

Village of Northbrook

Master Stormwater Management Plan

August 2011



Hampton, Lenzini and Renwick, Inc.
Civil Engineers • Structural Engineers • Land Surveyors



380 Shepard Drive
Elgin, Illinois 60123

Memorandum

From: Stormwater Management Commission Members

Date: August, 2011

Subject: New Master Stormwater Management Plan

A strong commitment needed to be undertaken by the Village's Board of Trustees, Stormwater Management Commission and Village staff to address the flooding problems that the Village is experiencing. Most recently on July 22-23 of this year the Village received 5.26-inches of rain, which by volume is the fourth largest since rain data has been collected. As part of this commitment, the Commission along with Village staff and consultant HLR, Inc. has developed a New Master Stormwater Management Plan for the Village. This New Plan will replace the previous Master Plan and the two subsequent editions. The purpose of the New Plan is to identify projects, programs and initiatives that are recommended to be undertaken to reduce flooding impacts throughout the Village. It will be the duty of the Village Board, Commission and Village staff to select and implement the recommended improvement projects contained in the New Plan in a timely manner and fair order to meet the expectations of the residential, business and industrial sectors in our community that they have a healthful, beneficial and prosperous existence. It also needs to be understood that the proposed projects will reduce, but not entirely eliminate the documented flooding conditions throughout the Village.

In reviewing the New Plan, the reader should be aware of the following:

- The **project rankings** were determined by the overall benefit-cost (B/C) ratio, number of structures benefitted and number of properties benefitted. The reduction of damages to structures was emphasized, first by considering the number of structures benefitted and then by the benefits in the B/C ratio, which are heavily weighted towards protecting structures from flood damages. If a tie resulted, the number of structures benefitted was the deciding factor.
- The Plan includes an **Optimum Level of Protection** for each improvement project, which is defined as the most cost effective project design that provides the most benefits for the given reoccurring storm event (10-year, 25-year, 50-year or 100-year).
- In order to ensure the intended project benefits are not diminished after construction, or flooding problems do not increase elsewhere in the Village, **limitations for increases in impervious coverage** and the **preservation of existing depressional storage and overland flood paths** should be strongly considered on a Village wide basis.
- A very important component of the New Plan is **education** that first starts at home in regards to proper lawn grading, downspout discharges, storm sump pump maintenance and not obstructing drainage paths and storm sewer structures. The Plan also contains many **property owner programs** that can be undertaken to reduce flooding impacts such as overhead sanitary sewer service conversions, lawn grading and low flow private storm sewer systems and auxiliary storm sump pump installations. The Village will continue to provide technical advice and may also continue to offer partial financial reimbursement in some instances.
- A **better understanding is needed** by everyone as to what constitutes inconvenience and actual flooding that threatens the health, safety and welfare of the public, which will then allow better comprehension of the goals and objectives of stormwater management in the Village. Street flooding is acceptable in extreme conditions so long as emergency vehicles can still gain access.
- There are many **external factors** that could possibly delay and/or change the order of implementation of the proposed improvement projects. These external factors include easements, property acquisitions and approvals from other agencies in the form of License or Intergovernmental Agreements. Several projects that are affected include the Shermer Road overflow sewer, Wescott Park storage, Keystone Road/Chartres Drive, Sunnyacres, Williamsburg Subdivision and Church Street.

New Master Stormwater Management Plan

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- The Commission recommends that the proposed **Wescott Park underground storage project** be further evaluated with at least one additional study due to its size, cost, complexity and potential additional benefits. The intent of the further evaluation is to identify additional benefits, refine costs, and explore additional funding opportunities and to determine if there are any additional ways to further value engineer the project. There was an identified need to include a project that addresses the flooding problems in the area roughly bordered by Illinois Road, Pfingsten Road, Farnsworth Lane and Shermer Road. Many alternative projects along with variations of the recommended project were evaluated. The mitigation (storage) concept was determined to be the most cost effective and resulting in the greatest number of benefits.

The stormwater management infrastructure is as important to the Village as good condition roadways, a safe water distribution system and an effective sanitary sewer system. Unfortunately its importance sometimes is only realized during major rainfall events. A firm commitment to appropriately invest in the stormwater management infrastructure is key to addressing the flooding problems in the community. The Stormwater Management Commission stands ready to assist the Village Board and staff to implement the recommended improvement projects in this new Plan.

