN IMPLEMENTATION

### Acronyms used in Chapter 8:

| | |
|---|---|
| Act | Public Act 93-1049 |
| ADID | Advanced Identification of Wetlands |
| CIP | Capital Improvement Program |
| CCSMP | Cook County Stormwater Management Plan |
| DWP | Detailed Watershed Plan |
| SSMP | Small Stream Maintenance Program |
| TGM | Technical Guidance Manual |
| WMO | Watershed Management Ordinance |
| WPC | Watershed Planning Council |

## CHAPTER 8
# PLAN IMPLEMENTATION

## 8.1 Introduction

The Cook County Stormwater Management Plan (CCSMP) presents the mission, goals and framework of the countywide stormwater management program for Cook County. The implementation of the CCSMP and its program elements will be accomplished through a phased approach. This chapter describes the four implementation phases:

Phase 1: Preparation of the WMO, Detailed Watershed Plans (DWPs), and a public information program and implementation of the Capital Improvement Program (CIP) and the Small Stream Maintenance Program (SSMP).

Phase 2: Implementation of Watershed Management Ordinance (WMO), continued preparation of DWPs and administration of the CIP and SSMP, and development of maintenance program.

Phase 3: Implementation of DWP recommendations, maintenance program and continued administration of the CIP and SSMP.

Phase 4: Continued implementation of DWP recommendations and maintenance program, administration of CIP and SSMP, and implementation of public education programs.

## 8.2 Adoption of the Cook County Stormwater Management Plan

A draft version of the CCSMP was distributed to municipalities, townships and various agencies for review and comment on August 7, 2006. The public review period concluded on October 13, 2006. In addition, seven public hearings on the CCSMP were conducted during the public review period. The CCSMP was revised to incorporate comments provided during the public review process which were germane to the CCSMP.

On February 15, 2007 the District's Board of Commissioners adopted the CCSMP by ordinance.

## 8.3 Implementation Phasing

The implementation phases reflect the mission and goals of the CCSMP that are stated in Chapter 1. The phasing outlines the development of the countywide stormwater management program's functional areas, which are discussed in Chapter 5. The scheduling of the CCSMP implementation is dependent on several factors within the

District including: available funding, available staff, preparation of DWPs, and the development of the WMO.

Exhibit 8-1 shows a general estimate of the implementation phasing based on program elements discussed in Chapter 5. Given the multiple phases and interrelatedness of many of the elements, there is an intentional overlapping of all phases. The program elements are described below in terms of the phases in which they will be carried out. The elements that are multi-phase or ongoing are repeated under the relevant phases.

## 8.4 Implementation Phase 1

Phase 1 implementation will focus on the preparation of the WMO, the development of the DWPs, and the initiation of a public information program.

### 8.4.1 Coordination with Watershed Planning Councils

The District will coordinate with the Watershed Planning Councils (WPCs) on the development of the WMO and the preparation of the DWPs. Coordination will be facilitated through the assistance of the municipal conferences.

### 8.4.2 Assign and Train Staff

Appropriate staff will be assigned to the stormwater management program and will be provided with adequate training. As the CCSMP is implemented, the District will assess staff requirements. The assessment will include a review of workload and will determine the extent to which activities are performed by staff versus consultants. In addition, as the stormwater management program evolves, the District plans to conduct seminars for municipal engineers and developers, including their planners and engineers.

### 8.4.3 Prepare the Watershed Management Ordinance

To facilitate the preparation of rules and regulations, the District will draft the WMO and forward it to the WPCs for review. Public Act 93-1049 (Act) states that the WPCs may recommend rules and regulations to the District governing the location, width, course, and release rates of all stormwater runoff channels, streams, and basins in their respective watersheds.

The following steps will be included in the preparation of the WMO:

- Review comments received by the District during the public review period for the CCSMP which were relevant to the WMO.
- Review the municipal responses to the regulatory-related questions in the municipal questionnaire described in Chapter 3.
- Review existing municipal stormwater ordinances in Cook County and compile summary information.
- Review existing regulatory ordinances of neighboring counties along with model ordinances prepared by the Chicago Metropolitan Agency for Planning and agencies such as the Illinois Department of Natural Resources and the Federal Emergency Management Agency.
- Prepare a draft WMO based on the regulatory approach described in Chapter 7.

The preparation of an Advanced Identification of Wetlands (ADID) Study will be pursued to ensure that floodplain and wetland information needed to support the WMO is available when, or shortly after, the WMO is adopted.

### 8.4.4 Prepare Technical Guidance Manual

Preparation of the Technical Guidance Manual (TGM) shall begin once standards in the WMO have been established. The TGM should be available on or before the effective date of the WMO. Periodic revisions to the TGM may be required if new information becomes available which requires the WMO be modified.

### 8.4.5 Continue Current Maintenance Activities

As explained in Chapter 5, the District inspects and shares maintenance responsibilities for several flood control reservoirs serving Cook County. The District has historically maintained certain reaches of waterways and streams. These maintenance activities will continue as the stormwater management program evolves. In addition, the District has initiated a SSMP. Further information on the SSMP can be found in Section 5.4.

### 8.4.6 Watershed Planning and Coordination Activities

The District staff will continue to perform ongoing coordination activities. In particular, the District will coordinate planning activities with Cook County, state and federal agencies as well as with neighboring counties to ensure consistency between programs.

### 8.4.7 Prepare Detailed Watershed Plans

The District will determine the sequence for preparation of DWPs for the major watersheds within Cook County. Watershed planning will be initiated for a portion of the watersheds during this phase. Watershed planning for remaining watersheds will continue through subsequent phases. Watershed planning coordination activities will occur during the planning process.

### 8.4.8 Funding Mechanisms & Budgeting

Examination of funding mechanisms will begin in this phase, along with budgeting for preparing DWPs and capital improvement projects. Development of funding mechanisms focuses on alternatives (i.e., permit application and permit review fees) for the implementation of the WMO.

### 8.4.9 Implement Capital Program

Capital projects that meet the minimum criteria detailed in Chapter 1 may be funded as allowed by available funds.

### 8.4.10 Develop Public Information Program

A public information and education program will be developed to garner support for regulatory standards. Generating recognition and interest early in the program will develop a constituency and will provide a central repository for information on significant stormwater problems and issues.

In addition to informing the public on the importance of stormwater management issues, the public information program will also provide suggestions on measures that the general public can implement to reduce the adverse impacts of stormwater and/or improve water quality.

### 8.4.11 Prepare Annual Report

As required by the Act, the District will continue publishing an annual report listing its stormwater management activities and the steps taken to incorporate the concerns of the WPCs.

## 8.5 Implementation Phase 2

The Phase 2 activities center on adopting the WMO and the program elements that support it.

### 8.5.1 Coordination with Watershed Planning Councils

District coordination with WPCs shall continue.

### 8.5.2 Train Additional Staff

Appropriate staff will be assigned to the stormwater management program and provided with adequate training.

### 8.5.3 Provide Technical Support

As described in Chapter 5, the District will provide technical support to municipalities, townships, developers and the public in general on stormwater management topics.

### 8.5.4 Adopt the Watershed Management Ordinance

The following steps are taken towards adopting the WMO:

- Request advice and comments from the WPCs regarding rules and regulations in the WMO.
- Revise draft WMO in view of WPCs' advice and comments.
- Provide agencies, stakeholders and the general public an opportunity to comment on the Draft WMO.
- Submit the WMO to the Board of Commissioners for adoption.

*Exhibit 8-1 - Summary of Countywide Stormater Management Program Implementation Phases*

| ***Phase*** | ***Administration and Management*** | ***Regulation*** | ***Maintenance*** | ***Watershed Planning*** | ***CIP Implementation*** | ***Public Information*** |
|---|---|---|---|---|---|---|
| ***Phase 1*** | Ongoing District Stormwater Activities<br><br>Coordination with WPCs (Ongoing)<br><br>Staff Training<br><br>Funding Mechanisms & Budgeting | Development of WMO<br><br>Development of TGM | Current District Maintenance Activities (Ongoing)<br><br>Initiation and Implementation of SSMP | Development of DWPs | Capital Program Implementation | Development of Public Information Program<br><br>Publish Annual Report |
| ***Phase 2*** | Coordination with WPCs<br><br>Staff Training<br><br>Technical Support<br><br>Professional Education<br><br>Funding Mechanisms & Budgeting | WMO Implementation<br><br>Development of TGM | Current District Maintenance Activities<br><br>Continue SSMP<br><br>Development of Maintenance Recommendations | Development of DWPs<br><br>DWP Recommendation Implementation | Capital Program Implementation | Development of Public Information Materials<br><br>Development of Education Programs<br><br>Publish Annual Report |
| ***Phase 3*** | Coordination with WPCs<br><br>Staff Training<br><br>Technical Support<br><br>Professional Education<br><br>Funding Mechanisms & Budgeting | WMO Enforcement<br><br>Delegation of Permit Reviews to Qualifying Municipalities | Current District Maintenance Activities<br><br>Continue SSMP<br><br>Implementation of Maintenance Program | Development of DWPs<br><br>DWP Recommendation Implementation | Capital Program Implementation | Distribution of Public Information Materials<br><br>Development of Education Programs<br><br>Publish Annual Report |
| ***Phase 4*** | Coordination with WPCs<br><br>Staff Training<br><br>Technical Support<br><br>Professional Education<br><br>Funding Mechanisms & Budgeting | WMO Enforcement<br><br>Delegation of Permit Reviews to Qualifying Municipalities | Current District Maintenance Activities<br><br>Continue SSMP<br><br>Implementation of Maintenance Program | DWP Recommendation Implementation<br><br>Assess Need for DWP Updates | Capital Program Implementation | Distribution of Public Information Materials<br><br>Development of Education Programs<br><br>Publish Annual Report |

### 8.5.5 Coordinate Professional Education

Training needs for both design and permit review professionals will be identified and training mechanisms will be developed. Efforts shall be coordinated so that these opportunities are available as the WMO implementation begins.

### 8.5.6 Develop Maintenance Recommendations for Stormwater Infrastructure

The District will examine appropriate maintenance and inspection recommendations for newly constructed stormwater infrastructure. Consistent standards for maintenance will ensure stormwater management features function as designed.

### 8.5.7 Develop Maintenance Recommendations for Natural Drainage Systems

In coordination with the WPCs, the District will consider maintenance recommendations for natural drainage systems. The program will emphasize educating property owners and responsible agencies on proper drainage system maintenance techniques.

### 8.5.8 Continue Current Maintenance Activities

The District's responsibilities for maintenance of flood control structures and certain waterways will continue in addition to administering the SSMP.

### 8.5.9 Prepare Detailed Watershed Plans

This activity will be continued from Phase 1. Watershed planning coordination activities will continue, including identification of coordination opportunities with other programs.

### 8.5.10 Funding Mechanisms & Budgeting

This activity will be continued from Phase 1.

### 8.5.11 Implement Capital Program

Capital projects that meet the minimum criteria detailed in Chapter 1 may be funded as allowed by available funds.

### 8.5.12 Prepare Public Information Materials

This activity will be continued from Phase 1. District will work with WPCs to identify specific public information needs for each watershed.

### 8.5.13 Prepare Annual Report

This activity will be continued from Phase 1.

## 8.6 Implementation Phase 3

Phase 3 will include development of a maintenance program for newly constructed and natural drainage systems.

### 8.6.1 Coordination with Watershed Planning Councils

This activity will be continued from Phases 1 and 2.

### 8.6.2 Train Staff

This activity will be continued from Phases 1 and 2.

### 8.6.3 Coordinate Professional Education
Coordinating professional education will continue from Phase 2.

### 8.6.4 Begin Watershed Management Ordinance Implementation and Enforcement Structure
Following adoption of the WMO, projects meeting certain minimum criteria will be required to obtain a permit from the District. Provisions of the WMO will need to be enforced by the District and potentially by qualifying municipalities, to ensure compliance.

### 8.6.5 Implement Maintenance Recommendations
The District will evaluate mechanisms for implementing maintenance recommendations, including provisions in the WMO, WPC activities, and public education efforts.

### 8.6.6 Continue Current Maintenance Activities
The District's current maintenance of flood control structures and certain waterways will continue.

### 8.6.7 Prepare and Implement Detailed Watershed Plans
Preparation of watershed plans will be ongoing through this phase. Implementation of watershed plans initiated in the previous phases will occur primarily through the construction of recommended facilities under the CIP. Coordination opportunities with state and/or federal programs will be considered during implementation of watershed plans.

### 8.6.8 Budgeting
Budgeting activities continue from Phase 2.

### 8.6.9 Implement Capital Program
Implementing this program is ongoing, initiated in Phase 2.

### 8.6.10 Implement Public Information Program
Public information activities continue, ongoing since their development in Phase 1. This program will include preparation of the annual report.

## 8.7 Implementation Phase 4

In this final phase, all program elements are underway and implemented throughout the county.

### 8.7.1 Administration and Management
All administrative and management functions continue, including coordination with the WPCs, staff training, technical support, professional education, and budgeting.

### 8.7.2 Watershed Management Ordinance Implementation and Enforcement
Started in Phase 3, implementation and enforcement continues.

### 8.7.3 Implement Detailed Watershed Plans
Implementing watershed plans continues from previous phase. From the beginning of the implementation process, watershed planning coordinates opportunities with other state and federal programs.

### 8.7.4 Assessment of Detailed Watershed Plans
DWPs are assessed to determine the need for updates or additional watershed analyses.

### 8.7.5 Implement Maintenance Recommendations
As started in the previous phase, implementation of the maintenance program will continue.

### 8.7.6 Continue Current Maintenance Activities
The District's current maintenance of flood control structures and certain waterways will continue.

### 8.7.7 Implement Capital Program
Initiated in Phase 2, capital improvement programs will be ongoing.

### 8.7.8 Public Information and Education
For this effort, the District will identify public information topics, prepare and distribute materials, and develop and deliver additional public education programs. Preparation of the annual report shall be included under this effort.

## 8.8 Plan Review and Amendment Process

The CCSMP may need to be amended. The amendment process outlined below generally parallels the steps taken to adopt the CCSMP:

### 8.8.1 Public Review Period
The District will prepare the draft amended plan and approve it for presentation to the WPCs and the public. A public review period will be initiated. At the beginning of this period, the draft will be sent to the WPCs and to other interested agencies, parties and stakeholders for review and comment. The District will hold at least one public hearing during this period. Relevant comments will be addressed in the final amended CCSMP at the District's discretion.

### 8.8.2 Adoption of Amended CCSMP by the District
The District will adopt the amended CCSMP by ordinance.

## 8.9 Summary

The mission and the goals of the CCSMP will be fostered through implementation of the countywide stormwater management program. The CCSMP implementation phases allow for the effective development of the countywide stormwater management program with a focus on watershed planning and effective regulations. The adoption of the

CCSMP and the establishment of the stormwater management program allow the District to begin funding consideration for capital improvement projects that will correct existing stormwater related problems and reduce the likelihood of future problems. With the development and implementation of the WMO, the DWPs, maintenance efforts, the capital improvement program and the public information program, the District and the communities will have the necessary tools for accomplishing countywide stormwater management. These efforts will bring about comprehensive watershed management in Cook County.

# ACRONYMS

# ACRONYMS

$AA_B$ – Average Annual Benefits

$AA_C$ – Average Annual Costs

$AA_D$ – Average Annual Damages

ABM – Articulated Block Mat

Act – Public Act 93-1049

ADID – Advanced Identification of Wetlands

BC – Benefit-to-Cost

BFE – Base Flood Elevation

BMP – Best Management Practice

CCDBZ – Cook County Department of Building and Zoning

CDSA – Critical Duration Storm Analysis

CCHD – Cook County Highway Department

CCSMP – Cook County Stormwater Management Plan

CIP – Capital Improvement Program

City – City of Chicago

CMAP – Chicago Metropolitan Agency for Planning

CNT – Center for Neighborhood Technology

CPI – Consumer Price Index

CRS – Community Rating System

CUDD – Calumet Union Drainage District

CVM – Contingent Valuation Method

District – Metropolitan Water Reclamation District of Greater Chicago

DTM – Digital Terrain Model

DWP – Detailed Watershed Plan

EAD – Expected Annual Damages

ELPC – Environmental Law and Policy Center

FCCC – Flood Control Coordination Committee

FDA – Flood Damage Assessment

FEMA – Federal Emergency Management Agency

FEQ – Full Equations Modeling, continuous simulation hydraulic computer model

FIRM – Flood Insurance Rate Map

FIS – Flood Insurance Study

FPDCC – Forest Preserve District of Cook County

GIS – Geographic Information System

HEC – Hydrologic Engineering Center

HEC-1 – Hydrologic Engineering Center, hydrologic computer model

HEC-2 – Hydrologic Engineering Center, hydraulic computer model

HEC-RAS – Hydrologic Engineering Center River Analysis System, hydraulic computer model

H&H – Hydrologic and Hydraulic

HSPF – Hydrologic Simulation Program-Fortran, continuous simulation hydrologic computer model

HWL – High Water Level

IDNR-OAEG – Illinois Department of Natural Resources – Office of Architecture, Engineering, and Grants

IDNR-ORC – Illinois Department of Natural Resources – Office of Resource Conservation

IDNR-OREP – Illinois Department of Natural Resources – Office of Realty and Environmental Planning

IDNR-OSRA – Illinois Department of Natural Resources – Office of Scientific Research and Analysis

IDNR-OWR – Illinois Department of Natural Resources – Office of Water Resources

IDNR-SWS – Illinois Department of Natural Resources – State Water Survey

IDOT – Illinois Department of Transportation

IEMA – Illinois Emergency Management Agency

IEPA – Illinois Environmental Protection Agency

IWPA – Interagency Wetlands Policy Act of 1989 [20 ILCS 830 et seq.]

LCSMC – Lake County Stormwater Management Commission

NB – Net Benefits

NCDC – National Climactic Data Center

NED – National Economic Development

NFIP – National Flood Insurance Program

NOAA – U.S. Department of Commerce, National Oceanic and Atmospheric Administration

NPDES – National Pollutant Discharge Elimination System

NPS – National Park Service

NRCS – Natural Resources Conservation Service

NWI – National Wetlands Inventory

NWL – Normal Water Level

NWMC – Northwest Municipal Conference

O&M – Operation and Maintenance

PV – Present Value

$PV_B$ – Present Value of Benefits

$PV_C$ – Present Value of Costs

RAS – River Analysis System

RED – Regional Economic Development

SCS – Soil Conservation Service

SFHA – Special Flood Hazard Area

SSMMA – South Suburban Mayors and Managers Association

SSMP – Small Stream Maintenance Program

SWCD – Soil and Water Conservation District

SWCM – Southwest Conference of Mayors

TARP – Tunnel and Reservoir Plan

TCM – Travel Cost Method

TGM – Technical Guidance Manual

TMDL – Total Maximum Daily Load

TR20 – Technical Release Number 20, hydrologic computer model

UAA – User Attainability Analysis

UDV – Unit Day Value

UNET – Unsteady NETwork Model

USACE – United States Army Corps of Engineers

USDA – United States Department of Agriculture

USEPA – United States Environmental Protection Agency

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

WCMC – West Central Municipal Conference

WMO – Watershed Management Ordinance

WPC – Watershed Planning Council

WSP2 – Water Surface Profiles 2, hydraulic computer model

# GLOSSARY OF TERMS

# GLOSSARY OF TERMS

The following glossary of terms is intended for use with the Cook County Stormwater Management Plan. To improve understanding by the reader the descriptions included here may, in some cases, deviate from the definitions used in federal, state, and local regulations.

ARMORING: The practice of reinforcing a streambank in order to prevent erosion. Hard armoring utilizes hard materials such as rip-rap, stone, gabions or concrete.

BASE FLOOD: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the “100-year” or “1% chance” flood. The base flood is a statistical concept used to ensure that all properties are protected to the same degree against flooding.

BASE FLOOD ELEVATION: The water surface elevation resulting from the 100-year frequency or 1% chance flood event.

BASIN: A natural or artificially created space or structure that is capable of holding water by reason of its shape and the character of its confining material. Water cannot flow out of a basin without artificial aid. The surface area within a given watershed.

BEST MANAGEMENT PRACTICE (BMP): A measure used to control the adverse stormwater-related effects of development. BMPs include structural devices (e.g., swales, infiltration basins, and detention basins) designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitat. BMPs also include non-structural urban site design measures such as minimizing impervious surfaces, utilizing native landscaping, and establishing buffers along streams, lakes, and wetlands. Finally, BMPs include institutional measures such as public education efforts to stop dumping of household chemicals into storm drains.

BIOENGINEERING: A discipline that integrates the engineering sciences with the biological sciences. Bioengineering includes using living systems through the application of the engineering sciences to provide erosion control, water quality, and habitat enhancement with aesthetics and effectiveness.

BRIDGE: A structure erected on foundations, piers, or abutments over a depression or an obstacle such as a river, roadway, or railroad; it carries a roadway for vehicular and pedestrian traffic.

