

The Village of Downers Grove
Watershed Infrastructure Improvement Plan



August 2007

Executive Summary

In February 2007, the Village Council authorized contracts with four consultants to begin a thorough analysis of the existing drainage conditions within each of the three primary watersheds. The product of these contracts is this combined report - the Watershed Improvement Plan. The overall goal of the plan is to improve the Village's stormwater system in terms of conveyance, storage and quality. In order to create similar sized study areas, the Village split the largest watershed (St. Joseph Creek) into two parts and assigned the resultant four areas as follows:

- V3 Companies of IL → Lacey Creek
- Christopher B. Burke Engineering, Ltd. → North St. Joseph Creek
- Engineering Resource Associates → South St. Joseph Creek
- Clark-Dietz → Prentiss Creek

Each consultant thoroughly studied the problem areas using historical data, recent flooding information (particularly the October 2, 2006 event), supplemental survey data, field visits, and past/present resident complaints. The existing conditions stage of the study revealed the following drainage issues within the Village:

- Inadequate stormwater storage
 - Lack of detention basins in some areas → basins form naturally
 - Undersized detention basins
- Inadequate stormwater conveyance
 - Areas with no storm sewers, undersized storm sewers
 - Underperforming streams
 - No formal overland flow routes
 - Deteriorated overland flow routes
- Insufficient maintenance of storage facilities and conveyance system

The consultants recommended specific solutions to each problem area with the following prioritization guidelines:

1. **HIGH (critical problems):** problems that result in an immediate danger to public health, safety, life, or complete loss of property value; structural damage (including any flooding of the first floor of a primary structure; basement flooding of more than 6-inches that resulted from overland flow through a window or door; or garage flooding of more than 7-inches.) Problems that cause disruption of major traffic routes were also classified as critical.
2. **MEDIUM (chronic problems):** problems that are less severe than critical and do not result in costly damage or repairs, including shallow street flooding, disruption of minor traffic routes, basement flooding of less than 6-inches resulting from overland flow, garage flooding of less than 7-inches, or yard flooding of more than 12-inches (which is not also associated with structural flooding).

3. **LOW (nuisance problems):** minor, isolated problems that are less severe than chronic and do not generally result in damage or require repair, or are not caused by surface flooding/drainage problems. Nuisance problems include yard flooding of less than 12-inches; basement flooding resulting from foundation cracks, sump pump failure, seepage or other non-overland causes; or other minor, isolated problems.

The recommended solutions include:

- Stormwater conveyance
 - New storm sewers
 - Upgraded or replaced storm sewers
 - New and improved overland flow routes
 - Stream improvements
- Stormwater conveyance
 - Existing detention basin improvements
 - New detention basin construction
 - Enhanced natural storage areas
 - Sufficient maintenance of storage facilities and conveyance pipes and structures

Although these recommendations are directed towards specific problem areas, detailed design plans are not included. Further work including detailed engineering plans will be required in order to transform the recommended solutions into capital construction projects. Also, the improvements will not solve every drainage issue within their vicinity. Instead, the recommended projects will address major flooding and create the capacity for future private improvements directed toward solving nuisance problems.

Many of the proposed stormwater projects will require resurfacing or complete reconstruction of entire streets. Generally, cost estimates assume that streets with rural cross-sections (ditches and no curb / gutter) will be constructed with a similar rural cross-section. Likewise, streets with urban cross-sections (curb/gutter and storm sewer) will be reconstructed with a similar urban cross-section. In some areas, changing from a rural to an urban cross-section is recommended to better control overland drainage.

Future Steps

Implementation of these solutions will require substantial resources of both time and money. The solutions will range from \$140M for major stormwater facilities (pipes and storage basins) to \$340M to include extension of smaller diameter pipes (those brought to the edge of each lot) and related road improvements.

These costs can be sub-totaled by classification as follows:

High	\$158M
Medium	\$135M
Low	\$47M
Total	\$340M

Given the magnitude of the projects recommended, the Village will need to balance the order in which projects are included in the Community Investment Program with annual funding levels. Aside from cost, factors to consider in determining this balance should include:

- Area affected by the proposed project
- Necessary order of construction (i.e. some downstream improvements may be required before upstream projects can be included)
- Strategic grouping of other needed projects (e.g. water main replacements and road reconstruction)
- Partnerships (public and private)

In addition to improvement of the Village's major stormwater system, implementation of the Watershed Improvement Plan will broaden access for landowner connections to address private nuisance surface water and groundwater discharge problems. A natural outgrowth of the Watershed Improvement Plan should include a reexamination of the current cost-share program and other policies to further enhance stormwater and flood management throughout the Village.