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Mission Statement

The purpose of the New Master Stormwater Management Plan (MSMP) is to identify projects, programs and initiatives that will reduce flooding conditions within the Village by the most cost effective means and at the appropriate level of protection.

Executive Summary

The MSMP revises and updates the previous three versions of the MSMP, the first of which was published in 1993. The latest previous edition, dated 2002, identified many projects to help relieve the flooding that had been experienced at that time. In the nine years since the previous edition was adopted, the Village of Northbrook has experienced significant flooding. Much of the more recent flooding has occurred in areas that were not considered in the previous MSMP and updates. This could be attributable to a number of factors, including additional development or redevelopment in the past decade; the magnitude and number of occurrences of major rainfall events; and Village citizens have more proactively been asking for assistance with flooding problems than in the past. In order to recommend and prioritize improvements that will help alleviate current flooding conditions, it is necessary to understand the causes of the flooding.

Storm Events

Responding to citizens' service requests during and immediately after larger rainfall events represents a significant expenditure to the Village in terms of both money and resources. Some of the more notable recent rainfall events are listed in the following table:

<i>Date(s)</i>	<i>Rainfall (depth)</i>
7/22/82	6.5"
8/14/87	7.75"
6/24/94	5.2"
10/12/01 - 10/13/01	4.1"
8/21/02 - 8/22/02	4.3 "
9/13/08 - 9/14/08	6.4"
5/13/10	2.2"
7/22/11 – 7/23/11	5.25"

Service calls to the Public Works department totaled over 500 during and immediately after the September 2008 event (6.4"); the August 2002 event (4.3") generated over 110 calls. Service requests have increased for smaller rainfall events, as indicated by the over 230 calls for the May 2010 event (2.2").

Nine projects identified in previous MSMP and subsequently implemented are shown in Table 1 of the Appendix. The total construction cost for these nine projects were \$5,217,500. Had these improvements not been in place, there would have undoubtedly been more flooding and, therefore, greater response required by the Village during these most recent events. This MSMP represents the evolution of the previous MSMPs and the

Village's commitment to its citizens to reduce flooding in a methodic and responsible manner.

Factors Contributing to Flooding

Total depth of rainfall is not the only factor that determines the rate of runoff generated by a storm event. Storm intensity (inches per hour), duration, and degree of soil saturation are all natural aspects that impact the rate of runoff. Increased flooding and the resultant increase in service requests and flood damages are also influenced by physical characteristics of the watershed, such as increased impervious surfaces, blockage or absence of overland flow paths or outlets, redevelopment, and outdated storm drainage systems.

- **Increased Impervious Surface**

An increase in impervious surface reduces the potential for infiltration of rainfall and increases stormwater runoff from a site. Larger paved areas, increased roof areas, and patio additions are examples for which individual impacts may seem insignificant, but collectively contribute to flooding throughout the Village.

- **Non-existent or Blockage of Overland Flow Routes or Outlets**

Storm sewers are typically designed to carry the runoff from a 10-year storm event. For runoff that exceeds the conveyance capacity of the storm sewer, excess must either pond, travel overland to the outlet, or both. The overland flow route may be down roadways, through back yards or side yards between houses, or through swales, ditches and creeks. If an overland flow path does not exist or has been blocked, stormwater levels will rise and likely cause flooding.

- **Redevelopment**

Residential redevelopment, or "teardowns," which results in existing residential structures being removed and replaced by larger homes, contributes more to flooding conditions than the obvious increase in impervious (roof) area. These developments commonly result in compaction of soils due to construction activities, the loss of depressional storage areas, and possibly the obstruction of overland flow routes, all of which increase stormwater runoff from the site. As in the case with increased impervious surfaces, individual impacts may seem insignificant, but their cumulative consequences can be widespread.

- **Outdated Drainage Systems**

Many of the subdivisions in Northbrook were built on or before the 1950s, and some of the drainage systems serving these developments were designed to accommodate runoff only from their respective subdivision. As development, and therefore runoff, within individual watersheds has increased, many of these drainage systems have been subjected to runoff they were not designed to handle. In addition, older local drainage systems were designed to carry low flow stormwater runoff based upon less stringent design standards, using rainfall data that yields lower runoff rates than today's accepted values. In many instances, the existing systems have been modified through individual, isolated efforts accompanying redevelopment, resulting in "improvements" that may benefit one property but adversely impact the rest of the system. The result is that many of

the older drainage systems may only be capable of carrying runoff from 3 to 5-year storm events, as compared to the current 10-year design criteria.