BUFFER: A strip of land along a stream, lake, or wetland planted with native vegetation. The width of the buffer is measured from the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland. Development within buffers is typically limited to improvements such as piers or docks necessary to allow access to the water.

CHANNEL: Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainage way, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

CHANNEL MODIFICATION: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping (or other armoring), widening, deepening, filling, straightening, relocating, lining, and significant removal of vegetation. Channel modification does not include the clearing of debris or removal of trash.

COMMON ENEMY RULE: Surface water is a common enemy, and each landowner has an unlimited legal privilege to deal with it as he or she pleases without regard to the consequences that might be suffered by a neighbor. Opposed to it is the natural drainage rule, which requires the owner of lower land to accept surface water that naturally drains onto that land.

COMMUNITY: A term used by the Federal Emergency Management Agency to designate local governments eligible to participate in the National Flood Insurance Program. A local government can be a "community" if the state enabling legislation gives it the authority to regulate land use and development. It usually includes cities, villages, towns, boroughs, Indian tribes, and counties (usually for their unincorporated areas only).

COMPENSATORY STORAGE: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of flood storage capacity when fill or structures are placed within the floodplain.

CULVERT: A closed conduit other than a bridge that conveys water in a natural channel or waterway beneath and across a roadway.

DAYLIGHT: The conversion of storm sewers into open drainageways.

DEPRESSIONAL STORAGE: The volume of storage available below the base flood elevation contained in low lying areas that have no drainage outlet.

DESIGN EVENT: A precipitation event that, statistically, has a specified duration and probability of occurring in any given year (expressed as average frequency of occurrence in years or as probability in percent).

DETENTION: Temporarily storing stormwater runoff, typically in a detention basin or reservoir, prior to gradually releasing the runoff into the receiving waters. The flowrate of stormwater exiting the detention area is typically controlled by a restricted outflow structure that limits the flowrate of water exiting the detention area.

DETENTION BASIN: A facility designed to temporarily store runoff either on, below, or above the ground surface, accompanied by controlled release of the stored water.

DEVELOPMENT: Any activity, excavation or fill, alteration, subdivision, change in land use, or practice, including without limitation, redevelopment, undertaken by private or public entities, that effects the discharge of stormwater. Development does not include maintenance of stormwater facilities.

DISCHARGE: The rate at which water moves through a channel or pipe; measured by volume per unit of time (cubic feet per second).

DITCH: An artificially constructed open drain or a natural drain that has been artificially improved.

DOMINANT ESTATE: Property so situated that its owners have rights on adjacent property, such as a right-of-way or a right of natural drainage. The adjacent land is called the servient land.

DRAIN: Any ditch, watercourse, or conduit, whether open, covered, or enclosed, natural or artificial, or partly natural and partly artificial, by which waters coming or falling upon lands are carried away.

DRAINAGE DISTRICT: A special district created by petition or referendum and court approval. It has the power to construct and maintain drainage improvements and to pay for the improvements with assessments on the land within the district boundaries. An assessment on the land cannot be greater in value than the benefits of the drainage improvements.

DRAINAGE AREA: The area from which water originates at a given point or location on a stream.

DRY BOTTOM BASIN: A detention basin designed to drain completely after temporary storage of stormwater runoff and to be normally dry over the majority of its bottom area.

EASEMENT: An acquired right to cross or use another's property.

EROSION: The general process whereby earth is removed by flowing water, wave action, or wind.

EXTENDED DETENTION: A stormwater design feature that provides for the detention and gradual release of a volume of water over a specified period of time to increase the settling of urban pollutants and to protect the channel from frequent flooding.

FILTER FABRIC: A temporary barrier of permeable fabric designed to intercept and slow the flow of sediment-laden stormwater runoff; traps sediment and sediment bound pollutants while allowing the stormwater runoff to permeate through the fabric.

FLOOD CONTROL: Flood mitigation measures, usually structural, to reduce the extent (elevation and/or area) of flooding. Generally includes reservoirs, levees, and channelization.

FLOOD MITIGATION: An action or set of actions taken to prevent flooding or mitigate the impacts of flooding. Remedial and/or preventative actions come in the form of stormwater regulations for development, floodplain management, stormwater detention/retention, levees, and non-structural activities such as open space preservation.

FLOOD PROTECTION ELEVATION: The elevation above which regulated structures within the floodplain must be elevated. The flood protection elevation is equal to the base flood elevation plus a specified amount of freeboard. The freeboard is typically one or two feet.

FLOODPLAIN: A relatively level, continuous area adjacent to a lake or stream channel which is submerged during times of flood; and natural depressions including wetlands which are periodically inundated by stormwater.

FLOODPLAIN MANAGEMENT: A set of actions taken to minimize damage to persons and property within the floodplain. These actions often include floodplain development regulations, floodplain acquisition and preservation and floodproofing.

FLOODPROOFING: Any combination of structural and non-structural additions, changes or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

FLOODWAY: The channel and that portion of the floodplain adjacent to a stream or watercourse which is needed to convey the anticipated existing 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent increase in velocities. In some cases, the floodway may include that portion of the floodplain containing 90% of the floodplain storage volume. Floodways can be calculated based on either existing or future land use runoff conditions.

FREEBOARD: An increment of elevation added to a design elevation or structure to provide a factor of safety for uncertainties in calculations, unknown localized conditions, wave actions, future development, and unpredictable effects such as those caused by ice or debris jams.

HIGH WATER MARK: The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation or other easily recognized characteristics.

HYDRAULICS: The science dealing with the mechanical properties of liquids; it describes the pattern and rate of water movement.

HYDRAULICALLY EQUIVALENT, INCREMENTAL COMPENSATORY STORAGE: Compensatory storage placed between the proposed normal water elevation and the proposed 100-year flood elevation. All storage lost or displaced below the existing 10-year flood elevation is replaced below the proposed 10-year flood elevation. All storage lost or displaced above the existing 10-year flood elevation is replaced above the proposed 10-year flood elevation.

HYDROLOGY: The science of the behavior of water, including its dynamics, composition, and distribution in the atmosphere, on the surface of the earth, and underground.

IMPERVIOUS SURFACE: Man-made or natural materials through which water, air or roots cannot penetrate and which prevents the movement of surface water down to the water table.

INFILTRATE: The passage or movement of water into the soil.

ISOLATED WETLANDS: Wetlands completely surrounded by upland with no definable surface-water connection to the surface tributary system, interstate wetlands or other Waters of the United States and is itself not defined as a Water of the United States by the Federal Government.

MAINTENANCE: Preserving and keeping each type of roadway, structure, and facility as close as possible to its original condition or as later improved.

MITIGATION: Any action taken to permanently eliminate or reduce the long-term risk to human life and property and the negative impacts on natural and cultural resources that can be caused by natural and technological hazards. Mitigation is an action that compensates for the impact of development on a wetland.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP): A federal program to provide flood insurance to businesses and residents within communities adhering to minimum state and federal floodplain management standards. The NFIP is administered by the Federal Emergency Management Agency (FEMA)

NATURAL DRAINAGE RULE: Where two adjoining pieces of land are so situated that one is dominant and the other servient, the dominant landowner has the right to have water flow naturally from his or her land to that of the servient landowner.

NON-POINT SOURCE POLLUTION: Pollution which has no single discharge point or origin. Pollutants are usually comprised of sediment, organic compounds, toxic metals and various pathogens. Sources of non-point source pollution typically include urban and agricultural runoff and effluent from septic systems and landfills.

ONSTREAM DETENTION: A stormwater management system designed to manage stormwater in its original stream or drainage channel.

OUTFALL: The point, location, or structure where stormwater runoff discharges from a stormwater facility to a receiving body of water.

PEAK FLOW: The maximum rate of flow of water at a given point in a channel or conduit.

PERMEABLE: Having pores or openings that permit liquids or gases to pass through.

POINT SOURCE POLLUTION: Pollution which is discharged from a single point or structure. Most often, a point source is a pipe delivering effluent from a wastewater treatment facility or industrial facility.

POSITIVE SLOPE: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

RECEIVING WATER BODIES: Streams, lakes, wetlands, etc., into which stormwater is discharged.

RECHARGE: Replenishment of groundwater reservoirs by infiltration through permeable soils.

REMEDIATE: To remedy or fix a problem. For example, flood control reservoirs can be used to remediate flooding problems.

RETENTION FACILITY: A basin designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

RETROFIT: A stormwater best management practice installed after development has occurred to improve water quality and meet other watershed restoration objectives.

RIPARIAN: Land bordering a stream, river or lake.

RIPARIAN ENVIRONMENT: Land bordering a waterway or wetland that provides habitat or amenities dependent on the proximity to water.

RIP-RAP: Stone of a nominal diameter often placed in area of pool fluctuation or high velocity flow to prevent erosion of the underlying soil particles.

RIVERINE: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

RUNOFF: Water which moves through the landscape, either as surface or subsurface flow, which originates from atmospheric precipitation, initially in the form of rain or snow. Runoff is that portion of the hydrologic budget which produces surface water in streams, lakes, and wetlands.

SEDIMENT: Solid soil material, both mineral and organic, that is being moved or has been moved from its original site by wind, gravity, flowing water or ice.

SEDIMENTATION: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

SETBACK: The horizontal distance between any portion of a structure or any development activity and the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland, measured from the structure's or development's closest point to the ordinary high water mark, or edge. Allowable development features within setbacks typically include minor improvements such as walkways and signs, utilities, park facilities, and lawns.

STORM SEWERS: Usually enclosed conduits that transport excess stormwater runoff toward points of discharge, sometimes called storm drains.

STORMWATER: Those waters that run off the land surface which originate from atmospheric precipitation, whether initially in the form of rain or snow.

STORMWATER MANAGEMENT: A set of actions taken to store, convey, or otherwise manage stormwater runoff to minimize the negative impacts of runoff from urban surfaces. Broadly interpreted, stormwater management encompasses both structural and non-structural measures to directly manage runoff as well as measures to protect natural water features such as streams, floodplains, lakes, and wetlands.

STRUCTURAL FLOOD CONTROL MEASURES: Flood control techniques that modify flood flows. Examples are dams, reservoirs, levees, channel alterations, and diversions.

SURFACE WATER: Waters that fall on the land from the skies or arise in springs and diffuse themselves over the surface of the ground. Such waters follow no defined course or channel, and do not gather into or form any more definite body of water than a mere bog or marsh.

TOTAL MAXIMUM DAILY LOAD (TMDL): A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. It is the total of the allowable loads of a single pollutant from all contributing point and non-point sources, and includes a margin of safety and consideration of seasonal variations.

URBAN RUNOFF: Runoff with characteristics reflective of urban land use. This usually includes increased volumes due to imperviousness and to degraded quality representative of non-point pollution associated with domestic activities.

URBAN RUNOFF SEDIMENTS: Contaminants commonly found in urban runoff which have been shown to adversely affect uses in receiving water bodies. Pollutants of concern include sediment, heavy metals, petroleum-based organic compounds, nutrients, oxygen-demanding organics (BOD), pesticides, salt, and pathogens.

WATERSHED: All land area drained by, or contributing water to, the same stream, lake, or stormwater facility.

WET BOTTOM BASIN: A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

WETLAND: An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

WETLAND MITIGATION: Measures taken to compensate for wetland disturbances such as filling, dredging, draining, impoundment, and vegetation removal. Mitigation measures include enhancement of existing wetlands (including the disturbed wetland) and creation of new wetlands.

WETLAND MITIGATION BANK: A site where aquatic resources such as wetlands or streams are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for authorized impacts to similar resources. Third party mitigation banks generally sell compensatory mitigation credits to permittees whose obligation to provide mitigation is then transferred to the mitigation bank sponsor.

2-YEAR EVENT: A runoff, rainfall, or flood event having a fifty percent chance of occurring in any given year. On average, an event of this size or larger will occur once every 2 years. Rainfall depths of various frequencies and durations can be found in Bulletin 70 from the Illinois State Water Survey.

100-YEAR EVENT: A rainfall, runoff, or flood event having a one percent chance of occurring in any given year. On average, an event of this size or larger will occur once every 100 years. Rainfall depths of various frequencies and durations can be found in Bulletin 70 from the Illinois State Water Survey.

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# APPENDIX

### Appendix A

# Cook County Stormwater Management Plan Questionnaire Response Summary

# Appendix A
# Cook County Stormwater Management Plan Questionnaire
# Drainage District Responses

A stormwater management questionnaire was developed by the Metropolitan Water Reclamation District of Greater Chicago to assess the current stormwater management framework in Cook County while developing the Cook County Stormwater Management Plan. The purpose of this questionnaire was to identify regulatory standards of the local governments in Cook County in regards to stormwater drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection. The questionnaire was sent to each of the municipalities, townships, and drainage districts. The questionnaire responses were collected in February 2006. The following summarizes the responses received from the drainage districts.

After each question, the number of Yes and No responses are given. Additional narrative responses are summarized below the question.

The drainage districts responding to the questionnaire include:

Calumet Union Drainage District
Lincoln Lansing Drainage District
Union Drainage District Number 1
Weller Creek Drainage District

## GENERAL

1. Please rank, in order of importance, the most critical elements of stormwater management as they pertain to your district (1=most important, 4=least)

| Importance | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Drainage Problems | 2 | 2 | 0 | 0 |
| Overbank Flooding | 0 | 0 | 1 | 3 |
| Erosion/Sedimentation | 1 | 2 | 0 | 1 |
| Water Quality | 0 | 0 | 2 | 2 |
| Other (please describe) | | | | |

Other Comments included:

- Calumet Union: Drainage problems of illegal dumping, overbank flooding limited to 2 locations, erosion a problem throughout, water quality in Harvey and Markham in particular
- Lincoln Lansing: Drainage problems awaiting for ditch cleaning for forest preserve ditch
- Union: Drainage problems, stream cleanout, remove blockages, erosion of streambank

2. Have any drainage, flooding, water quality, environmental or other water resource related studies (master plans, watershed plans, etc.) been prepared or are being prepared for your drainage district? **YES (3) NO (1)**

   If yes, please describe the study briefly:
   - Calumet Union: CUDD channel improvement plan NCRS
   - Lincoln Lansing: South Suburban Mayor's and Manager's watershed study 2003
   - Union: NPDES, attempt to test water in streams two times per year in two locations

3. Has an inventory of drainage systems (ditches, drainageways, on line detention facilities, stowm sewers, etc.) been completed?
   **YES (3) NO (1)**

   Is the inventory updated on a regular basis?
   **YES (3) NO (0)**

   If yes, please describe the format of the inventory, frequency of updates, and date of last update:
   - Calumet Union: On-going touring by commissioners
   - Union: Maps updated as needed

4. Does your drainage district have a regular drainage facility maintenance program?
   **YES (4) NO (0)**

5. What are your most recent capital improvement projects relating to drainage or stormwater?
   - Calumet Union: No solo capital improvement projects
   - Lincoln Lansing: Repairs as needed and removal of debris from ditches and culverts along Torrence Avenue and Burnham Avenue and populated areas
   - Union: Stream stabilization project in 2005, stream cleaning in 2001, on-going updating of pumps and controls at reservoir basin #28 Duffy Road
   - Weller Creek: Storm water retention in Mount Prospect

6. What intergovernmental agreements does your drainage district have with other districts, communities or agencies relevant to water resources (examples: stormwater, floodplain, stream preservation, right-of-way acquisition, project cost sharing, land preservation, NPDES permits, Operations and Maintenance, NRCS, etc.)? Please list agreements:
   - Calumet Union: Four party agreement with MWRD, Harvey, Markham and Thornton Township on a project by project basis
   - Lincoln Lansing: Lansing, Sauk and Lynwood
   - Union: Village of Deerfield and Lake County Forest Preserve District
   - Weller Creek: Mount Prospect, Arlington Heights, Des Plaines and Wheeling

## Appendix A
# Cook County Stormwater Management Plan Questionnaire
# Municipal Responses

A stormwater management questionnaire was developed by the Metropolitan Water Reclamation District of Greater Chicago to assess the current stormwater management framework in Cook County while developing the Cook County Stormwater Management Plan. The purpose of this questionnaire was to identify regulatory standards of the local governments in Cook County in regards to stormwater drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection. The questionnaire was sent to each of the municipalities, townships, and drainage districts. The questionnaire responses were collected in February 2006. The following summarizes the responses received from the municipalities.

After each question, the number of Yes and No responses are given. Additional narrative responses are summarized below the question. Not all municipalities answering the questionnaire answered each question.

The municipalities responding to the questionnaire include:

Alsip
Arlington Heights
Bartlett
Bellwood
Bensenville
Berwyn
Blue Island
Broadview
Buffalo Grove
Burbank
Burr Ridge
Calumet City
Calumet Park
Chicago Heights
Chicago Ridge
Cicero
Country Club Hills
Countryside
Deerfield
Des Plaines
East Dundee
East Hazel Crest
Elk Grove Village
Elmwood Park
Evanston
Glenview
Glenwood
Harvey
Hazel Crest
Hickory Hills
Hillside
Hinsdale
Hoffman Estates
Homewood
Indian Head Park
Inverness
LaGrange Park
Lansing
Lemont
Lynwood
Lyons
Matteson
Maywood
Midlothian
Morton Grove
Mount Prospect
New Lennox
Niles
Norridge
Northbrook
Oak Park
Olympia Fields
Orland Park
Palatine
Palos Heights
Palos Hills
Palos Park
Park Forest
Park Ridge
Prospect Heights
Riverside
Rolling Meadows
Roselle
Rosemont
Sauk Village
Schaumburg
Schiller Park
Skokie
South Barrington
South Holland
Streamwood
Summit
Tinley Park
Westchester
Western Springs

| | | |
|---|---|---|
| Flossmoor | Northfield | Wheeling |
| Forest Park | Northlake | Wilmette |
| Forest View | North Riverside | Winnetka |
| Franklin Park | Oak Forest | Worth |
| Glencoe | Oak Lawn | |

## GENERAL

1. Please rank, in order of importance, the most critical elements of stormwater management as they pertain to your community (1=most important, 4=least)

| Importance | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Drainage Problems | 52 | 11 | 4 | 2 |
| Overbank Flooding | 14 | 24 | 8 | 21 |
| Erosion/Sedimentation | 4 | 24 | 29 | 12 |
| Water Quality | 5 | 14 | 16 | 34 |
| Other (please describe) | 2 | 1 | 2 | 0 |

Other Comments Included:

- Alsip and Hickory Hills: Detention
- Calumet Park and Cicero: Village is mostly combined sewers
- Des Plaines: Added street and rear yard storm sewers, enforced title 14 construction in floodplain, Title 10 Chapter 5 Erosion and Sedimentation
- Forest View: Canal regulated by dams Army Corps of Engineers
- Lynwood: Ditches overgrown and over regulation
- Midlothian: Drainage problems related to creeks, overbank flooding on Natalie Creek and Midlothian Creek
- Mount Prospect: Floodplain issues and development impacts
- Niles: Flooding
- Northbrook: Ensuring new developments comply
- Oak Park: No rivers or streams in Oak Park
- Palos Hills: Drainage problems on 88$^{th}$ Ave. at 96$^{th}$ St. and at 99$^{th}$ St., overbank flooding of the Lucas Ditch south of 111$^{th}$ St., sediment control from construction runoff, water quality public education
- Rolling Meadows: Several drainage improvements completed locally in 2003, Salt Creek and detention pond erosion
- Roselle: Issues ranked by prevalence of complaints
- Summit: Survey only addresses separate storm sewers
- Tinley Park: Drainage problems of local areas affecting property values, not nuisance flooding, overbank flooding in areas of floodplain, erosion control is generally addressed by ordinance, currently benchmarking river system for water quality

2. Have any drainage, flooding, water quality, environmental or other water resource related studies (master plans, watershed plans, etc.) been prepared or are being prepared for your community? **YES (47) NO (28)**

   If yes, please describe the study briefly:

   - Arlington Heights: Flood mitigation study by Village engineer Jim Masserelli

- Bensenville: CBBEL completed Addison Creek, Silver Creek and Willow Creek watershed as part of DuPage County's Upper Des Plaines River Tributaries Watershed Plan
- Buffalo Grove: FEMA flood study, Buffalo Creek and White Pine Ditch Streambank Stabilization Study
- Burr Ridge: Various studies conducted on DuPage County side, nothing in MWRD area
- Calumet City: Floodplain Management plan in 12/2001
- Calumet Park: Limited to 2000 FEMA FIRM map study
- Chicago Heights: IDNR and Army Corps of Engineers in relation to tributary "B" of Thorn Creek
- Countryside: City completed major flood control project and received a letter of map revision effective 2/9/06 by FEMA
- Des Plaines: Stormwater management master plan 4/1986, Current stormwater management plan 7/2003
- East Hazel Crest: Compliance with EPA NPDES permit
- Elk Grove Village: Several small drainage reports have been prepared in response to flooding drainage problems
- Evanston: Township is same geographic area as city, city has facility plan developed
- Flossmoor: Butterfield Creek Stormwater etc.
- Franklin Park: I-294 stormwater management plan
- Glencoe: East Diversion ditch basin study, study and recommended solutions for 3 areas tributary to East diversion ditch in 2005, and North Dundee Drainage Study 2002
- Glenview: Village wide detention study on-going
- Hazel Crest: LOMA application and determination of BFE for possible development near 175th and Central Park
- Hickory Hills: IDNR 200 acre feet retention, completed pond north of 87th St., IDNR and CCHD storm detention for Hickory Hills woods for combined 10 acre feet
- Hinsdale: South of 55th St., DuPage County drainage
- Homewood: Downey Manor flooding mitigation, merchant's park detention and flooding mitigation
- Lansing: Drainage studies or flooding studies are done on a project basis, no master plans in place
- Lemont: After 1996 floods a stormwater report of the flooded area was performed by CBBEL, most have been corrected
- Midlothian: Army Corps hydrology study and flood relief concept for Natalie Creek
- Morton Grove: Investigation of street flooding near Shermer and Dempster, 1992, location drainage study Lincoln Ave., 1988, combined sewer relief program, 1987, stormwater management plan, 1985, combined sewer operation plan, 1996
- Mount Prospect: Des Plaines River study phases I and II by the US Army Corps of Engineers, and a comprehensive stormwater management report in 1990
- Northbrook: We have a master stormwater plan
- North Riverside: Cook County, county wide flood insurance rate map revisions in conjunction with FEMA
- Oak Forest: Drainage study of Natalie subdivision to investigate overland flood routing problems
- Orland Park: Several tributary stream flood studies to alleviate neighborhood flooding
- Palatine: Palanois Park, Winston Park, Buffalo Creek and south central portions of village flooding study, 2001

- Palos Hills: A study was completed in the early eighties that resulted in a major ditching program and two major drainage projects, 86th Avenue and 81st Avenue, currently waiting to act on study completed for 88th Avenue at 99th Street and 96th Street
- Palos Park: Local area studies to evaluate culvert sizing and Base Flood Elevations
- Park Forest: Central park wetland restoration management plan, blocking existing drain tile system on a 4.5 acre site and return natural hydrology
- Prospect Heights: McDonald Creek stabilization analysis
- Riverside: Independent verification of properties within 100-year floodway and flood fringe as designated by FEMA FIRM and United States Army Corps of Engineers Lower Des Plaines study
- Rolling Meadows: A 2002 stormwater management study by CBBEL which investigated 13 areas in the city that had experienced flooding or drainage problems and recommended solutions
- Roselle: DuPage county watershed plans
- Sauk Village: IDNR conducted a study of the Lincoln-Lansing Drainage Ditch that is the primary drain for Sauk Village, the ditch is undersized but current storm damage resulting from it may not fulfill cost/benefit criteria for a major reconstruction of the system within Sauk Village
- Schiller Park: Crystal Creek flood control project by IDNR
- Skokie: Stormwater relief in early 1980’s
- South Holland: Floodplain management plan 2005
- Streamwood: South branch of Poplar Creek study in 1985, one foot contour map in 2003
- Tinley Park: Many projects being completed as part of $8.3 million bond issue, including floodplain reduction by elevation, new reservoirs and new outlet storm sewers, Village is 2 years ahead of NPDES schedule
- Westchester: Addison Creek floodplain study by FEMA
- Wheeling: LOMR on Buffalo Creek/village wide, village is awaiting approval by FEMA, creek bank stabilization Phase I stream assessment grant publication, 2005
- Wilmette: North branch of the Chicago River watershed open space plan

3. Has an inventory of stormwater systems (detention facilities, storm sewers, localized flooding problems, etc.) been completed?
   **YES (57) NO (17)**

   Is the inventory updated on a regular basis?
   **YES (42) NO (11)**

   If yes, please describe the format of the inventory, frequency of updates, and date of last update:
   - Bartlett: Semi-annual update to storm sewers and detention facilities
   - Bensenville: Paper atlas with separate map for detention facilities, updates as necessary
   - Broadview: Village maintains sewer atlas
   - Buffalo Grove: Storm sewer utility map sets
   - Burr Ridge: Currently working on inventory map, as part of NPDES Phase II permit using GIS
   - Calumet Park: Ongoing process to log areas of frequent flooding and sewer backups
   - Country Club Hills: Storm sewer atlas in AutoCAD, last updated in 2005

- Countryside: Storm sewers are cleaned and inspected as needed, atlases updates annually, flooding problems addressed on a case by case basis
- Deerfield: Video taping of storm sewers performed yearly
- Des Plaines: Inventoried in Microsoft Excel
- East Hazel Crest: Mapped the ditches and outfalls 6/11/03
- Elk Grove Village: Storm sewer only
- Evanston: System shown in a GIS format, updated as needed, last update 12/05
- Flossmoor: AutoCAD record maps
- Forest Park: Localized flooding, 2002, storm sewer atlas, 2005
- Forest View: Atlas as needed for revisions, 7/25/02
- Franklin Park: Sewer atlas prepared every three years, last update 1997
- Glencoe: Relatively accurate inventory on GIS database, updated several times a year
- Glenview: List of detention systems restrictors information updated June 2002
- Hazel Crest: A stormwater atlas updated as inventory increases or changes
- Hillside: Annually 5/1/05
- Hinsdale: Atlas sheets updated annually, 2005
- Hoffman Estates: Maps and atlas, annual updates 2005
- Indian Head Park: Storm sewer atlas originally prepared 1996
- Inverness: Drainage map last revised 1994
- Lansing: Inventory of detention facilities and storm sewers, Public Works tracks flooding problems, updates are project specific, last update 6/2005
- Lemont: Storm sewer atlas, updates bi-annually
- Lyons: Combined sewer system atlas update 2004
- Midlothian: Sewer atlases (Maywood); In the process
- Morton Grove: GIS ArcView storm sewers only, private detention facilities not shown
- Mount Prospect: Compiled 2005 GIS, as needed
- New Lennox: Storm sewer atlas originally prepared 1996
- Northbrook: Updated from permit figures, periodically but not less than 5-years, in progress now
- North Riverside: A survey of all our detention facilities, private and public, was done in 2003 by the Friends of the Chicago River
- Northlake: Storm sewers are cleaned and inspected as needed, atlases updated annually, flooding problems addressed on a case by case basis
- Oak Park: Sewer atlas are updated as needed, approximately every year
- Orland Park: Detention facilities, location and parcel size, updated annually 2/28/05, in progress
- Palos Hills: GIS not complete
- Palos Park: MS4 map, ongoing updates
- Park Ridge: GIS database
- Prospect Heights: Residential drainage compliant database updated as calls are received
- Riverside: Riverside is CSO community with no stormwater system eligible for permitting
- Rolling Meadows: Mapping inventory updated in 2004 in approximately 50% of City covered by GIS database, previous updates in 1990's
- Roselle: In progress, developing storm/sewer facilities atlas
- Schaumburg: Updated annually as part of utility GIS program

- South Holland: Detention facilities, water tributaries and ditches inventoried two times each year, last update was 4/12/05
- Streamwood: Paper storm sewer atlases
- Summit: Storm sewer atlases
- Tinley Park: GIS format updated in 2005
- Wheeling: Storm sewer maps/atlases, inspection of detention facilities completed 2005
- Wilmette: Informal data collection, village atlas for storm sewers
- Winnetka: Storm sewer atlas that is updated

4. Does your community have a regular stormwater systems maintenance program?
   **YES (57) NO (16)**

5. What are your most recent capital improvement projects relating to stormwater?
   - Alsip: Installation of storm sewers in the Hazel Green Subdivision
   - Bartlett: Upgrades to existing storm or detention systems
   - Bensenville: Under street detention in pipes for Main Street construction
   - Blue Island: The city is mostly combined sewer, new subdivision proposed with storm sewer and detention pond
   - Broadview: Street improvement projects that include repair or replacement of drainage structures, and deteriorated sections of storm sewer
   - Buffalo Grove: Streambank stabilization in Lake County areas of village
   - Burr Ridge: Detention basin improvements, roadside pipe/storm sewer installations, new subdivisions
   - Calumet City: Sewer improvements, upgrade Little Calumet levee, Thornton Quarry reservoir, cleaning of ditches
   - Calumet Park: Sewer jetting, cleaning repairs
   - Chicago Heights: Detention pond for Saratoga Farms, mowing and clearing tributary "B" of Thorn Creek, 1999 to 2005
   - Country Club Hills: Maycrest Lake wetland expansion and creation of recreation area, MFT project that included replacement of 54" arch pipe
   - Countryside: Major flood control project which included enclosing floodway ditch into twin box culverts
   - Deerfield: Stratford Rock, new storm mechanical and utility structures, upsize and to increase capacity with new storm sewer service stubs
   - Des Plaines: Area four storm sewer project
   - Elk Grove Village: Storm sewer annual drainage improvement program, storm sewers installed in response to standing water problems
   - Elmwood Park: Installation of concrete vaults under streets used to capture excess stormwater runoff
   - Evanston: Ongoing implementation of facility plan, Colfax/Grant storm sewer project
   - Flossmoor: Completed Phase I storm sewer rehabilitation and relining budgeted for FY 07, Phase II storm sewer rehabilitation preliminary engineering, budgeted for FY 08 Phase II storm sewer rehabilitation construction
   - Forest Park: Street reconstruction and water main replacement with sanitary/storm sewer spot repairs to alleviate infiltration
   - Forest View: Installation of 42" outfall storm sewer, 2003
   - Franklin Park: Copenhagen Pond, I-294 stormwater management, Scott Street sewer inspection, alley paving program, Grand avenue underpass

- Glencoe: 60" diameter relief storm sewer, 2005, 36" diameter outfall replacement and energy dissipation structure, 2004, outfall improvement as part of street program
- Glenview: New storm sewers in unsewered areas, storm sewer lining, annual storm sewer point repairs program
- Glenwood: NPDES
- Harvey: Sewer cleaning
- Hazel Crest: Creek stabilization, and purchase of $120,000 Vactor truck
- Hickory Hills: Retention pond, 200 acre-feet, north of 87th Street, detention pond expansion at 9400 south 88th Avenue, developer detention at 9400 south Keen Avenue
- Hillside: Pipe replacement
- Hinsdale: Sewer repair as part of road programs
- Hoffman Estates: Replace failing corrugated metal pipes with new storm sewers
- Homewood: Installed storm relief sewers, underground detention, and detention basins
- Indian Head Park: Storm sewer culvert replacement, catch basin cleaning, drainage way cleaning and outfall restabilization
- Inverness: Replacement of deteriorated road culvert pipes, storm sewers in new developments
- LaGrange Park: Storm sewer separation projects
- Lansing: Separate storm and sanitary sewers, 5 new detention ponds, Waterford Estates, Public Works facility, Oakwood Estates and Hills of Lansing
- Lemont: The village has an ongoing program separating the storm sewer from the combined sewer
- Lynwood: No funds for big projects
- Lyons: Catch basin improvement program, annual, catch basin cleaning, annual, combined sewer system cleaning, annual
- Maywood: Yearly curb and gutter replacement
- Midlothian: Cleaning of storm sewers, improvement of drainage on many unimproved streets, storm sewer atlas, clean and restore flow line of Natalie Creek
- Morton Grove: Cured-in-place pipe lining
- Mount Prospect: Creek bank channel stabilization, storm sewer/combined sewer improvements, storm sewer backwater control valves, detention pond dredging, and bank stabilization
- New Lennox: Storm sewer culvert replacement, catch basin cleaning, drainage way cleaning and outfall restabilization
- Niles: In-line detention storage, oversized storm sewers
- Northbrook: Drain relief sewer and online storage, 5-year project is now 50% complete, "cattle pass" overflow sewer, flap grates on sewer outfalls, Northbrook East detention basin
- Northfield: Linder/Orchard Street sewer improvements, Central Avenue rebuild and associated sewer improvements, West Frontage Road improvements
- Northlake: Creek bank restoration projects along Addison Creek
- North Riverside: Catch basin adjustment, reconstruction and replacement and storm lateral replacement in conjunction with paving improvements
- Oak Forest: Detention pond rehabilitation
- Oak Lawn: Repair and adjustments to storm sewers, manholes and basins, installations of rear lot drainage systems
- Oak Park: Sewer main replacement yearly with CIP. Combined sewer system is 80 to 100 years old, has annual replacements of deteriorated mains typically involves surrounding drainage structure

- Orland Park: Stormwater flooding relief, construction of stormwater pipes for flood protection
- Palatine: Sewer improvements and replacements, land acquisition for detention basin, curb and gutter replacement
- Palos Hills: $88^{th}$ Avenue at $107^{th}$ Street, CCHD/CPH storm drainage, $86^{th}$ and $87^{th}$ Streets at $102^{nd}$ Street, storm drainage and retention, $81^{st}$ Avenue at $98^{th}$ Street, storm drainage conveyance and major ditching throughout city
- Palos Park: Culvert replacements
- Park Forest: Storm sewer inlet, manhole, catch basin reconstruction and storm sewer pipe rehabilitation
- Park Ridge: City of Park Ridge new reservoir completed 2005
- Prospect Heights: Storm sewer rodding, installation of storm sewer to reroute flows, annual road program includes extensive regrading and pipe networks to improve drainage
- Rolling Meadows: Phases I and II of city's stormwater improvements, 2002 and 2003, $2.3 million, Salt Creek stream bank stabilization Phase II, 2002 and 2003, $360,000, partial funding, of $200,000, by IEPA 319 section program
- Roselle: Heathergreen pond detention facility construction, 2004, Turn pond silt removal, 2004
- Rosemont: Willow Higgins Creek channel improvement project
- Sauk Village: Rehabilitation of the Lincoln-Lansing drainage ditch, grading and shaping, tree removal, and storm sewer cleaning, 2004
- Schaumburg: 2001 spectrum by-pass storm sewer, storm sewer installed to improve conveyance of storm water
- Schiller Park: Crystal creek projects with IDNR (Schiller Park);
- Skokie: Howard Street improvement with new storm sewers and curb and gutter flow regulators, stormwater detention
- South Holland: Roadway reconstruction includes culvert replacement at Van Dam Road, Prince Drive and Cottage Grove as well as improved stormwater system on these roads
- Streamwood: Replacement of existing storm sewers, regrade detention area shore line, high resolution 1-foot contour map
- Tinley Park: New detention basins, updated storm sewers systems, channel maintenance, storm water quality
- Wheeling: William Rogers memorial diversion channel
- Wilmette: Lining, replacement, point repairs
- Winnetka: Improving storm drainage sewers west of Hibbard adjacent to golf course, rehabilitation of existing storm sewer outfalls to lake

6. What intergovernmental agreements does your community have with other agencies relevant to water resources (examples: stormwater, floodplain, stream preservation, right-of-way acquisition, project cost sharing, land preservation, NPDES permits, Operations and Maintenance, NRCS, etc.)? Please list agreements:
   - Alsip: NPDES ordinances, or mandates by IEPA
   - Bartlett: Project basis only, no agreement in place
   - Bensenville: We are a partial waiver community with DuPage County Stormwater and Floodplain ordinance
   - Buffalo Grove: Buffalo Creek reservoir agreement, involving Buffalo Grove, MWRD and Lake County Forest Preserve District

- Burr Ridge: Partial waiver community with DuPage County permitting
- Calumet City: Most water comes from City of Hammond
- Calumet Park: NPDES permit
- Chicago Heights: FEMA Floodplain Management ordinance
- Country Club Hills: NPDES Phase II stormwater permit for city's storm sewer system
- Deerfield: SMC, NPDES
- Des Plaines: Cook County Forest Preserve District
- East Hazel Crest: Agreement with IHWTA since all storm water dumps into their system
- Flossmoor: Butterfield Creek steering committee, Will South Cook Soil Conservation, NPDES
- Franklin Park: Crystal Creek Improvements, between IDNR, Schiller Park and Franklin Park
- Glencoe: General Permit – NPDES Phase II
- Glenview: Floodplain under NFIP with FEMA and IDNR, NPDES Phase II with IEPA
- Hazel Crest: Village of Homewood allowed connect to Hazel Crest storm sewer
- Hickory Hills: IDNR – detention pond O&M, North 87$^{th}$ Street, NPDES Permit ILR400351
- Hinsdale: DuPage County Stormwater Management Ordinance, NPDES permits
- Hoffman Estates: NPDES permit with IEPA
- Homewood: Homewood Flossmoor Park District
- Lansing: NPDES permits
- Lyons: NPDES Phase II No. ILM580004
- Midlothian: NPDES permit with state, manage floodplain issues consistent with FEMA and state floodplain regulations
- Niles: NPDES No. ILM580035
- Northlake: Intergovernmental agreement with IDNR-OWR for conveyance floodway through Northlake for Addison Creek
- Oak Park: None, MWRD handles NPDES permits since Oak Park is a combined sewer system
- Palos Hills: NPDES permit and floodplain
- Park Forest: Thorn Creek ecosystem partnership and related grants and programs, incorporation of Will County Stormwater Management Ordinance into ours
- Rolling Meadows: Rolling Meadows Park District for Salt Creek maintenance, Village of Palatine pending agreement for storm sewer connection to Rolling Meadows storm sewer
- Roselle: Participate with DuPage County in joint NPDES permit administration and various projects
- Sauk Village: NPDES permit No. ILR400441
- Schaumburg: NPDES Phase II permit
- Schiller Park: IDNR and Franklin Park Crystal Creek Projects
- Skokie: Evanston for water purchase
- South Holland: Work with SSMMA
- Tinley Park: Delegated permit authority by IDNR for floodplain work
- Wilmette: IEPA water pollution control permit 1993-HB-2417, NPDES combined sewer overflow IL0069981, ILM580012, ILR400473 – Stormwater – M54

7. Does your community regulate development activities?
   **YES (85) NO (2)**

# STORMWATER

8. Does your community have a stormwater and/or drainage ordinance?
   **YES (67)   NO (20)**

   If the municipality answered no, they proceeded to the general floodplain section, or question 18

9. Does your community regulate:
   Runoff Volume **YES (54) NO (13)**
   Runoff Rates **YES (61) NO (6)**
   Water Quality **YES (36) NO (29)**

10. Must existing depressional storage be preserved?
    **YES (43)   NO (21)**

11. Is there an acreage threshold below which stormwater detention requirements do not apply? **YES(45) NO(19)**

    If yes, please list the minimum sizes below for each category:

    Residential:
    MWRD **(4)**
    Less than 4 contiguous lots **(1)**
    40,000 ft^2 **(1)**
    1 acre **(7)**
    2 acres **(3)**
    3 acres **(4)**
    5 acres **(10)**
    10 acres **(10)**

    Commercial/Industrial:
    MWRD **(3)**
    At all times **(3)**
    40,000 ft^2 **(1)** (Maywood)
    1/3 acre **(1)** (Cicero)
    1 acre **(11)**
    2 acres **(1)** (Lyons)
    2.5 acres **(1)** (Rolling Meadows)
    3 acres **(3)**
    5 acres **(9)**
    10 acres **(1)** (Franklin Park)

    Other (please specify):
    MWRD **(3)**
    Fees for less than 3 acres **(1)** (Olympia Fields)
    Fees for less than 5 acres **(1)** (Palatine)
    One or two lots **(1)** (Skokie)
    20,000 ft^2 **(1)** (Calumet City)
    40,000 ft^2 **(1)** (Maywood)

1/3 acre for multi family **(1)** (Cicero)
1 acre for multi family **(1)** (Bartlett)
3 acres for multi family **(2)**
5 acres **(2)**
10 acres **(1)** (Country Club Hills)

12. What methodology for detention volume determination is used (Modified Rational Method, Hydrograph Routing, Nomograph, Other)?