Increases in impervious surfaces; loss of depressional storage; impairment of overland flow paths and outlets; and inadequate storm sewers, as well as flood stage levels in receiving rivers and floodplains, all contribute to flooding within the Village of Northbrook. Implementation of the improvements and programs identified and prioritized in this MSMP will help decrease flooding and prevent such occurrences from increasing in the future.

Project Categories

The recommendations presented in the MSMP are divided into three categories-Watershed Projects, Neighborhood Projects and Property Owner Programs-each of which identifies the problems and provides individual plans for reduction of flooding.

Watershed Projects target large drainage problems, typically involving large areas of flooding. Lack of sufficient conveyance capacity and/or overland flood routes are often the major factors contributing to flooding. These projects will generally provide benefits to the greatest number of residents and are expensive to implement.

Neighborhood Projects target smaller drainage problems. These typically involve areas of one or two blocks or less which experience repeated flooding. As with watershed projects, lack of conveyance capacity and/or overland flood routes contribute to the problem. These projects will benefit a smaller number of residents and are usually significantly less expensive to implement than watershed projects.

Property Owner Programs are used to encourage property owners to implement their own projects to reduce flooding to their own properties, often with a cost sharing or other benefit as incentive. These programs are independent of the projects described above and only directly benefit the property upon which they are implemented.

In identifying and ranking the proposed projects presented in this MSMP, the following hierarchy of goals, from high to low, was used:

- Elimination of structure damage
- Reduction in street and front yard flooding
- Management of back yard flooding
- Management of development/redevelopment so that it does not aggravate existing flooding conditions, with or without proposed improvements in place. A list of private properties to be acquired for strategic drainage easements and/or local stormwater detention was compiled.

Proposed Projects

This MSMP addresses and prioritizes 22 projects, 14 of which are new and 8 of which were identified in previous editions. The projects were chosen on the basis of flooding records and consultation with Village Staff. Likely causes of flooding were evaluated. The recommended projects are described in the individual project exhibit sections in the MSMP. Projects were compared against each other and prioritized accordingly to their respective benefit/cost ratio, number of structures benefited and number of residents benefitted. The results of the ranking process are included in Project Ranking – Table 1. The following projects were the 7 highest ranked projects:

<i>Project Rank</i>	<i>Project Number</i>	<i>Project</i>	<i>Properties Benefitted</i>	<i>Structures Benefitted</i>	<i>Total Estimated Cost</i>	<i>B/C Ratio</i>
1	3	Techny Drain Phase IV	82	10	\$798,000	10.57
2	2	Shermer Road Overflow Sewer	22	17	\$1,327,000	1.92
3	11	Northbrook East	29	11	\$718,000	2.18
4	1	Wescott Park Storage	91	12	\$8,200,000	0.33
5	10	Keystone Road /Chartres Drive	17	5	\$635,000	3.05
6	16	Sunny Acres	14	3	\$614,000	4.16
7	14	Shermer Road Outlet	42	0	\$13,000	0.85

Possible Funding Sources

Possible funding sources, including grants, are included in the Appendix (Additional Initiatives-Funding).

Future of the MSMP

This MSMP is intended to be used as a guide to the Village for future improvements and associated budgeting. The Village has experienced past success in reducing flooding through previously implemented improvements; this MSMP is a guide to stimulate the continued implementation of such projects. This MSMP is intended to be a living document that should be revisited periodically to address flooding throughout the Village. The document should also be updated to acknowledge changes to federal, state and local laws, rules and regulations.

Major storm events should continue to be documented by Village Staff and residents. Photos and videos of actual flooding can aid in investigation into the causes. Documentation may indicate that simple maintenance could alleviate a flooding problem, or that infrastructure improvements are needed.

Changes to laws, rules, regulations and policies may require that the MSMP be revisited. The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) is Cook County's lead stormwater agency. It is anticipated that there will be no significant flood relief benefits to the Village from the MWRDGC projects that are part of their current Detailed Watershed Plan. The new Cook County Watershed Management Ordinance (WMO) has not yet been completed; comments on the Public Review Draft are being addressed in great detail. The new WMO will include regulations regarding isolated wetlands, depressional storage and credits for storage reduction based on implementation of Best Management Practices. When the WMO is adopted, this MSMP and Village ordinance should be re-examined to ensure compliance on a countywide basis.