    Modified Rational Method **(36)**
    Modified Rational Method for less than 5 acres **(1)** (Inverness)
    Modified Rational Method for less than 10 acres **(2)**
    Rational Method **(5)**
    Rational Method for greater than 10 acres **(2)**
    Hydrograph Routing **(11)**
    Hydrograph Routing for greater than 10 acres **(4)**
    HEC-1 or TR-20 **(3)**
    TR-55 **(3)**
    Illinois Bulletin 70 Routing Table **(1)** (North Riverside)
    (inches)=V100-Qrtd=C*100td-0.15*3td **(1)** (Forest Park)

13. What is the allowable release rate for the 100-year event (3-year, 0.1 cfs/acre, 0.15 cfs/acre, other)?

    0.15 cfs/acre **(25)**
    0.10 cfs/acre **(5)**
    0.16 cfs/acre **(1)** (Tinley Park)
    0.20 cfs/acre **(1)** (Mount Prospect)
    0.25 cfs/acre **(1)** (Northfield)
    0.042 cfs/acre **(1)** (Streamwood)
    2-year **(4)**
    3-year **(21)**
    MWRD **(6)**
    Volume regulated rather than rate **(1)** (Riverside)
    Unknown **(1)** (Oak Lawn)

14. Do you regulate the 2-year storm event or other low-flow?
    **YES (17)** **NO (47)**

    If yes, with what requirement?
    0.04 cfs/acre **(14)**
    10 year storm to detention basins **(1)** (Des Plaines)
    No increase in flow to neighboring properties under any TR **(1)** (Riverside)
    undeveloped **(1)** (Skokie)

15. What rainfall data source is required? (check one)
    TP40 **(17)** Bulletin 70 **(41)** Not Specified **(3)**

    Other comments included:
    - Palatine: 100-year U.S. Weather Bureau
    - Riverside: IBLD

- Skokie: Illinois State Water Survey
- Oak Lawn: unknown

16. Is detention allowed in the floodway, flood fringe, wetlands and/or online in the floodplain? Please explain.

 Floodway **(18)**
 Flood Fringe **(33)**
 Wetlands **(21)**
 Online in the Floodplain **(22)**
 Yes **(17)**
 No **(22)**
 Not Applicable **(3)**
 Other comments included:
 - Bellwood: In floodway and flood fringe with compensatory storage
 - Bensenville: Runoff stored under all stream flow conditions
 - Calumet City: Yes, with approval from village
 - Calumet Park: All allowed subject to FEMA, IDNR-OWR and US Army Corps of Engineers
 - East Dundee: All allowed providing watershed benefit
 - Franklin Park: In flood fringe in addition to compensatory storage
 - Glenview: No, within floodplain compensatory storage volume requirements may be allowed
 - Homewood: In flood fringe, wetlands and online with compensatory storage of 1.10:1
 - Inverness: In flood fringe with compensatory storage and in wetlands with Corps of Engineers approval, generally filling and floodplain areas in excess of 100 cubic yards is not allowed
 - Lemont: Yes, using proper BMPs
 - Midlothian: Yes, subject to FEMA, IDNR-OWR and US Army Corps of Engineers regulations
 - Northfield: In floodway and flood fringe with detention occupying the bottom of the basin
 - Orland Park: In flood fringe, wetlands and online above BFE with backwater analysis and compensatory storage at 1.50:1
 - Palatine: Yes, with compensatory storage of 110%
 - South Barrington: Yes, but strongly discouraged
 - Tinley Park: Yes, compensatory storage required above required detention, if submerged outlet volume based on zero release unless high water elevation is greater than BFE

17. Please describe other unique regulations in your community's ordinance that were not identified above:
 - Bensenville: DuPage County Ordinance
 - Berwyn: Sump pumps for footing and foundation drains are to be connected to combined and storm sewers
 - Burr Ridge: Minimum 2" control pipe diameter
 - Calumet City: Threshold limits for new and existing construction
 - Des Plaines: Single family lots cannot drain at 1% grade to right-of-way, must construct rear yard storm sewer and connect to public storm sewer

- Glenview: Prior to start, site development permit required, secured site with erosion control means in place
- Homewood: Fee in lieu of detention
- Lansing: Minimum 3" diameter restrictor
- Lemont: Required detention volume is 125% of calculated volume
- Matteson: Fee in lieu of storage for less than 3 acre sites
- Midlothian: Compensatory storage in floodplain 1.5 times the volume lost due to fill or structure
- Morton Grove: 3" minimum restrictor is required, developments are allowed to use release rate from 3" restrictor for calculating detention volume
- Mount Prospect: Runoff coefficients, impervious surface equals 0.95 and pervious equals 0.50
- Northbrook: Impervious C factor is 0.95, pervious C factor is 0.50, required detention volume is increased by 15%
- Northfield: When net impervious exceeds 100 square feet, detention must be provided, fee can be paid in lieu of detention
- Northlake: Follows NIPC model ordinance
- Palos Hills: All commercial development requires detention
- Park Forest: Stormwater facilities must be functional before building permits are issued, residential and commercial
- Park Ridge: Fee in lieu of detention when runoff rate and detention requirements cannot be provided
- Rolling Meadows: City follows MWRD's requirements, with the exception of a development in a "flood prone area" where city is more stringent, fee levied to fund
- Roselle: See DuPage County Stormwater Ordinance
- Streamwood: All new developments must install water quality structures
- Wilmette: Grading ordinance

## FLOODPLAIN

18. Does your community have a floodplain management ordinance?
    **YES (82) NO (5)**

    If the municipality answered no, they proceeded to the water quality section, or question 28

19. Has your community adopted the minimum requirement from the "Model Floodplain Ordinance for Communities Within Northeastern Illinois" recommended by IDNR-OWR? **YES (75) NO (6)**

20. Does your community participate in the Community Rating System (CRS) with the National Flood Insurance Program (NFIP)?
    **YES (19) NO (62)**

    If yes, what is your rating? 5 **(1)** 6 **(1)** 7 **(7)** 8 **(4)**

    If no, why not?
    - Bartlett: No floodplain
    - Bensenville: Staffing
    - Burr Ridge: Very few homes require flood insurance

- Elk Grove Village: Too much administrative paperwork
- Franklin Park: Awaiting entry
- Glencoe: Small percentage of homes in floodplain
- Glenview: In process
- Inverness: Village does not have enough staff to maintain a CRS
- Lemont: Not well publicized
- Northfield: Beginning the process to participate this February
- Riverside: Under implementation
- Streamwood: No current flood insurance policies
- Summit: Not well publicized
- Winnetka: Have not been able to dedicate adequate time

Are you interested in learning more about the CRS Program?
**YES (27) NO (15)**

If MWRD hosted a seminar on the CRS Program, would you be interested in attending?
**YES (35) NO (12)**

21. Which of the following are addressed in the purpose statement of your floodplain ordinance? (check all that apply)
Protection of:
Aesthetics **(44)**
Aquatic Habitat **(47)**
Hydrologic Functions **(77)**
Recreation **(38)**
Water Quality **(59)**

22. Is your list of Appropriate Uses for the floodway more restrictive than IDNR-OWR?
**YES (12) NO (69)**

23. Are onstream impoundments discouraged unless a public benefit is shown?
**YES (57) NO (21)**

24. Is channel modification discouraged unless there are no practical alternatives?
**YES (62) NO (18)**

25. For the following areas, please indicate whether compensatory storage is required and specify the safety factor (1.5:1, etc.).

Floodplain **YES (78) NO (3)**
If yes, safety factor 1.0:1 **(21)**
1.1:1 **(7)**
1.12:1 to 1.5:1 **(1)** *(Northfield)*
1.2:1 **(1)** *(Deerfield)*
1.25:1 **(3)**
1.5:1 **(40)**
Per Regulatory Authority **(1)** *(Niles)*
Per IDNR **(1)** *(Arlington Heights)*

Depressional Storage **YES (24) NO (52)**
If yes, safety factor 1.0:1 **(13)**
1.1:1 **(2)**
1.5:1 **(6)**
Per Regulatory Authority **(1)** *(Niles)*
Per IDNR **(1)** *(Arlington Heights)*

Wetlands **YES (22) NO (53)**
If yes, safety factor 1.0:1 **(6)**
1.1:1 **(2)**
1.5:1 **(6)**
1.5 or 3 or 5:1 **(1)** *(Deerfield)*
By others if required **(2)**
Per US Army Corps of Engineers **(2)**
Per Regulatory Authority **(1)** *(Niles)*
Per IDNR **(1)** *(Arlington Heights)*

26. Do you apply any other standards that are above the minimum required by IDNR-OWR or FEMA?
**YES (14) NO (64)**

If yes, what are they?
- Bellwood: Lowest floor two feet above BFE
- Buffalo Grove: BFE plus 2.5 feet versus BFE plus one foot for building protection elevation
- Des Plaines: Title 14 of City Code
- Glenview: One foot above BFE and no development in floodway
- Hinsdale: DuPage County
- Hoffman Estates: US Army Corps of Engineers for wetlands
- Mount Prospect: Freeboard, foundation protection, protection of floodplain storage capacity Northfield: One foot above 100 year BFE
- Northlake: Follows NIPC Model Ordinance
- Oak Lawn: BFE equals two feet
- Prospect Heights: Flood protection elevation is 2.5 feet above BFE
- Schiller Park: Flood protection elevation is one foot above BFE
- Streamwood: Lowest floor two feet above BFE
- Wheeling: 1.5 compensatory storage

27. Do you apply floodplain management standards to non-regulatory streams and floodplain (those not identified on the FEMA floodplain maps)?
**YES (26) NO (53)**

If yes, how do you determine when the standards apply?
- All streams **(2)**
- Development draining more than one square mile **(9)**
- Calumet City: Determine BFE for site
- Flossmoor: Each individual case
- Homewood: When calculated BFE is less than FIRM BFE
- Inverness: For development areas with historical flooding
- Matteson: Use calculated BFE

- Northlake: If ground elevation is close to floodplain elevation, then floodplain management standards apply
- Oak Lawn: BFE equals three feet above historical flood record elevation
- Orland Park: Flood History
- Palatine: BFE of flood of record by Village Engineer
- Park Ridge: No floodways, when no BFE by FEMA, and when draining more than one square mile
- Roselle: Project specific, see article 10 of DuPage County Stormwater and Floodplain Management Ordinance
- Streamwood: Best available data, USGS or local study
- Tinley Park: Sound engineering judgment
- Wheeling: If within a special flood hazard area, those regulations apply

## WATER QUALITY

28. Does your community have an NPDES Phase II Permit?
 **YES (57) NO (12)**

29. Do you have a community outreach program for educating residents about water quality?
 **YES (55) NO (28)**

 If yes, please describe program:
 - Pamphlets/Brochures/Flyers **(14)**
 - Newsletter **(33)**
 - Local Cable TV Channel **(3)**
 - Meetings/Presentations **(8)**
 - Website **(24)**
 - Part of DuPage County Program **(4)**
 - No, but under development **(5)**
 - Glencoe: Earth Day activities, website and newsletter
 - Park Forest: Annual water quality reports
 - Streamwood: Storm sewer stenciling, newsletter, signs, creek cleanup
 - Wilmette: New resident reception, listening post, communicator

30. Does your community regulate private or commercial lawn care?
 **YES (14) NO (70)**

 If yes, please explain regulation: Sprinkling Restrictions **(13)**
 Height of weeds/grass **(1)** (Wheeling)

31. Is armoring of channels and banks discouraged unless vegetation and gradual bank sloping are inadequate to prevent erosion?
 **YES (51) NO (31)**

## SOIL EROSION AND SEDIMENT CONTROL

32. Does your community enforce a soil erosion and sediment control ordinance?
 **YES (64) NO (22)**

If the municipality answered no, they proceeded to the stream and wetland management section, or question 37.

33. Is there an acreage threshold below which soil erosion and sediment control standards do not apply?
**YES (16) NO (49)**

If yes, please specify the minimum disturbance area
- 2,500 $ft^2$ **(1)** (Hinsdale)
- 5,000 $ft^2$ **(2)**
- 10,000 $ft^2$ **(2)** (Country Club Hills)
- 1 acre **(10)**
- When in a floodway **(1)** (Worth)
- 1 acre or more, or any lot required by the director **(1)** (Elk Grove Village)

34. Does your community have a list of soil erosion and sediment control design standards?
**YES (48) NO (17)**

35. Are soil erosion and sediment control practices maintained throughout the duration of construction?
**YES (65) NO (1)** (East Hazel Crest)

36. Does the ordinance specify critical stages at which inspection will be performed?
**YES (19) NO (46)**

If yes, please list stage:
- Bensenville: Prior to excavation and at final grading
- Country Club Hills: Before, during, and after construction
- Deerfield: Per Lake County SMC
- Des Plaines: Stripping, rough grading, final grading
- Glenview: Before, during and after development
- Hazel Crest: Before, during and after development
- Hoffman Estates: All the time
- Oak Lawn: Before, during and after construction
- Palatine: Stripping, rough grading, final grading and final inspection
- Rolling Meadows: Rough grading and final inspection
- Schaumburg: Rough grading, drainage completion and final landscaping
- South Barrington: Drainage installation, rough and final grading
- South Holland: Same as NPDES
- Burr Ridge: Random site inspections

## STREAM AND WETLAND MANAGEMENT

37. Does your community have stream and wetland protection regulations?
**YES (35) NO (48)**

If the municipality answered no, they proceeded to the Permit Review and Enforcement section, or question 41.

38. Are modifications to wetlands, stream corridors and lakes prohibited?
**YES (13) NO (29)**

If yes, please describe what type of modifications are prohibited (may include filling, draining, excavating, damming, impoundment and vegetation removal).

- All **(6)**
- US Army Corps of Engineers Permit required **(2)**
- Calumet Park: Preconstruction conditions met within 48 hours of completion, vegetation removal, temporary crossings, draining may be temporarily improved
- Hazel Crest: Unapproved modifications are not allowed, any modifications in accordance with the village's floodplain ordinance are allowed
- Homewood: All unapproved unless modifications maintain or improve wetland
- Midlothian: Filling, draining, excavating, damming, and impoundment
- Palos Heights: Filling
- Rolling Meadows: Within floodway and within a 25 feet of the channel, a natural vegetation strip needs to be preserved
- South Barrington: All prohibited unless conditional use is granted
- South Holland: Filling, draining, damming and excavating are regulated
- Winnetka: Must comply with State, Federal, DNR and US Army Corps of Engineers

39. Is development within buffers adjacent to wetlands, stream corridors and lakes controlled?
**YES (25) NO (18)**

If yes, please specify buffers or setbacks allowed from the following:
Wetlands

| | |
|---|---|
| 15' to 50' | **(1)** (East Dundee) |
| 25' | **(5)** |
| 30' | **(1)** (Lynwood) |
| 30' or 100' | **(3)** |
| 50' | **(4)** |
| 75' | **(1)** (Flossmoor) |
| 100' | **(3)** |
| Case by Case | **(1)** (Wheeling) |
| Has not come up | **(1)** (Des Plaines) |
| Not Applicable | **(3)** |

Stream Corridors

| | |
|---|---|
| 25' | **(4)** |
| 30' | **(6)** |
| 50' | **(1)** (Orland Park) |
| 75' | **(1)** (Flossmoor) |
| Case by Case | **(1)** (Wheeling) |
| Not Applicable | **(3)** |

Other comments included:

- Des Plaines: No development in floodway is allowed
- Lansing: Five foot wall by river and ponds with flood gate
- Roselle: Floodplain or riparian area
- Winnetka: Floodway portion of ordinance

Lakes

| | |
|---|---|
| 30’ | **(5)** |
| Case by Case | **(1)** (Wheeling) |
| Not Applicable | **(6)** |

Other comments included:

- Orland Park: Fifty foot natural and 25 foot artificial
- Winnetka: US Army Corps of Engineers Permit

40. Are mitigation measures required for approved wetland and waterbody modifications? **YES (20) NO (21)**

    If yes, please describe the mitigation requirements including mitigation ratio, monitoring requirements, etc.:

- US Army Corps of Engineers **(6)**
- Per IDNR **(2)**
- 1:1 mitigation ratio **(2)**
- Bartlett: DuPage County ordinance
- Bensenville: 3:1 critical wetlands, 1.5:1 regulatory wetlands, mitigation in same watershed, annual monitoring reports required
- Deerfield: Per Lake County SMC, 1.5:1 for I, II and III, 5:1 for aquatic, and 6:1 for forest wetlands
- Des Plaines: Have never had one
- Glenview: 1:1 swap of wetlands, US Army Corps of Engineers permit required
- Hinsdale: 3:1 critical wetlands, 1.5:1 regulatory wetlands, periodic monitoring report includes design construction and maintenance
- Homewood: Erosion control and sedimentation basin
- Midlothian: Proper slope and erosion control
- Niles: Per regulatory authority
- Orland Park: 1.5:1 mitigation with 5-year maintenance and monitoring
- Palos Hills: US Army Corps of Engineers and IDNR requirements
- Roselle: See article 10 of the DuPage County Stormwater Management and Floodplain ordinance
- Schaumburg: Special use permit and US Army Corps of Engineers wetland permit
- South Holland: Regulated by others
- Streamwood: Ratio is 1.5:1
- Wheeling: US Army Corps of Engineers

# PERMIT REVIEW AND ENFORCEMENT

41. Please list the parties involved in the review process for the following activities (examples: staff and/or consultants):

| Plan Type \ Reviewer | Building Department/ Commissioner | Consultants | Village Engineer | Public Works | Plans Examiner/ Code Enforcement | Staff | DuPage County | USACOE or IDNR-OWR |
|---|---|---|---|---|---|---|---|---|
| Stormwater | 3 | 32 | 23 | 6 | 4 | 28 | NA | NA |
| Floodplain Management | 7 | 24 | 23 | 4 | 4 | 29 | 3 | NA |
| Soil Erosion and Sediment Control | 9 | 25 | 20 | 7 | 4 | 32 | 1 | NA |
| Wetland, Stream Corridor and Lake Protection | 4 | 27 | 18 | 5 | 3 | 21 | 2 | 3 |

42. Please describe enforcement mechanisms for non-compliant development activities:
- Alsip: Permits are regulated by the building department, fines and/or stop work orders
- Arlington Heights: Written citations, stop work orders, fines
- Bartlett: Referred to code enforcement, building code officials
- Bensenville: Cash bonds are held for stormwater permits
- Berwyn: Citations, fines, stop work orders from the building department
- Blue Island: Project will be shut down by the city if the contractor does not comply with the stormwater management plan
- Buffalo Grove: Municipal ordinance citation
- Burr Ridge: Stop work order, draw on letter of credit, if applicable, fines
- Calumet City: Citations, fines
- Calumet Park: Citations are issued
- Chicago Ridge: Code enforcement staff
- Cicero: Citations and fines
- Country Club Hills: A letter of credit surety is required, with a refusal for noncompliance
- Countryside: No permit issued for non-compliance
- Deerfield: Citations, stop work orders for non-compliance
- Des Plaines: Violation notice and subsequent hearing in City of Des Plaines court
- East Hazel Crest: If a violation occurs, the person liable is cited per code
- Elk Grove Village: Construction work is stopped, court citations are issued
- Elmwood Park: Code enforcement staff
- Flossmoor: Issuance of stop work order, local ordinance citation
- Forest Park: Depends on violation or infringement
- Forest View: Withhold permit or fines
- Franklin Park: Citations and fines, adjudication and fines

- Glencoe: Fines issues or project stop work order
- Glenview: Stop work order, written citation and fees
- Glenwood: Building department
- Harvey: Building department
- Hinsdale: Lawful actions, fines, stop work
- Hoffman Estates: Shut down project
- Homewood: Stop work orders, fines citations, court
- Indian Head Park: Stop work orders, fines
- Inverness: Deny building permits, stop work orders, complaint in circuit court
- LaGrange Park: Permit revocation and fines possible
- Lansing: Stop work order
- Lemont: Violations are ticketed, in noncompliance, court date is set, village will fix problem and lien owner, enforcement is the key
- Lynwood: Stop work, ticketing, hold letter of credit
- Lyons: Penalties, fines, liens
- Maywood: Citations, court, fines, stop work
- Midlothian: Floodplain and stormwater ordinance
- Morton Grove: Tickets, fines, stop work orders, non-issuance of occupancy permit
- Mount Prospect: Citations and fines
- New Lennox: Stop work orders, fines
- North Riverside: No permit issued for non-compliance
- Northbrook: Hold-up, delay the issuance if the occupancy permit and return of escrow
- Northfield: Stop work order, issue ticket with up to $750/day fine, court appearance, no occupancy permit issued
- Northlake: Issue citations
- Oak Forest: Suspension of building permits
- Oak Lawn: Court, fines
- Orland Park: Project is halted or stopped until compliance, ticket issued and fine levied
- Palatine: Citations, fines, stop work, court
- Palos Hills: Per city codes
- Palos Park: Stop work orders and/or fines
- Park Ridge: Citations, fines, stop work orders
- Prospect Heights: Stop work orders, tickets, fines
- Riverside: Citation under village code
- Rolling Meadows: Inspection every two weeks and fines for non-compliance, and stop work
- Roselle: Stop work
- Rosemont: Code enforcement staff
- Sauk Village: Ticketing, fines, or stop work order
- Schaumburg: Enforcement mechanisms range from warnings to stop work orders to fines for non-compliance
- Schiller Park: Permit revocation and fines possible
- Skokie: Stop work order, citations, fines
- South Holland: Citations, fines, stop work order
- Streamwood: Stop work or stop occupancy permit
- Summit: Tickets issued
- Wheeling: Municipal code violation citation
- Wilmette: Code enforcement, other issue a citation

- Winnetka: Jobs can be stopped until situation is rectified ad/or impose citation and penalty fine
- Worth: Citations, fines, liens

43. List the water resource related standards requiring the most enforcement action:
- Bartlett: Sediment and erosion control standards
- Bensenville: Site work, erosion control, floodplain and wetland preservation next to construction
- Blue Island: Erosion control
- Burr Ridge: Sediment and erosion control
- Calumet Park: Village ordinance
- Country Club Hills: As-built verification of detention systems, currently not getting enough information to verify proper construction
- Countryside: Special flood hazard area and stormwater detention
- Deerfield: Soil erosion
- Des Plaines: Filling in the floodplain without a permit
- Elk Grove Village: Detention pond volume
- Flossmoor: Village of Flossmoor Stormwater management code (11/90) Article 1.108 – Obstructions in water courses
- Forest Park: Soil erosion control
- Forest View: Water quality from industrial sites
- Franklin Park: Floodplain management, stormwater requirements are refined during pre-development and construction stages
- Glencoe: Because of the number of redeveloped home sites, silt fence maintenance is the most common, knocked down or improper installation
- Glenview: Erosion control practices
- Glenwood: Detention volumes
- Harvey: Floodplain management
- Hazel Crest: Detention design review
- Hickory Hills: Floodplain encroachment
- Hinsdale: Erosion control
- Hoffman Estates: Illinois urban manual
- Indian Head Park: Altering water course, obstructing ditches, erosion control
- Inverness: Soil erosion and sedimentation control
- LaGrange Park: Floodplain regulations
- Lansing: Village ordinance
- Lemont: Knocked down silt fence and mud on street, a daily enforcement problem
- Midlothian: Floodplain issues relative to residential development
- Morton Grove: NPDES permit requirements
- Mount Prospect: Sump pump discharge code violations
- New Lennox: Altering water course, obstructing ditches, erosion control
- North Riverside: Stormwater detention
- Northbrook: Stormwater detention and floodplain development
- Northfield: Stormwater issues
- Northlake: Soil erosion and sediment
- Oak Forest: Soil erosion control
- Orland Park: Soil erosion control
- Palos Hills: Soil erosion and sediment control regulations

- Palos Park:  Erosion and sediment control
- Prospect Heights:  Illegal dumping if SFMA, flood proofing non-residential structures, erosion control maintenance
- Riverside:  Increase in storm flows caused by in-fill development
- Roselle:  Erosion control
- Sauk Village:  Household stormwater discharge to unpermitted locations
- Schaumburg:  Soil erosion control
- Schiller Park:  Floodplain regulations
- Streamwood:  Soil erosion control
- Summit:  Silt fence knocked down
- Wheeling:  Wetland violations, soil erosion control during construction activities
- Wilmette:  Soil erosion
- Winnetka:  Filling in floodplain

## Appendix A
# Cook County Stormwater Management Questionnaire Township Responses

A stormwater management questionnaire was developed by the Metropolitan Water Reclamation District of Greater Chicago to assess the current stormwater management framework in Cook County while developing the Cook County Stormwater Management Plan. The purpose of this questionnaire was to identify regulatory standards of the local governments in Cook County in regards to stormwater drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection. The questionnaire was sent to each of the municipalities, townships, and drainage districts. The questionnaire responses were collected in February 2006. The following summarizes the responses received from the townships.

After each question, the number of Yes and No responses are given. Additional narrative responses are summarized below the question.

The townships responding to the questionnaire include:

Bloom Township
Calumet Township
Elk Grove Township
Leyden Township
Lyons Township
Maine Township
New Trier Township
Palatine Township
Palos Township

## GENERAL

1. Please rank, in order of importance, the most critical elements of stormwater management as they pertain to your township. (1=most important, 4=least)

| Importance | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Drainage Problems | 4 | 1 | 2 | 0 |
| Overbank Flooding | 2 | 3 | 0 | 2 |
| Erosion/Sedimentation | 0 | 0 | 5 | 2 |
| Water Quality | 0 | 1 | 0 | 6 |
| Other (please describe) | 1 | 1 | | |

Other comments included:

- Bloom: Numerous instances of flooding during recent wet weather cycle exacerbated by inadequate stormwater drainage, debris and vegetative growth blocking waterways.
- Palatine: Marked 1 for Permit Process
- Palos: Marked 2 for the antique storm drain in the McGinnis subdivision.
- Maine: Drainage problems with the secondary street ditches, overbank flooding for Prairie Creek, erosion on Prairie Creek, and overland dirty water in creek.
- Palos: Keeping ditches clean.
- Calumet Township and New Trier Township did not answer this question

2. Have any drainage, flooding, water quality, environmental or other water resource related studies (master plans, watershed plans, etc.) been prepared or are being prepared for your township? **YES (2) NO (5)**

   If yes, please describe the study briefly:
   - Maine: IDNR, many plans over past 20 years
   - Palatine: Hydrologic study of Salt Creek through Plum Grove Estates
   - Lyons: Ordered digital orthographic contour photographs of the unincorporated areas of the township to determine the best means of solving current drainage problems

3. Has an inventory of drainage systems (ditches, drainageways, on line detention facilities, storm sewers, etc.) been completed?
   **YES (2) NO (4)**

   Is the inventory updated on a regular basis?
   **YES (1) NO (3)**

   If yes, please describe the format of the inventory, frequency of updates, and date of last update:
   - Leyden: Log book mapping
   - Lyons: Once photos received, field survey to be made to identify all culverts, storm sewers etc.
   - Palos: On-going visual inventory

4. Does your township have a regular drainage facility maintenance program?
   **YES (6) NO (1)**

5. What are your most recent capital improvement projects relating to drainage or stormwater?
   - Bloom: Proposal to remove and replace drainage culverts on various township roads
   - Elk Grove: Martha Lincoln detention basin
   - Leyden: Silver Creek bank improvements, continual updating storm sewer and ditch improvements
   - Lyons: Replace defective culverts on a yearly basis, as well as rechannelizing ditch
   - Maine: Minor culvert ditching yearly, all new construction must pipe property line rerouting to shortest or direct route to creek
   - Palatine: Forest Estates curb and gutter and storm sewer improvements
   - Palos: Replace pipe at McGinnis storm drain, annual ditch cleaning, grade all method, culvert pipe replacement, periodic under drains

6. What intergovernmental agreements does your township have with other townships, districts, communities or agencies relevant to water resources (examples: stormwater, floodplain, stream preservation, right-of-way acquisition, project cost sharing, land preservation, NPDES permits, Operations and Maintenance, NRCS, etc.)? Please list agreements:
   - Lyons: Work closely with Indian Head Park and Cook County Highway Department for drainage improvements
   - Maine: Work closely with neighbors, system flows through Glenview, Niles and Des Plaines.

## Appendix B

# Cook County Stormwater Management 303 (D) Stream Listing

## APPENDIX B

### SUMMARY OF COOK COUNTY STREAM POLLUTANTS FROM IEPA ILLINOIS INTEGRATED WATER QUALITY REPORT AND SECTION 303(d) LIST-2006

**Watershed: Lower Des Plaines River Tributaries**
**Stream: Des Plaines River**

| Hydrologic ID Number | Miles of Stream Surveyed | Designated Use | Pollutant | Potential Sources |
|---|---|---|---|---|
| IL-G-22 | 4.14 | Aquatic Life | Methoxychlor | Contaminated Sediments |
| | | | Nitrogren (Total) | Contaminated Sediments, Municipal Point Source Discharges |
| | | | Phosphorus (Total) | Contaminated Sediments, Municipal Point Source Discharges |
| | | | Total Dissolved Solids | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Source Unknown, Urban Runoff/Storm Sewers |
| IL_G-28 | 8.82 | Aquatic Life | Chloride | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nitrogren (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_G-15 | 3.47 Miles | Aquatic Life | Chloride | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nitrogren (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | pH | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Sedimentation/Siltation | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Combined Sewer Overflows, Site Clearance (Land Development or Redevelopment), Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Source Unknown, Urban Runoff/Storm Sewers |
| IL_G-30 | 5.14 Miles | Aquatic Life | Chloride | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nitrogren (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Sedimentation/Siltation | Urban Runoff/Storm Sewers |
| | | | Silver | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Zinc | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |

| Watershed: Lower Des Plaines River Tributaries<br>Stream: Des Plaines River - Con'd | | | | |
|---|---|---|---|---|
| IL_G-32 | 6.08 Miles | Aquatic Life | Chloride | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Sedimentation/Siltation | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_G-36 | 6.92 Miles | Aquatic Life | Nitrogen (Total) | Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Impacts from Hydrostructure Flow Regulation/modification |
| | | | pH | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Silver | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Urban Runoff/Storm Sewers |
| IL_G-03 | 15.08 Miles | Aquatic Life | Chloride | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | DDT | Contaminated Sediments |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Silver | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_G-39 | 11.12 Miles | Aquatic Life | Cadmium | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Chloride | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Lindane | Contaminated Sediments |
| | | | Nickel | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | pH | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Silver | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Zinc | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Source Unknown |

| | | | | |
|---|---|---|---|---|
| **Watershed:** | **Lower Des Plaines River Tributaries** | | | |
| **Stream:** | **Addison Creek** | | | |
| IL_GLA-02 | 6.61 Miles | Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Chloride *TMDL | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Chromium (Total) | Contaminated Sediments |
| | | | DDT | Contaminated Sediments |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nickel | Contaminated Sediments |
| | | | Nitrogen (Total) | Municipal Point Source Discharges |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Total Dissolved Solids *TMDL | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_GLA-04 | 3.76 Miles | Aquatic Life | alpha-BHC | Contaminated Sediments |
| | | | Copper *TMDL | Municipal Point Source Discharges |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogen (Total) | Municipal Point Source Discharges |
| | | | Oxygen, Dissolved *TMDL | Impacts from Hydrostructure Flow Regulation/modification, Loss of Riparian Habitat, Municipal Point Source Discharges, Upstream Impoundments (e.g., Pl-566 NRCS Structures) |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Polychlorinated biphenyls | Contaminated Sediments |
| | | | Total Suspended Solids | Streambank Modifications/destablization, Urban Runoff/Storm Sewers |
| **Watershed:** | **Lower Des Plaines River Tributaries** | | | |
| **Stream:** | **Higgins Creek** | | | |
| IL_GOA-01 | 1.67 Miles | Aquatic Life | Chloride | Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Urban Runoff/Storm Sewers |
| IL_GOA-02 | 2.81 Miles | Aquatic Life | Chloride | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nickel | Municipal Point Source Discharges |
| | | | Silver | Municipal Point Source Discharges |
| | | | Total Dissolved Solids | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Zinc | Municipal Point Source Discharges |
| **Watershed:** | **Lower Des Plaines River Tributaries** | | | |
| **Stream:** | **Skokie Lagoons** | | | |
| IL_RHJ | 225 Acres | Aesthetic Quality | Phosphorus (Total) | Littoral/shore Area Modifications (Non-riverine), Runoff from Forest/Grassland/Parkland, Urban Runoff/Storm Sewers, Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO) |
| | | | Total Suspended Solids | Littoral/shore Area Modifications (Non-riverine), Runoff from Forest/Grassland/Parkland, Urban Runoff/Storm Sewers, Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO) |
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Little Calumet River North** | | | |
| IL_HA-04 | 1.74 Miles | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| IL_HA-05 | 5.06 Miles | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Indigenous Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Iron | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Channelization, Combined Sewer Overflows, Upstream Impoundments (e.g., Pl-566 NRCS Structures) |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Silver | Contaminated Sediments |

| | | | | |
|---|---|---|---|---|
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Calumet River** | | | |
| IL_HAA-01 | 6.88 Miles | Aquatic Life | pH | Combined Sewer Overflows, Industrial Point Source Discharge, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Combined Sewer Overflows |
| | | | Silver | Combined Sewer Overflows, Industrial Point Source Discharge, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Grand Calumet River** | | | |
| IL_HAB-41 | 2.6 Miles | Indigenous Aquatic Life | Ammonia (Un-ionized) | Municipal Point Source Discharges |
| | | | Arsenic | Contaminated Sediments |
| | | | Barium | Contaminated Sediments |
| | | | Cadmium | Contaminated Sediments |
| | | | Chromium (Total) | Contaminated Sediments |
| | | | Copper | Contaminated Sediments |
| | | | DDT | Contaminated Sediments |
| | | | Iron | Combined Sewer Overflows, Contaminated Sediments, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Lead | Contaminated Sediments |
| | | | Nickel | Contaminated Sediments |
| | | | Nitrogren (Total) | Combined Sewer Overflows, Contaminated Sediments, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Contaminated Sediments, Municipal Point Source Discharges |
| | | | Polychlorinated biphenyls | Contaminated Sediments |
| | | | Sedimentation/Siltation | Channelization, Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Silver | Contaminated Sediments |
| | | | Zinc | Contaminated Sediments |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Source Unknown |
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Little Calumet River** | | | |
| IL_HB-01 | 8.6 Miles | Aquatic Life | Fluoride | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogren (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oil and Grease | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Sedimentation/Siltation | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Silver | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | Fish Consumption | Mercury | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_HB-42 | 4.06 Miles | Aquatic Life | Fluoride | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Nitrogren (Total) | Combined Sewer Overflows |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows |
| | | | Sedimentation/Siltation | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Silver | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows |
| | | | Total Suspended Solids | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |

| | | | | |
|---|---|---|---|---|
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Thorn Creek** | | | |
| IL_HBD-02 | 3.68 Miles | Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Chlordane | Contaminated Sediments |
| | | | DDT | Contaminated Sediments |
| | | | Dieldrin | Contaminated Sediments |
| | | | Endrin | Contaminated Sediments |
| | | | Fluoride | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogren (Total) | Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Polychlorinated biphenyls | Contaminated Sediments |
| | | | Silver | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Urban Runoff/Storm Sewers |
| | | | Zinc | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Primary Contact | Fecal Coliform | Urban Runoff/Storm Sewers |
| IL_HBD-04 | 4.11 Miles | Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Chlordane | Contaminated Sediments |
| | | | DDT | Contaminated Sediments |
| | | | Dieldrin | Contaminated Sediments |
| | | | Endrin | Contaminated Sediments |
| | | | Fluoride | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogren (Total) | Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Channelization, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Polychlorinated biphenyls | Contaminated Sediments |
| | | | Silver | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Urban Runoff/Storm Sewers |
| | | | Zinc | Municipal Point Source Discharges |
| | | Primary Contact | Fecal Coliform | Source Unknown |
| IL_HBD-05 | 2.64 Miles | Aquatic Life | Total Dissolved Solids | Urban Runoff/Storm Sewers |
| IL_HBD-06 | 1.98 Miles | Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Deildrin | Contaminated Sediments |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogren (Total) | Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Silver | Municipal Point Source Discharges |
| | | Primary Contact | Fecal Coliform | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **North Creek** | | | |
| IL_HBDA-01 | 11.66 Miles | Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Oxygen, Dissolved | Urban Runoff/Storm Sewers |
| | | | Sedimentation/Siltation | Runoff from Forest/Grassland/Parkland, Urban Runoff/Storm Sewers |
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Butterfield Creek** | | | |
| IL_HBDB-03 | 14.65 Miles | Aquatic Life | DDT | Contaminated Sediments |
| | | | Oxygen, Dissolved | Urban Runoff/Storm Sewers |
| **Watershed:** | **Little Calumet River** | | | |
| **Stream:** | **Tinley Creek** | | | |
| IL_HF-01 | 8.73 Miles | Aquatic Life | Impairment Unknown | Source Unknown |

| | | | | |
|---|---|---|---|---|
| **Watershed:** | **North Branch Chicago River** | | | |
| **Stream:** | **North Branch Chicago River** | | | |
| IL_HCC-02 | 2.06 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| IL_HCC-07 | 11.49 Miles | Aquatic Life | Aldrin | Contaminated Sediments |
| | | | Chloride | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | DDT | Contaminated Sediments |
| | | | Hexachlorobenzene | Contaminated Sediments |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Silver | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Source Unknown |
| IL_HCC-08 | 5.45 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| | | Indigenous Aquatic Life | Iron | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oil and Grease | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| **Watershed:** | **North Branch Chicago River** | | | |
| **Stream:** | **South Branch Chicago River** | | | |
| IL_HC-01 | 3.97 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| **Watershed:** | **North Branch Chicago River** | | | |
| **Stream:** | **South Fork South Branch Chicago River** | | | |
| IL_HCA-01 | 3.08 Miles | Indigenous Aquatic Life | Oxygen, Dissolved | Combined Sewer Overflows |
| | | | pH | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows |
| **Watershed:** | **North Branch Chicago River** | | | |
| **Stream:** | **North Shore Channel** | | | |
| IL_HCCA-02 | 4.25 Miles | Aquatic Life | Nickel | Combined Sewer Overflows |
| | | | Nitrogren (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification, Upstream Impoundments (e.g., Pl-566 NRCS Structures) |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Zinc | Combined Sewer Overflows |
| | | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_HCCA-04 | 3.38 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| **Watershed:** | **North Branch Chicago River** | | | |
| **Stream:** | **West Fork North Branch Chicago River** | | | |
| IL_HCCB-05 | 14.74 Miles | Aquatic Life | Chloride | Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | DDT | Contaminated Sediments |
| | | | Nitrogren (Total) | Municipal Point Source Discharges |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Total Dissolved Solids | Highway/Road/Bridge Runoff (Non-construction Related), Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Zinc | Municipal Point Source Discharges |
| | | Primary Contact | Fecal Coliform | Urban Runoff/Storm Sewers |

| | | | | |
|---|---|---|---|---|
| **Watershed:** | **Upper Salt Creek** | | | |
| **Stream:** | **Salt Creek** | | | |
| IL_GL | 11.19 Miles | Aquatic Life | Chloride | Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Impacts from Hydrostructure Flow Regulation/modification, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Urban Runoff/Storm Sewers |
| | | | Silver | Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Urban Runoff/Storm Sewers |
| IL_GL-10 | 3.64 Miles | Aquatic Life | Chloride | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nitrogen (Total) | Municipal Point Source Discharges |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Total Dissolved Solids *TMDL | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Zinc | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Urban Runoff/Storm Sewers |
| IL_GL-19 | 3.1 Miles | Aquatic Life | Chloride | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nickel | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved *TMDL | Combined Sewer Overflows |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Sedimentation/Siltation | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Source Unknown |
| | | Primary Contact | Fecal Coliform | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| **Watershed:** | **Upper Salt Creek** | | | |
| **Stream:** | **Flagg Creek** | | | |
| IL_GK-03 | 7.76 Miles | Aquatic Life | Nitrogen (Total) | Municipal Point Source Discharges |
| | | | Phosphorus (Total) | Municipal Point Source Discharges |
| | | | Total Dissolved Solids | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| **Watershed:** | **Upper Salt Creek** | | | |
| **Stream:** | **Salt Creek** | | | |
| IL_GL-03 | 10.38 Miles | Aquatic Life | DDT | Contaminated Sediments |
| | | | Heptachlor | Contaminated Sediments |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Sanitary Sewer Overflows (Collection System Failures) |
| | | | Oxygen, Dissolved *TMDL | Combined Sewer Overflows, Sanitary Sewer Overflows (Collection System Failures) |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Sanitary Sewer Overflows (Collection System Failures) |
| | | | Polychlorinated biphenyls | Contaminated Sediments |
| | | | Sedimentation/Siltation | Combined Sewer Overflows, Sanitary Sewer Overflows (Collection System Failures), Site Clearance (Land Development or Redevelopment), Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids *TMDL | Combined Sewer Overflows, Municipal Point Source Discharges, Sanitary Sewer Overflows (Collection System Failures), Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids (TSS) | Combined Sewer Overflows, Sanitary Sewer Overflows (Collection System Failures), Site Clearance (Land Development or Redevelopment), Urban Runoff/Storm Sewers |
| | | Fish Consumption | Mercury | Source Unknown |
| | | | Polychlorinated biphenyls | Contaminated Sediments |

| | | | | |
|---|---|---|---|---|
| **Watershed:** | **Upper Salt Creek** | | | |
| **Stream:** | **Chicago Sanitary & Ship Canal** | | | |
| IL_GI-06 | 12.34 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| | | Indigenous Aquatic Life | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification, Urban Runoff/Storm Sewers |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| **Watershed:** | **Cal Sag Channel** | | | |
| **Stream:** | **Calumet-Sag Channel** | | | |
| IL_H-01 | 5.79 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| | | Indigenous Aquatic Life | Iron | Municipal Point Source Discharges, Urban Runoff/Storm Sewers |
| | | | Nitrogen (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Oxygen, Dissolved | Combined Sewer Overflows, Impacts from Hydrostructure Flow Regulation/modification |
| | | | Phosphorus (Total) | Combined Sewer Overflows, Municipal Point Source Discharges |
| | | | Total Suspended Solids | Combined Sewer Overflows, Urban Runoff/Storm Sewers |
| IL_H-02 | 10.35 Miles | Fish Consumption | Polychlorinated biphenyls | Source Unknown |
| **Watershed:** | **Poplar Creek** | | | |
| **Stream:** | **Poplar Creek** | | | |
| IL_DTG-02 | 14.52 Miles | Aquatic Life | Chloride | Highway/Road/Bridge Runoff (Non-construction Related), Urban Runoff/Storm Sewers |
| | | | Oxygen, Dissolved | Urban Runoff/Storm Sewers |
| | | | Sedimentation/Siltation | Urban Runoff/Storm Sewers |
| | | | Silver | Urban Runoff/Storm Sewers |
| | | | Total Dissolved Solids | Highway/Road/Bridge Runoff (Non-construction Related), Urban Runoff/Storm Sewers |
| | | | Total Suspended Solids | Urban Runoff/Storm Sewers |
| | | Primary Contact | Fecal Coliform | Source Unknown |

Appendix C

# USGS Stream Flowmeters

**APPENDIX C**

# USGS Stream Flowmeters

**TABLE C-1**
USGS Daily Stream Flow Monitoring Sites within Cook County

| Station Name | Start of Period of Record | End of Period of Record | COOP ID |
|---|---|---|---|
| Buffalo Creek near Wheeling, IL | 8/12/1952 | Current | 05528500 |
| Des Plaines River near Des Plaines, IL | 10/01/1940 | Current | 05529000 |
| McDonald Creek near Mount Prospect, IL | 8/13/1952 | Current | 05529500 |
| Weller Creek at Des Plaines, IL | 10/01/1950 | Current | 05530000 |
| Willow Creek near Park Ridge, IL | 10/01/1950 | 9/30/1958 | 05530500 |
| Salt Creek at Rolling Meadows, IL | 7/12/1973 | Current | 05530990 |
| Salt Creek near Arlington Heights, IL | 8/01/1950 | 9/30/1973 | 05531000 |
| Salt Creek at Western Springs, IL | 10/01/1945 | Current | 05531500 |
| Salt Creek near Elk Grove Village, IL | 10/01/2004 | Current | 05531044 |
| Addison Creek at Bellwood, IL | 8/16/1950 | Current | 05532000 |
| Des Plaines River at Riverside, IL | 10/01/1943 | Current | 05532500 |
| Flag Creek near Willow Springs, IL | 7/26/1951 | Current | 05533000 |
| Des Plaines River at Lemont, IL | 11/04/1914 | 9/30/1944 | 05533500 |
| West Fork of North Branch Chicago River at Northbrook, IL | 8/08/1952 | Current | 05535500 |
| North Branch Chicago River at Niles, IL | 10/01/1950 | Current | 05536000 |
| North Shore Channel at Wilmette, IL | 10/01/1999 | 9/30/2003 | 05536101 |
| North Branch Chicago River at Albany Avenue at Chicago, IL | 10/01/1999 | Current | 05536105 |
| North Branch Chicago River at Grand Avenue at Chicago, IL | 7/02/2002 | Current | 05536118 |
| North Branch Chicago River at Deerfield, Il | 8/01/1952 | Current | 05534500 |
| Chicago River at Columbus Drive at Chicago, IL | 10/01/1996 | Current | 05536123 |
| Thorn Creek near Chicago Heights, IL | 6/26/1964 | 10/03/1979 | 05536210 |
| Thorn Creek at Glenwood, IL | 5/17/1949 | Current | 05536215 |
| Deer Creek near Chicago Heights, IL | 5/17/1948 | Current | 05536235 |
| Butterfield Creek at Flossmoor, IL | 5/17/1948 | Current | 05536255 |

**TABLE C-1**
USGS Daily Stream Flow Monitoring Sites within Cook County

| Station Name | Start of Period of Record | End of Period of Record | COOP ID |
|---|---|---|---|
| Lansing Ditch near Lansing, IL | 5/17/1948 | Current | 05536265 |
| North Creek near Lansing, IL | 5/11/1948 | 9/30/1979 | 05536270 |
| Thorn Creek at Thornton, IL | 5/17/1948 | Current | 05536275 |
| Little Calumet River at South Holland, IL | 10/01/1947 | Current | 05536290 |
| Little Calumet River at Harvey, IL | 10/01/1916 | 9/30/1933 | 05536325 |
| Midlothian Creek at Oak Forest, IL | 10/01/1950 | Current | 05536340 |
| Calumet River below O'Brien Lock and Dam at Chicago, IL | 10/01/1996 | 9/30/2003 | 05536358 |
| Tinley Creek near Palos Park, IL | 7/11/1951 | Current | 05536500 |
| Long Run near Lemont, IL | 7/01/1951 | Current | 05537500 |
| Poplar Creek at Elgin, IL | 8/14/1951 | Current | 05550500 |

## Appendix D
# NCDC Rain Gauge Data

**APPENDIX D**

# NCDC Rain Gauge Data

**TABLE D-1**
NCDC Rain Gauge Location Summary

| Station Name | Start of Period of Record | End of Period of Record | COOP ID |
|---|---|---|---|
| Barrington | N/A | N/A | 1144 |
| Barrington 3sw | 1/6/1909 | Present | 11442 |
| Bellwood Addison Creek | N/A | N/A | 11571 |
| Brookfield | N/A | N/A | 11982 |
| Chicago / Wheeling Pal - Waukee A | 10/1/1978 | Present | N/A |
| Chicago 95th / Baltimore | N/A | N/A | 11161 |
| Chicago Botanical Garden | 8/1/1981 | Present | 111497 |
| Chicago C Wtr Filt Plant | 1/1/1972 | 3/31/1980 | 111523 |
| Chicago Cal Treat Wks | 7/1/1948 | 5/1/1998 | 111522 |
| Chicago Christiana Av | N/A | N/A | 111524 |
| Chicago Dan Ryan Woody | 4/1/1973 | 5/1/1998 | 1115 |
| Chicago Dunne Crib | N/A | N/A | N/A |
| Chicago Grant Park | 1/1/1972 | 8/1/1976 | 111526 |
| Chicago Hanover Park | N/A | N/A | 11153 |
| Chicago Hazelcrest | N/A | N/A | 11155 |
| Chicago Heights | 1/1/1948 | 6/30/1952 | 111527 |
| Chicago Homewood | N/A | N/A | 111529 |
| Chicago Lake Calumet | N/A | N/A | 111531 |
| Chicago Lakeview Pump | 7/1/1948 | 4/30/1965 | 111532 |
| Chicago Lansing Municipal Air | 11/1/1993 | Present | N/A |
| Chicago Lawrence / Calif | N/A | N/A | 111534 |
| Chicago Loyola Univ | 7/1/1948 | 1/24/1907 | 111537 |
| Chicago Mayfair Pump Station | 7/1/1948 | 3/31/1980 | 111542 |
| Chicago Meigs Field | 1/1/1949 | Present | N/A |
| Chicago Midway Airport | 7/11/1903 | Present | N/A |
| Chicago Midway Ap 3sw | 9/1/1980 | Present | 111577 |
| Chicago N Bra Pump Station | 7/1/1948 | 6/24/1907 | 111547 |

**TABLE D-1**
NCDC Rain Gauge Location Summary

| Station Name | Start of Period of Record | End of Period of Record | COOP ID |
|---|---|---|---|
| Chicago Northerly Island | 4/1/2005 | Present | 11155 |
| Chicago O'hare Tollway | N/A | N/A | 111551 |
| Chicago Oak Lawn | N/A | N/A | 11159 |
| Chicago Ohare International Airport | 10/30/1958 | Present | 111549 |
| Chicago Orland Park | N/A | N/A | 111511 |
| Chicago Racine Pump | 7/1/1948 | 5/1/1998 | 111557 |
| Chicago Roseland Pump | 7/1/1948 | 3/31/1980 | 111552 |
| Chicago S Wtr Filt Plant | 7/1/1948 | 3/31/1980 | 111564 |
| Chicago San Dist Office | 7/1/1948 | 12/19/1906 | 111562 |
| Chicago San Dist Office | 11/19/1906 | 5/1/1998 | 111562 |
| Chicago Springfld Pump | 7/1/1948 | 5/1/1998 | 111567 |
| Chicago University | 1/1/1916 | 2/1/1995 | 111572 |
| Chicago WSFO | N/A | N/A | N/A |
| Chicago Wb City 2 | 1/1/1872 | 10/15/1970 | 111584 |
| Chicago Yacht Club | N/A | N/A | 111587 |
| Chicago Yacht Club Bh | Unknown | 11/30/1972 | 111592 |
| Cicero | 1/1/1948 | 12/10/1905 | 111648 |
| Des Plaines | 3/25/1988 | 5/1/1998 | 11229 |
| Des Plaines 1 NW | 1/1/1948 | 11/30/1950 | 112286 |
| Elk Grove Village | 12/1/1908 | 11/1/2003 | 112763 |
| Evanston Pump Station | 7/1/1948 | 5/31/1968 | 112888 |
| Flossmoor 1 E River | N/A | N/A | 113117 |
| Glenview | N/A | N/A | 113494 |
| Glenview Depot Station | N/A | N/A | 113495 |
| Glenview NAS | 3/1/1943 | Present | N/A |
| Kenilworth | N/A | N/A | 114681 |
| Lagrange | N/A | N/A | 114814 |
| Lansing | N/A | N/A | N/A |
| Lansing | 6/25/2005 | Present | 11489 |
| Lemont | N/A | N/A | 11523 |
| Little Red School House | 10/1/1992 | Present | 11511 |
| Mount Prospect | 6/1/1995 | 7/1/1996 | 115922 |

**TABLE D-1**
NCDC Rain Gauge Location Summary

| Station Name | Start of Period of Record | End of Period of Record | COOP ID |
|---|---|---|---|
| Niles River | N/A | N/A | 116166 |
| Northbrook | N/A | N/A | N/A |
| Northbrook Under Lab | N/A | N/A | 116227 |
| Oak Lawn 2 N | N/A | N/A | 116339 |
| Park Forest | 6/1/1952 | Present | 116616 |
| Park Ridge | 8/9/1904 | 1/1/2004 | 116624 |
| Rolling Meadows River | N/A | N/A | 117447 |
| Skokie | 3/1/1954 | 8/19/1907 | 117988 |
| Skokie N S Treat Wks | 7/1/1948 | 5/1/1998 | 11799 |
| Stickney W Side Treat Wks | 7/1/1948 | 5/1/1998 | 118278 |
| Streamwood | 5/1/1994 | Present | 118324 |
| Thornton River | N/A | N/A | 118576 |
| Wilmette | N/A | N/A | 119317 |
| Wilmette | N/A | N/A | N/A |
| Wilmette Harbor Lbstn | N/A | N/A | 119315 |

# Appendix E
# Manning's Roughness Coefficient and Cross-Section Field Forms

# DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENT*

CREW ____________

INITIALS: ____________

____________

DATE: ____________

TIME: ____________

RAINFALL: Y N

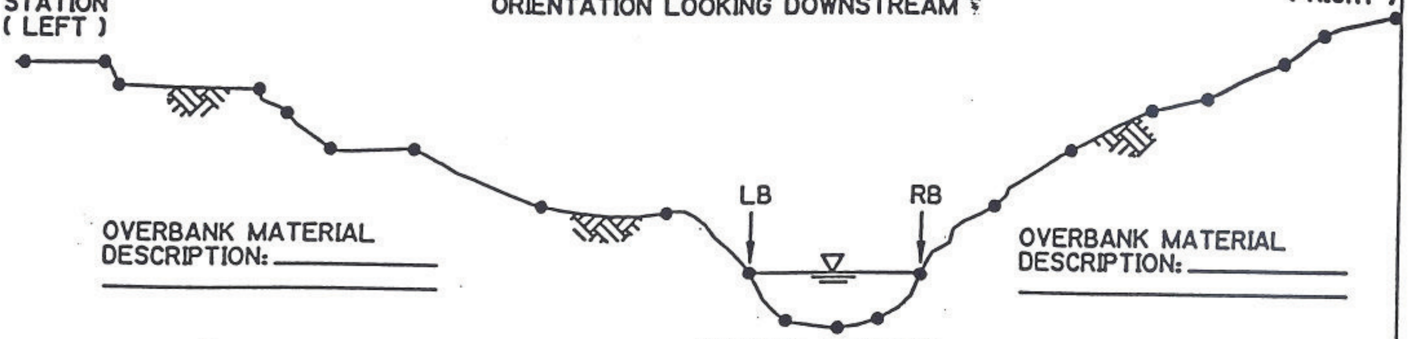
LOCATION & ID NUMBER: ________________________________

RANGE/TOWNSHIP/SECTION: ___ ___ ___

START STATION ( LEFT )

ORIENTATION LOOKING DOWNSTREAM

END STATION ( RIGHT )




OVERBANK MATERIAL DESCRIPTION: ____________
____________

OVERBANK MATERIAL DESCRIPTION: ____________
____________

CHANNEL MATERIAL DESCRIPTION: ____________
____________

| CHANNEL CONDITIONS | | | VALUES | LEFT OVERBANK | MAIN CHANNEL | RIGHT OVERBANK |
|---|---|---|---|---|---|---|
| MATERIAL INVOLVED | EARTH | $N_0$ | 0.020 | | | |
| | ROCK CUT | | 0.025 | | | |
| | FINE GRAVEL | | 0.024 | | | |
| | COARSE GRAVEL | | 0.028 | | | |
| DEGREE OF IRREGULARITY | SMOOTH | $N_1$ | 0.000 | | | |
| | MINOR | | 0.005 | | | |
| | MODERATE | | 0.010 | | | |
| | SEVERE | | 0.020 | | | |
| VARIATIONS OF CHANNEL CROSS SECTION | GRADUAL | $N_2$ | 0.000 | | | |
| | ALTERNATING OCCASIONALLY | | 0.005 | | | |
| | ALTERNATING FREQUENTLY | | 0.010-0.015 | | | |
| RELATIVE EFFECT OF OBSTRUCTIONS | NEGLIGIBLE | $N_3$ | 0.000 | | | |
| | MINOR | | 0.010-0.015 | | | |
| | APPRECIABLE | | 0.020-0.030 | | | |
| | SEVERE | | 0.040-0.060 | | | |
| VEGETATION | LOW | $N_4$ | 0.005-0.010 | | | |
| | MEDIUM | | 0.010-0.025 | | | |
| | HIGH | | 0.025-0.050 | | | |
| | VERY HIGH | | 0.050-0.100 | | | |
| DEGREE OF MEANDERING | MINOR | $M_5$ | 1.000 | | | |
| | APPRECIABLE | | 1.150 | | | |
| | SEVERE | | 1.300 | | | |
| | | | $N=(N_0+N_1+N_2+N_3+N_4)M_5$ | | | |

* FROM: OPEN CHANNEL HYDRAULICS, VEN TE CHOW, McGRAW HILL BOOK CO. 1959. BENCHMARK: ____________

PHOTO# ________ SHEET ___ OF ___

CREW ______________

INITIALS: ______________

______________

# TYPICAL CHANNEL CROSS-SECTIONS

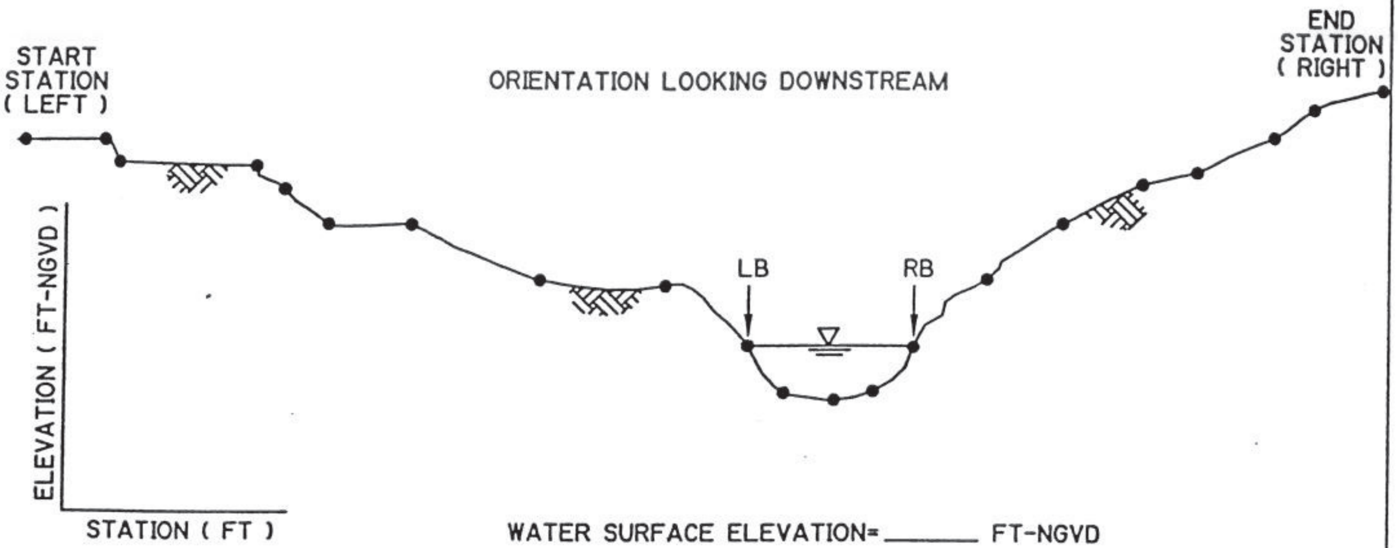
DATE: ______________

TIME: ______________

RAINFALL: Y N

LOCATION & ID NUMBER: ______________

RANGE/TOWNSHIP/SECTION: ___ ___ ___




WATER SURFACE ELEVATION= ______ FT-NGVD

| | STATION ( FT ) | ELEVATION ( FT-NGVD ) | *( LB/RB ) |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |

* ( INDICATE LEFT BANK STATION WITH LB )
( INDICATE RIGHT BANK STATION WITH RB )

HOUSE IN X-SECTION ? Y N
( CIRCLE ONE )

FIRST FLOOR ELEVATION= ______________ FT-NGVD

STATION OF HOUSE= ______________

FLOODPLAIN VEGETATION/DESCRIPTION: ______________

COMPASS DIRECTION OF FLOW: ______________

ESTIMATED APPLICABLE LENGTH (FT ): ______________

GENERAL NOTES: ______________

BENCHMARK:

PHOTO# ______

SHEET ___ OF ___

# Appendix F
# Benefit-Cost Analysis of Flood Protection Measures

## Acronyms used in Appendix F:

| | |
|---|---|
| $AA_B$ | Average Annual Benefits |
| $AA_C$ | Average Annual Cost |
| $AA_D$ | Average Annual Damages |
| BC | Benefit-to-Cost |
| BFE | Base Flood Elevation |
| EAD | Expected Annual Damages |
| FEMA | Federal Emergency Management Agency |
| NED | National Economic Development |
| O&M | Operation and Maintenance |
| PV | Present Value |
| RED | Regional Economic Development |
| USACE | United States Army Corps of Engineers |

# Benefit-Cost Analysis of Flood Protection Measures

PREPARED FOR: Metropolitan Water Reclamation District of Greater Chicago

PREPARED BY: Dan Medina, Ph.D., P.E., C.F.M.

DATE: May 2006

## 1. Introduction

This memorandum presents the steps necessary to conduct a benefit-to-cost (BC) analysis of flood protection measures according to standard methodologies employed by the US Army Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA). BC analyses for flood protection projects involve the determination of benefits as damages avoided over the life of the project and comparing them with the construction and operation and maintenance (O&M) costs associated with the project. Damages avoided include physical damages to buildings and infrastructure due to flooding and/or erosion, as well as nonphysical damages such as loss of income and transportation damages. Four damage categories will be considered in the detailed watershed plans (DWPs): property damage, erosion damage, transportation damage, and recreation damage.

## 2. Benefit-Cost Analysis

BC analysis is commonly applied to determine the adequacy of a project to meet its goals. This type of analysis helps define the best composition of a project, identify whether a project is worth the investment, and compare and choose among competing alternatives.

In the case of flood protection, BC analysis is intended to provide a measure of how a project will provide National Economic Development (NED) benefits, which are defined as "increases in the economic value of the goods and services that result directly from a project."[1] If the NED benefits of implementing a project are greater than the implementation costs (NED costs), then the BC ratio (NED benefits divided by NED costs) will be greater than one and the project will make a positive impact on the economy.

If there are several competing projects all of them with a BC ratio greater than one, the project with the highest NED net benefits (NED benefits minus NED costs) is the one that should be implemented; however, that project may not be the one with the greatest BC ratio.

The concept of NED benefits can be extended to regional economies by designation of Regional Economic Development (RED) benefits, which are the damages avoided to the regional economy by deploying of a flood protection project.

The subsequent sections discuss all of the components that need to be addressed when conducting BC analyses.

[1] U.S. Army Corps of Engineers. 1988. *National Economic Development Procedures Manual—Urban Flood Damage*. Water Resources Support Center. Institute for Water Resources. IWR Report 88-R-2. Ft. Belvoir, Virginia.

## 2.1 Definition of Benefits and Costs

As noted, benefits are defined as damages avoided; therefore, the benefits of a project are equal to the damages without the project minus the damages with the project. If the project is technically sound, the damages with the project should be less than the damages without it and the net benefits will be positive.

Most flood damage is physical and includes structural damage to buildings, loss of contents in those buildings, damage to infrastructure, and damage to special or unique facilities. Nonphysical damage includes income loss for wages and profits to businesses, emergency response, temporary relocation, and post-flood cleanup.

Flood protection projects can be one or a combination of flood barriers (levees and floodwalls), building elevation, building relocation, and floodproofing. The costs of the project are mainly the capital cost of construction and O&M costs consisting of periodic inspection, preventive maintenance, and repairs throughout the useful life of the project.

## 2.2 Discounting Procedures

Flood protection projects provide benefits throughout a defined useful life that depends on the type of project. A levee may have a useful life of 50 years, whereas relocation of a house outside the floodplain is a permanent solution. Every year that the project performs its functions provides benefits and, in principle, requires some expenditure, although most of the cost is incurred during construction. Therefore, the concept of present value (PV) is applied to compare these two series of unevenly distributed benefits and costs.

PV is a basic concept of engineering economics that accounts for the time value of money. To calculate the PV, the series of benefits accrued and the series of costs incurred every year are discounted using compound interest procedures. The discount rate used is typically set by the federal government and recently has varied between roughly 3 and 7 percent. Figure 1 illustrates the discounting process.

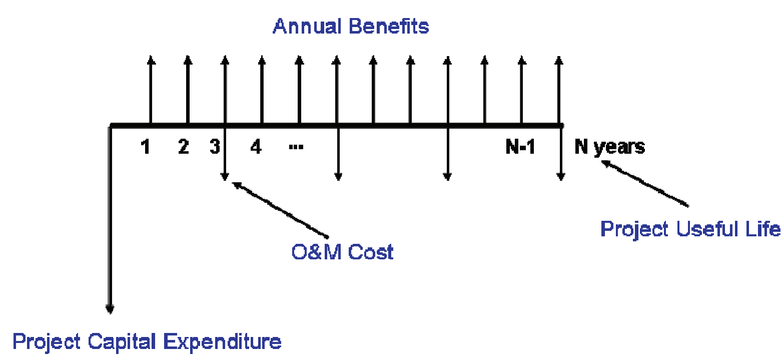



*Figure 1. Discounting process to compare benefits and costs using present values.*

Standard economic engineering textbooks provide formulas to convert a uniform series of "payments" to their present value. All these formulas are based on the fact that $PV$ for an amount $P$ accrued in year $t$ is

$$PV = \frac{P}{(1+i)^t} \tag{1}$$

where $i$ is the discount rate.

Conversely, the $PV$ can be transformed into a series of equal amounts $A$ over a given number of years n using the formula

$$A = PV \frac{i(1+i)^n}{(1+i)^n - 1} \tag{2}$$

### 2.3 BC Ratio Computation

Once the PVs of benefits and costs have been estimated, the BC ratio of the project can be computed using the formula

$$BC = \frac{PV_B}{PV_C} \tag{3}$$

where $PV_B$ is the present value of the benefits and $PV_C$ is the present value of the costs.

Equivalently, the BC ratio can be computed using the annual "payments" resulting from Eqn. 2. When applied to $PV_B$, the resulting uniform amount corresponds to the average annual benefits $AA_B$. Similarly, when Eqn. (2) is applied to $PV_C$, the uniform amount is the expected annual cost $AA_C$. Therefore, the BC can also be computed as

$$BC = \frac{AA_B}{AA_C}$$

The BC ratio can be used to evaluate whether a project is cost-effective. If the BC ratio is greater than unity, the project benefits exceed the costs and the project can be considered cost-effective. Vice versa, a project with a BC ratio less than one is not cost-effective and should not be considered.

Similarly, the net benefits of the project are equal to

$$NB = PV_B - PV_C$$

If the net benefits are positive, then the project is cost-effective and the BC ratio is greater than one. When several alternative project formulations are being considered, the project with the greatest net benefits (not the greatest BC ratio) is the optimal choice.

## 3. Estimation of Flood Damages

### 3.1 Physical Damages

As stated earlier, physical damages include structural damage to buildings (residential, commercial, industrial, public), loss of contents in those buildings (equipment, furnishings, raw materials, inventory), damages to infrastructure (roads, railways, sewers, power lines and other utilities), and damages to special facilities (power plants, hospitals, wastewater treatment plants). Physical damages may correspond to property damage, erosion damage, or transportation damage, although the majority of physical damages due to flooding are generally property damages. For all three damage categories, a floodplain inventory is necessary to understand what assets are at risk.

Physical damages depend on the severity of the flooding event. For riverine flooding, the severity is dictated mostly by the flooding levels but also by high flow velocities and duration of flooding. For coastal flooding, the inundation damage may be worsened by wave action. The severity of flooding is typically estimated using hydrologic and hydraulic models to simulate the water surface elevations and flow velocities caused by storm events of various magnitudes.

### 3.1.1 Hydrologic and Hydraulic Modeling.

Hydrologic models are used to estimate the peak flows that are caused by a range of rainfall events. These models simulate physical watershed processes to convert rainfall into runoff. Modeling is typically performed for individual storm events of varying severity, for example the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year storms. The result of hydrologic modeling is typically the relationship between peak flows and their probability of occurrence shown in Figure 2. A relationship like this can be determined for any given location along a stream.

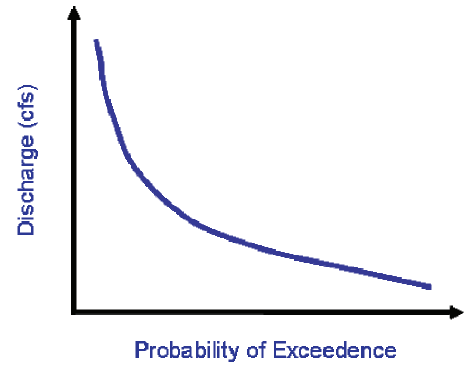



*Figure 2.Flow frequency relationship for a given location.*

Figure 2 shows that events that result in large peak flows have less probability of being exceeded. For example, the so-called “100-year flood” has a peak flow with a one-percent chance of being exceeded in any given year, whereas the “2-year flood” has a 50 percent exceedence probability.

A hydraulic model takes the peak flows resulting from the hydrologic model and estimates water surface elevations. One result of hydraulic modeling is the horizontal extent of the flooding caused by a given event. This area called the floodplain is determined by intersecting the flood elevations with the terrain. Floodplains for severe storms cover greater area than those for lesser events. The second result from hydraulic modeling is the relationship between flood elevations and probability of exceedence shown in Figure 3.

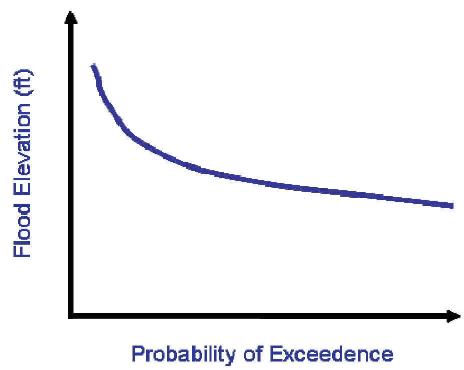



*Figure 3.Flood depth- frequency relationship for a given location.*

This relation follows the trend in Figure 2 in that severe events that produce high flood elevations have a low probability of exceedence. Curves like Figure 2 characterize the flood hazard at a given location. For FEMA regulatory purposes, the “100-year flood” elevations (also known as the Base Flood Elevations, BFEs) are used.

**3.1.2 Floodplain Inventory.** The damages caused by a flood reaching a given elevation are a function of the flooding depth inside buildings that causes damages. Therefore, the zero-damage elevation, typically the elevation of the lowest occupied floor in each building, is necessary to determine the depth of the flood waters inside. Similarly, for utilities, roads, bridges and other infrastructure, it is possible to determine a zero-damage elevation below which the asset is not expected to sustain damages.

A floodplain inventory is needed to determine these zero-damage elevations as well as the types of buildings and other assets at risk.

***Residential.*** In residential properties, flooding damages the structure and its contents. It is also possible that high velocity flows can erode the stream banks a cause loss of property. The floodplain inventory for residential buildings must include a topographic survey of first floors as well as characterization of the type of residence: one story or multi-story, with or without basement, detached or attached, single family or multi-family.

The residence type is used to determine the replacement value of the structure (with or without depreciation), which is the basis to estimate structural and content damages. Standard building industry data can be used to determine the replacement value, for example R.S. Means or Marshall & Swift manuals.

Contents are typically estimated as a fraction of the replacement value, which insurance companies typically assumed to be 50 percent of the building replacement value.

Loss of property due to erosion can be estimated as the value of the structures deemed at imminent risk of failure to erosion.

***Commercial / Industrial.*** Damages to non residential buildings also include structure and contents but the characterization is building specific due to the wide range of operations that can take place in various commercial and industrial outfits. Losses can also stem from damaged raw materials and products that may be warehoused.

***Infrastructure.*** Physical damages to roads, bridges, power plants, sewers, water and wastewater treatment plants and similar infrastructure is difficult due to the unique nature of these systems. In most circumstances, damage evaluation requires detailed knowledge of each system and its operations and is best acquired using data from previous floods. In the absence of more detailed information, transportation damage (including both physical damage and emergency response costs) may be estimated as 15% of property damage (structure and contents).

**3.1.3 Damage Curves.** The discussion above indicates that physical damages depend on the depth and possibly the velocity of water and the duration of flooding affecting the buildings in the floodplain. These damages are typically estimated using depth-damage curves that relate the depth of water above the lowest occupied floor with the percent damage to a structure and its contents. For example, Figure 4 shows damage curves for structure and contents of a one-story single-family detached home. These curves are statistical averages from FEMA flood insurance actuarial data.

For non residential buildings these curves must be obtained on a site-specific basis for both the structure and the contents. Similar site-specific curves can be developed for other infrastructure, typically from data collected during a previous flooding event.

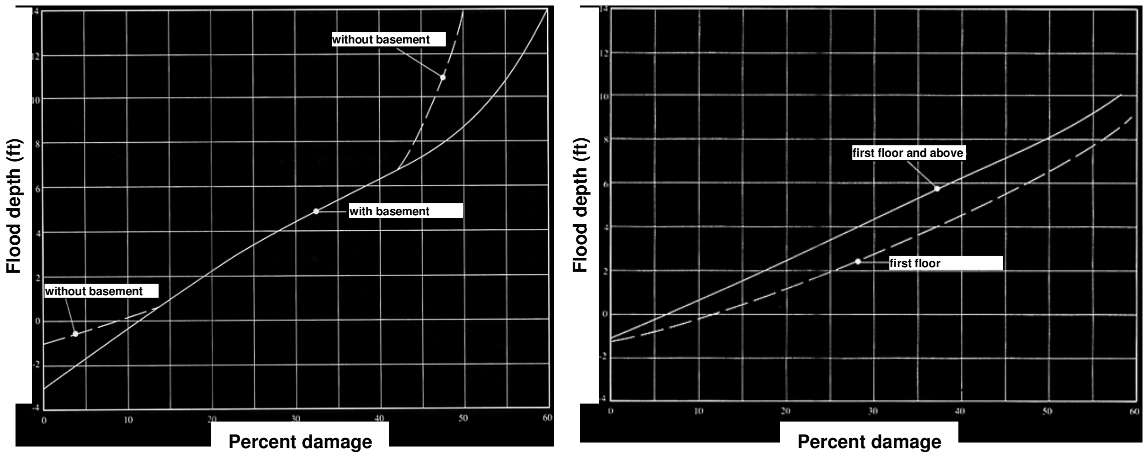



*Figure 4. Damage curves for structure and contents in a one-story house2.*

**3.1.4 Elevation-Damage Relationships.** The building inventory, lowest-floor elevations, and depth-damage curves can be combined to produce an elevation-damage curve for the study area. This curve is the result of selecting an elevation and accumulating all of the damages for all assets that would occur if the flood waters reach that elevation. Figure 5 shows the typical shape of this curve.

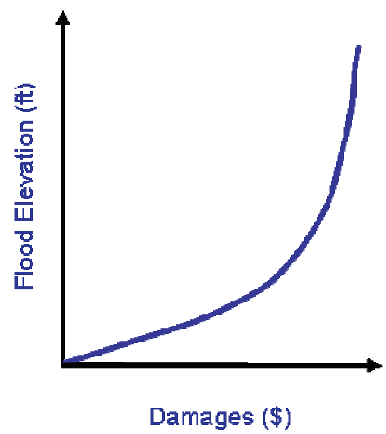



*Figure 5. Elevation-damage relationship for a given study area.*

**3.1.5 Damage-Frequency Relationships.** Because each flood elevation in Figure 5 is associated with the probability of the rainfall event that caused it, the elevation-damage curve can be transformed into a damage-frequency curve by assigning the exceedence probability to the corresponding damages as shown in Figure 6.

As expected, Figure 6 shows that there is a low probability for the greatest damages, which would be caused by severe but infrequent events. The curve levels off at these low probabilities indicating that the damages are virtually the same for very severe events that inundate all of the assets in the floodplain.

The area under the curve in Figure 6 is the expected annual damages (EAD), which is essentially the sum of all of the potential damages weighted by their probability of occurrence.

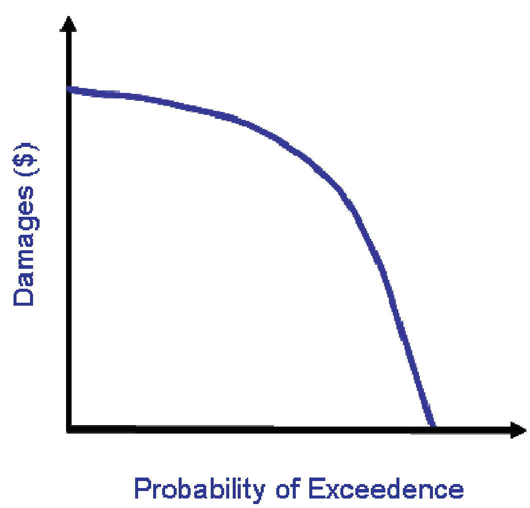



*Figure 6. Damage-frequency relationship for a given study area.*

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2http://www.usace.army.mil/inet/functions/cw/cecwp/NFPC/fphow/ace8-00.htm

### 3.2 Nonphysical Damages

Nonphysical damages may include income loss for wages and profits to businesses, emergency response, temporary relocation, and post-flood cleanup. These damages are typically a lesser component of the entire flood damages but can be significant for commercial and industrial operations. Typically, nonphysical damages will correspond to the recreation and transportation damage categories.

The process to accumulate nonphysical damages is the same as for physical damages. The total dollar figure of damages is calculated for each flooding event and associated with the probability of the event to produce a curve similar to Figure 6. It is recognized that, in many cases, the necessary input data to perform a detailed analysis of non-physical damages for individual recurrence intervals may not be available. Nonphysical damages such as emergency response costs are included in the aforementioned estimate of transportation damage as 15% of property damage. When warranted, a detailed consideration of non-physical transportation damage might consider additional nonphysical damages such as income loss and relocation loss, although flood damage is not expected to be extensive enough to result in considerable damages in these categories.

Recreation damage may be developed in consultation with the USACE Economics Guidance Memorandum, which defines unit day values for recreation, benefits which may not be received due to access restrictions caused by flood conditions.

## 4. Damage Reduction by Flood Protection Measures

Flood protection projects can be one or a combination of installing levees or floodwalls, elevating structures, relocating out of the floodplain, residential buy-outs, and dry and wet floodproofing. Dry floodproofing involves deployment of flood shields along the perimeter of a building to keep floodwaters out up to certain level, typically not to exceed 2 or 3 feet. Wet floodproofing allows water to enter buildings but takes measures to minimize damage, such as utility relocation.

The effect of any flood protection measure is to reduce the damages. In terms of the depth-damage curves, flood protection measures have the effects shown in Figures 7 through 10.

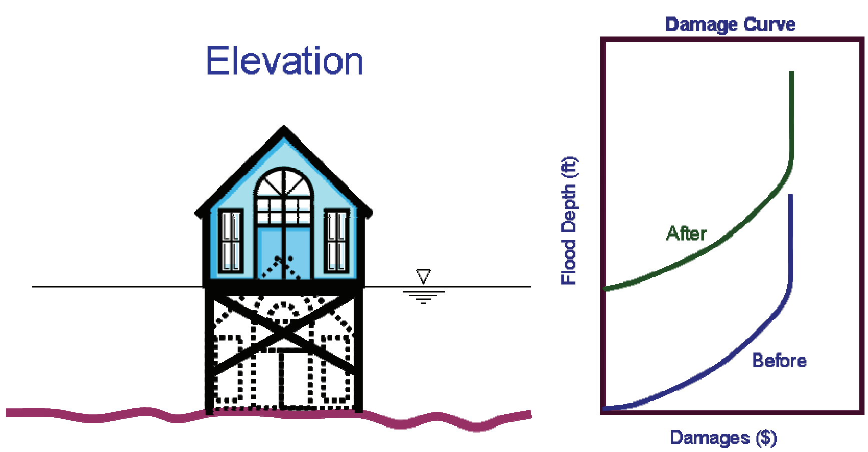


*Figure 7. Damage reduction caused by elevating a structure. The damage curve shifts vertically.*

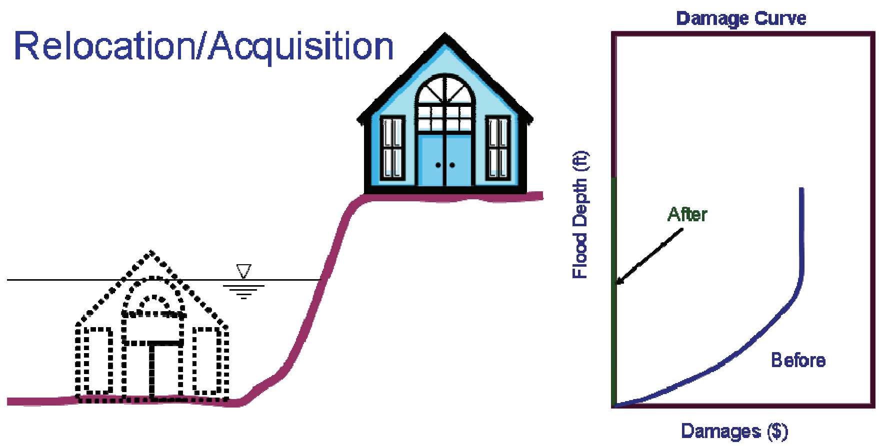


*Figure 8. Damage reduction caused by removing a structure a structure out of the floodplain. The damages are zero.*

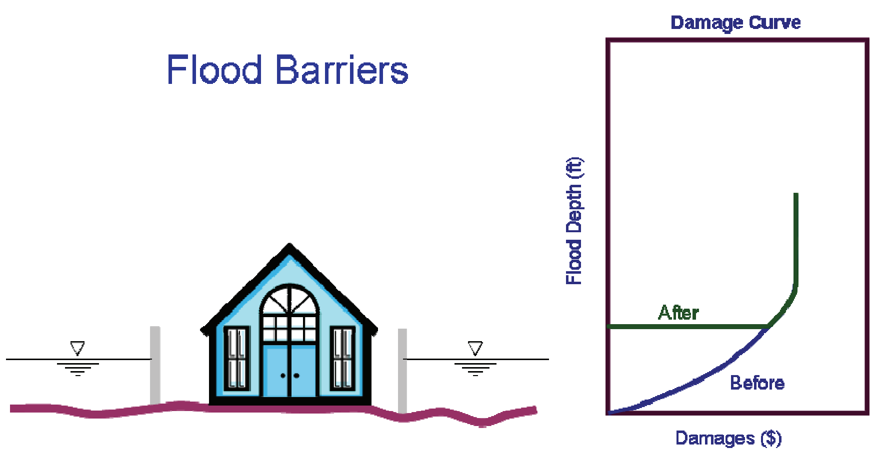


*Figure 9. Damage reduction caused by building a levee or floodwall. Damages are zero up to the barrier top elevation and then become equal to the original curve when the barrier is overtopped.*

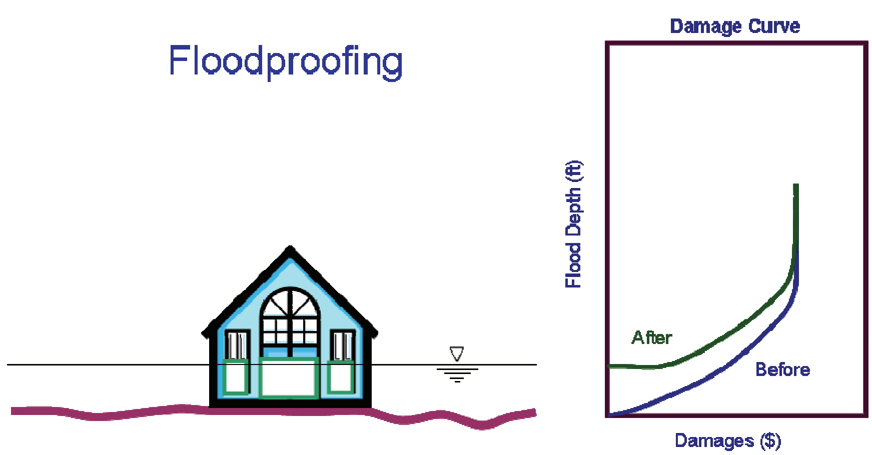

*Figure 10. Damage reduction caused by floodproofing a structure. Damages are zero up to the height of the floodproofing measure and are reduced somewhat up to a certain elevation.*

### 4.1 Damages Avoided

The process of computing damages avoided (benefits) requires estimation of the damage-frequency relationship after the flood protection project is implemented. This is basically the same sequence of computations explained above for the without-project condition. Figure 11 illustrates the result of the two parallel computations.

As noted, the area under each curve in Figure 11 corresponds to the average annual damages ($AA_D$). Therefore, the difference between the two areas is the expected annual damages avoided, which by definition corresponds the average annual benefits ($AA_B$). The benefits are accrued every year and correspond to the positive cash flow series in Figure 1. The series is assumed uniform throughout the life of the project but in reality, there will be changes in the building stock and economic activity in the floodprone area that may cause variations in the benefits.

### 4.2 Costs

The costs of the project involve all of the expenditures necessary for implementation. In the case of a levee, the cost includes study, design, and construction, plus O&M costs to maintain performance. For a residential buy-out, there is only the one-time cost of purchasing a number of houses in the floodplain, including demolition of the structures, restoration of the land, and closing costs. Floodproofing costs may be represented by one-time costs of utility relocation and periodic complete replacement of flood shields.

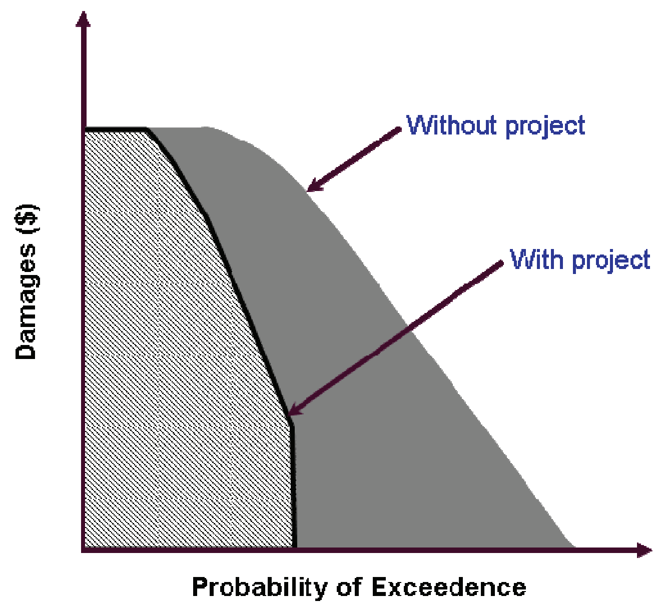


*Figure 11. Damage frequency curves with and without project.*

## 5. Summary

The BC analysis process for flood control projects consists of the following steps:

1. Delineate the study area
2. Inventory the study area to categorize buildings and infrastructure and estimate zero-damage elevations for each asset.
3. Select depth-damage relationships for all assets, including physical and nonphysical damages.
4. Perform hydrologic and hydraulic modeling for a series of events of varying severity to determine flood elevation vs. frequency relationships, with and without the project.

5. Calculate elevation-damage relationships accumulated for all assets in the study area, with and without project
6. Calculate damage-frequency relationships with and without project
7. Calculate average annual damages ($AA_D$), with and without project, as the areas under the corresponding damage-frequency curves.
8. Calculate the average annual benefits ($AA_B$) as the $AA_D$ without project minus the $AA_D$ with project.
9. Estimate the capital and O&M costs associated with the project.
10. Define the useful life of the project
11. Calculate the present value (PV) of the uniform annual series of $AA_B$ and the PV of the cost including O&M. Alternatively, calculate the expected annual cost $AA_C$ using Eqn. 2.
12. Compute the BC ratio as the PV of benefits divided by PV of costs, or as $AA_B$ divided by $AA_C$. Compute the net benefits as the PV of the benefits minus the PV of the costs.

## Appendix G

# Basis for Damage Calculation Assumptions

## Acronyms used in Appendix G:

| | |
|---|---|
| CPI | Consumer Price Index |
| CVM | Contingent Valuation Method |
| NED | National Economic Development |
| TCM | Travel Cost Method |
| UDV | Unit Day Value |

**DEPARTMENT OF THE ARMY**
U.S. ARMY CORPS OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-CP

20 November, 2006

MEMORANDUM FOR PLANNING COMMUNITY OF PRACTICE

SUBJECT: Economics Guidance Memorandum, 07-03, Unit Day Values for Recreation, Fiscal Year 2007

The enclosed information is provided for immediate use. Questions related to this memorandum should be addressed to Bruce Carlson at bruce.d.carlson@usace.army.mil or by telephone at (202) 761-4703.

Harry E. Kitch, P.E.
Deputy, Planning Community of Practice
Director or Civil Works

Encl

# Unit Day Values for Recreation, Fiscal Year 2007

The national economic development (NED) benefit evaluation procedures contained in ER 1105-2-100 (22 Apr 00), Appendix E, Section VII, include three methods of evaluating the beneficial and adverse NED effects of project recreation: travel cost method (TCM), contingent valuation method (CVM), and unit day value (UDV) method.

The criteria for selecting the appropriate method are described in paragraph E-50b(4) and Figure E-10 of ER 1105-2-100 and in the attached document. If the UDV approach is used, the range of unit day value for FY 2007 studies is:

| | | |
|---|---|---|
| General Recreation | \$3.32 | \$9.97 |
| Specialized Recreation | \$13.50 | \$39.45 |

If, when using the UDV method, evidence indicates a value outside the published range, use either TCM or CVM to evaluate recreation benefits.

The attached document provides a detailed description of the application of the UDV method. The tables provided in the attachment are constructed as guidance for planners in the selection of unit day values for particular recreation activities. Tables 1 and 2 illustrate a method of assigning a point rating to a particular activity. Point values are assigned based on measurement standards described for the five criteria of activities, facilities, relative scarcity, ease of access, and aesthetic factors.

Table 1 covers general recreation, involving relatively intensive development of access and facilities. The specialized recreation category, covered in Table 2, includes such unique experiences as big game hunting, wilderness pack trips, white water canoeing, and other activities generally categorized by more extensive, low density use.

Values provided for FY 2007 may be used to convert points to a UDV dollar amount if the point assignment method is used. The table was adjusted from Table K-3-1, Federal Register Vol. 44, No. 242, p.72962, December 4, 1979, using the CPI factor.

As a special note of warning, it is important to recognize that all specialized recreation activities claimed will require a regional model or a site-specific study, the results of which would probably not agree with the specialized values in the attached table. The only exception would be in those specific cases for which the unreliability or infeasibleness of TCM or CVM can be stated convincingly.

Conversion of Points to Dollar Values

| Point Values | General Recreation Values (1) | General Fishing and Hunting Values (1) | Specialized Fishing and Hunting Values (2) | Specialized Recreation Values other than Fishing and Hunting (2) |
|---|---|---|---|---|
| | | | | |
| 0 | $3.32 | $4.78 | $23.26 | $13.50 |
| 10 | 3.95 | 5.40 | 23.88 | 14.33 |
| 20 | 4.36 | 5.81 | 24.30 | 15.37 |
| 30 | 4.98 | 6.44 | 24.92 | 16.61 |
| 40 | 6.23 | 7.06 | 25.54 | 17.65 |
| 50 | 7.06 | 7.68 | 28.03 | 19.93 |
| 60 | 7.68 | 8.51 | 30.53 | 22.01 |
| 70 | 8.10 | 8.93 | 32.39 | 26.58 |
| 80 | 8.93 | 9.55 | 34.89 | 30.94 |
| 90 | 9.55 | 9.76 | 37.38 | 35.30 |
| 100 | 9.97 | 9.97 | 39.45 | 39.45 |

(1) Points from Table 1 in attachment.
(2) Points from Table 2 in attachment.

# Unit Day Method

1. Overview. The unit day value (UDV) method for estimating recreation benefits relies on expert or informed opinion and judgment to approximate the average willingness to pay of users of Federal or Federally assisted recreation resources. If it can be demonstrated that more reliable TCM or CVM estimates are either not feasible or not justified for the particular project under study, the UDV method may be used. By applying a carefully thought-out and adjusted unit day value to estimated use, an approximation is obtained that may be used as an estimate of project recreation benefits.

2. Implementation.

(a) When the UDV method is used for economic evaluations, planners will select a specific value from the range of values provided annually. Application of the selected value to estimated annual use over the project life, in the context of the with- and without-project framework of analysis, provides the estimate of recreation benefits.

(b) Two categories of outdoor recreation days, general and specialized, may be differentiated for evaluation purposes. "General" refers to a recreation day involving primarily those activities that are attractive to the majority of outdoor users and that generally require the development and maintenance of convenient access and adequate facilities. "Specialized" refers to a recreation day involving those activities for which opportunities in general are limited, intensity of use is low, and a high degree of skill, knowledge, and appreciation of the activity by the user may often be involved.

(c) Estimates of total recreation days of use for both categories, where applicable, will be developed. The general category comprises the great majority of all recreation activities associated with water projects, including swimming, picnicking, boating, and most warm water fishing. Activities less often associated with water projects, such as big game hunting and salmon fishing, are included in the specialized category. A separate range of values is provided annually for each category and for fishing and hunting to facilitate adoption of a point system in determining the applicable unit values for each individual project under consideration.

(d) When employing this method to determine recreation benefits, select appropriate values from the range of values provided. If evidence indicates a value outside the published range, use the TCM or CVM method.

(e) In every case, planners are expected to explain the selection of any particular value. To assist in explaining a specific value, a point rating method may be used. The method illustrated here contains five specific criteria and associated measurement standards designed to reflect quality, relative scarcity, ease of access, and esthetic features. Since the list of criteria and weights assigned may vary with the situation, public involvement should occur in the value determination process. Planners are also expected to make appropriate use of studies of preferences, user satisfaction, and willingness to pay for different characteristics. When these studies are used, particular efforts should be made to use estimates derived elsewhere from applications of the TCM and CVM techniques, to support the value selected.

(1) General recreation (Table 1). Activities in this category are those associated with relatively intensive development of access and facilities as compared to the specialized recreation category. Generally, progressively higher physical standards for each unit of carrying capacity is involved in selecting higher unit values, and these may be accompanied by larger related non-project costs.

(2) Specialized recreation (Table 2).

(a) This category includes those activities whose values are generally lowered, if not actually excluded, by the type of development that enhances activities in the general recreation category. Thus, extensive or low-density use and development constitutes the higher end of this range of values (e.g., big game hunting, and wilderness pack trips). Also included in the upper end of the range are relatively unique experiences such as inland and marine fishing for salmon and steelhead, white water boating and canoeing, and long-range boat cruises in areas of outstanding scenic value. Examples of activities to which values at the lower end of the range would be assigned include upland bird hunting and specialized nature photography.

(b) The unit day values to be used for both the general and specialized recreation categories should be further adjusted to reflect additional quality considerations expected to prevail at various project sites in various regions of the Nation, and weighted according to their importance to users. For example, a reservoir that is expected to carry a relatively heavy load of suspended silt or is expected to be used beyond optimum capacity would be less desirable, and therefore of lower unit value, than one that will have clear water and be less crowded.

(c) Hunting and fishing may be treated either as general recreation (Table 1) or specialized recreation (Table 2) depending upon whether it is associated with developed areas or back country areas, respectively. In either case, the recreation experience (criterion "a" in the tables) will be given points according to the additional consideration of the chances of success; the midpoint of the value range is associated with the region's average catch or bag. Other criteria may be modified if appropriately based on available evidence about the preferences and willingness to pay of hunters and fishermen for different recreation quality factors.

(d) The degree to which alternative non-project opportunities are available to users is also considered in the assignment of values. Higher values should be assigned if the population to be served does not have existing water-oriented recreation opportunities. If water-oriented recreation opportunities are relatively abundant, as compared to other outdoor recreation opportunities, lower unit values should be assigned, even if a large number of visitations are expected at the proposed development.

(e) The choice of a unit day value must account for transfers to avoid double counting of benefits. The net value of a transfer of use from one site to another is the difference in unit day values for recreation at the two sites. If recreation activities at the two sites are comparable, travel cost savings are the only NED benefits associated with the transfer. Use at the site must therefore be desegregated according to the proportion of total estimated use that would not have occurred without the project and the proportion of total use that represents transfers from existing sites. The respective types of uses must then be assigned different daily values as indicated.

(f) Unit values selected are to be considered net of all associated costs of both the users and others in using or providing these resources and related services.

3. Estimating Use.

(a) Using the ranges of values requires the study of estimates of annual use foregone and expected at recreation sites. Use can be estimated by a use estimating equation or per capita use curve as discussed above, but when these means are available, the second step of the travel cost method should generally be used instead of UDVs to derive the benefit.

(b) The capacity method is an alternative method of estimating use, but it has severe limitations. The capacity procedure involves the estimation of annual recreation use under without project and with project conditions through the determination of resource or facility capacities (taking into consideration instantaneous rates of use, turnover rates, and weekly and seasonal patterns of use). Seasonal use patterns are dependent on climate and culture and probably account for the greatest variation in use estimates derived through this method. In general, annual use of outdoor recreation areas, particularly in rural locations and in areas with pronounced seasonal variation, is usually about 50 times the design load, which is the number of visitors to a recreation area or site on an average summer Sunday. In very inaccessible areas and in those known for more restricted seasonal use, the multiplier would be less; in urban settings or in areas with less pronounced seasonal use patterns, the multiplier would be greater. In any case, the actual estimation of use involves an analytical procedure using instantaneous capacities, daily turnover rates, and weekly and seasonal use patterns as specific data inputs.

(c). Because the capacity method does not involve the estimation of site-specific demand, its use is valid only when it has been otherwise determined that sufficient demand exists in the market area of project alternatives to accommodate the calculated capacity. Its greatest potential is therefore in urban settings where sufficient demand obviously exists. Additionally, its use should be limited to small projects with (1) a facility orientation (as opposed to a resource attraction), and (2) restricted market areas that would tend to make the use of alternative use estimating procedures less useful or efficient.

4. Calculating Values. The estimates of annual use are combined with the selected unit day values to get an estimate of annual recreation benefits. The value assigned to each activity or category of activities is multiplied by the number of recreation days estimated for that activity. The products are then summed to obtain the estimate of the total value of an alternative. Recreation days to be gained and lost or foregone as a result of a particular alternative are listed and valuated separately, not merely shown as net recreation days. Transfers of recreational users to or from existing sites in the region must be calculated, and the net regional gain or loss used in the final benefit estimated. Adequate information must appear in the discussion of the use estimation and valuation procedure or elsewhere in the report concerning the alternative being considered, so that the reader can derive a similar value for each activity.

## Unit Day Method

Table 1: Guidelines for Assigning Points for General Recreation

| Criteria | Judgment factors | | | | |
|---|---|---|---|---|---|
| Recreation experience[1]<br><br>Total Points: 30<br><br>Point Value: | Two general activities[2]<br><br>0-4 | Several general activities<br><br>5-10 | Several general activities: one high quality value activity[3]<br><br>11-16 | Several general activities; more than one high quality high activity<br><br>17-13 | Numerous high quality value activities; some general activities<br><br>24-30 |
| Availability of opportunity[4]<br><br>Total Points: 18<br><br>Point Value: | Several within 1 hr. travel time; a few within 30 min. travel time<br><br>0-3 | Several within 1 hr. travel time; none within 30 min. travel time<br><br>4-6 | One or two within 1 hr. travel time; none within 45 min. travel time<br><br>7-10 | None within 1 hr. travel time<br><br>11-14 | None within 2 hr. travel time<br><br>15-18 |
| Carrying capacity[5]<br><br>Total Points: 14<br><br>Point Value: | Minimum facility for developmen t for public health and safety<br><br>0-2 | Basic facility to conduct activity(ies)<br><br>3-5 | Adequate facilities to conduct without deterioration of the resource or activity experience<br><br>6-8 | Optimum facilities to conduct activity at site potential<br><br>9-11 | Ultimate facilities to achieve intent of selected alternative<br><br>12-14 |

Table 1 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| Accessibility<br><br>Total Points: 18<br><br>Point Value: | Limited access by any means to site or within site<br><br>0-3 | Fair access, poor quality roads to site; limited access within site<br><br>4-6 | Fair access, fair road to site; fair access, good roads within site<br><br>7-10 | Good access, good roads to site; fair access, good roads within site<br><br>11-14 | Good access, high standard road to site; good access within site<br><br>15-18 |
| Environmental<br><br>Total Points: 20<br><br>Point Value: | Low esthetic factors[6] that significantly lower quality[7]<br><br>0-2 | Average esthetic quality; factors exist that lower quality to minor degree<br><br>3-6 | Above average esthetic quality; any limiting factors can be reasonably rectified<br><br>7-10 | High esthetic quality; no factors exist that lower quality<br><br>11-15 | Outstanding esthetic quality; no factors exist that lower quality<br><br>16-20 |

[1]Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.
[2]General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.
[3]High quality value activities include those that are not common to the region and/or Nation, and that are usually of high quality.
[4]Likelihood of success at fishing and hunting.
[5]Value should be adjusted for overuse.
[6]Major esthetic qualities to be considered include geology and topography, water, and vegetation.
[7]Factors to be considered to lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

## Unit Day Method

Table 2: Guidelines for Assigning Points for Special Recreation

| Criteria | Judgment factors | | | | |
|---|---|---|---|---|---|
| Recreation experience[1]<br><br>Total Points: 30<br><br>Point Value: | Heavy use or frequent crowding or other interference with use<br><br>0-4 | Moderate use, other users evident and likely to interfere with use<br><br>5-10 | Moderate use, some evidence of other users and occasional interference with use due to crowding<br><br>11-16 | Usually little evidence of other users, rarely if ever crowded<br><br>17-13 | Very low evidence of other users, never crowded<br><br>24-30 |
| Availability of opportunity[2]<br><br>Total Points: 18<br><br>Point Value: | Several within 1 hr. travel time; a few within 30 min. travel time<br><br>0-3 | Several within 1 hr. travel time; none within 30 min. travel time<br><br>4-6 | One or two within 1 hr. travel time; none within 45 min. travel time<br><br>7-10 | None within 1 hr. travel time<br><br>11-14 | None within 2 hr. travel time<br><br>15-18 |
| Carrying capacity[3]<br><br>Total Points: 14<br><br>Point Value: | Minimum facility for development for public health and safety<br><br>0-2 | Basic facility to conduct activity(ies)<br><br>3-5 | Adequate facilities to conduct without deterioration of the resource or activity experience<br><br>6-8 | Optimum facilities to conduct activity at site potential<br><br>9-11 | Ultimate facilities to achieve intent of selected alternative<br><br>12-14 |

Table 2 (Continued)

| | | | | | |
|---|---|---|---|---|---|
| Accessibility<br><br>Total Points: 18<br><br>Point Value: | Limited access by any means to site or within site<br><br>0-3 | Fair access, poor quality roads to site; limited access within site<br><br>4-6 | Fair access, fair road to site; fair access, good roads within site<br><br>7-10 | Good access, good roads to site; fair access, good roads within site<br><br>11-14 | Good access, high standard road to site; good access within site<br><br>15-18 |
| Environmental<br><br>Total Points: 20<br><br>Point Value: | Low esthetic factors[4] that significantly lower quality[5]<br><br>0-2 | Average esthetic quality; factors exist that lower quality to minor degree<br><br>3-6 | Above average esthetic quality; any limiting factors can be reasonably rectified<br><br>7-10 | High esthetic quality; no factors exist that lower quality<br><br>11-15 | Outstanding esthetic quality; no factors exist that lower quality<br><br>16-20 |

[1]Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.
[2]Likelihood of success at fishing and hunting.
[3]Value should be adjusted for overuse.
[4]Major esthetic qualities to be considered include geology and topography, water, and vegetation.
[5]Factors to be considered to lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

Appendix H

# Benefit Calculation Assumptions

**APPENDIX H**

# Benefit Calculation Assumptions

**TABLE H-1**
Recreational Damage Calculations

| Type of Recreation Facility | Unit Day Value ($F_x$) $/person-day | Average Daily Visitors (Vx) | Length of Impact (Lx) |
|---|---|---|---|
| Forest Preserve/ Park | $5.28 | 589 | Calculated based on H&H model results. Assume impact occurs when water elevation is 0.1 foot above ground surface elevation. |

*Note:* Assumptions used to calculate estimates for Fx and Vx are provided in Appendix G. Easily obtainable site-specific information may be substituted.

**TABLE H-2**
Wetland and Riparian Area Benefit Calculation

| Watershed | Benefit/Acre[a] |
|---|---|
| Des Plaines (Cook County) | $70,000 |
| Lake Michigan, Chicago River, Calumet River | $60,000 |
| Cal Sag Channel | $60,000 |

[a] Dollar values obtained from phone survey of wetland bankers.