VILLAGE OF DOWNERS GROVE
WATERSHED INFRASTRUCTURE IMPROVEMENT PLAN

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Chapter 1

Overview

VILLAGE OF DOWNERS GROVE
WATERSHED INFRASTRUCTURE IMPROVEMENT PLAN

Chapter 1 - Overview

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1.0 Introduction

The Village of Downers Grove has had a long history of flooding and drainage issues. Given that there are three major creeks (Lacey, St. Joseph, and Prentiss) and three minor creeks (Oak, Ginger and Wards) draining the Village, stormwater management was bound to be an extremely important factor facing development in the community. From the time of our settlement until the 1970's the solution to this issue was simple: move the water away as quickly as possible. During the initial period of large subdivision development in the 1890's and early 1900's, drainage systems were seized for small storms and nuisance drainage. Development practice and regulations were not in place to address flood protection for infrequent storm events. The Village's first stormwater master plan (c. 1960) proposed that a series of large pipes be constructed, some of which were installed, most notably the 11-foot diameter pipe which carries St. Joseph Creek under downtown. Storage of stormwater was rarely considered during this era.

Realizing the Village's topography and soil types required greater attention to detail than was typically being given to post-WWII subdivisions, one of the first flood control ordinances in the State was adopted in 1965. It sought to address the problem caused to downstream residents by the previous development practices. It introduced the concept of holding stormwater for a time before sending it downstream. This ordinance was in place during the development of large areas of the Village such as Orchardbrook, Innisbrook, Valley View Estates and many of the Dunham Place subdivisions. These subdivisions generally were built with stormwater detention facilities, curbs, gutters and storm sewers. In 1971, the second master was developed which called for more sewer pipes, but also suggested stream improvements. In 1976 the stormwater detention requirements were strengthened with the adoption of a comprehensive stormwater runoff ordinance.

Even tighter control was included in the 1991 DuPage Countywide Stormwater and Flood Plain Ordinance (the County Ordinance). The County suffered two severe floods (1986 and 1987) which provided the impetus to look at stormwater as a County problem, not just a municipal issue. The Village's adoption of this master ordinance meant that more projects, including redevelopment projects, would now require permits. It also codified the release rate criteria at one cubic-foot per second (1 cfs) per acre of disturbed area and included general language which stated that (re)development activities shall not have an adverse impact to downstream properties.

In 2005, the Village Council authorized a new stormwater master plan update which would address new challenges facing the Village since the 1971 Master Plan and since the adoption of the County Ordinance in 1991-92. This latest version addressed the maintenance of the storm sewer system, the challenges posed by residential redevelopment and the new concept of water quality control mandated by the Federal government in the National Pollution Discharge Elimination System (NPDES), Phase Two program. The plan suggested a more aggressive maintenance regime and studying further detention options with water quality control in mind.

On the evening October 2, 2006, a heavy storm dumped a total of 3.77-inches of rain in one hour over the majority of the Village. Overall, the Village received 47-inches of rain or 42% more than the 33-inch average for the year. Residents suffered everything from structure damage during flash floods to completely unusable yards throughout the year.

The Village's experience during 2006 magnified some of the maintenance problems and confirmed many deficiencies in our conveyance and storage systems that were identified in the 2005 master plan update.

2.0 The Plan

In February 2007, the Village Council authorized contracts with four consultants to begin a more thorough analysis of the existing drainage conditions within the three primary watersheds within the Village. The product of these contracts is this combined report, the Watershed Improvement Plan.

The overall goal of the plan is to improve the Village's stormwater system in terms of conveyance, storage and quality. In order to create similar sized study areas, the Village split the largest watershed (St. Joseph Creek) into two parts and assigned the resultant four areas as follows (see map, page 9):

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- Clark-Dietz ? Prentiss Creek

Each consultant thoroughly studied the problem areas using historical data, recent flooding information (particularly the October 2, 2006 event), supplemental survey data, field visits, and past/present resident complaints. The existing conditions stage of the study revealed the following drainage issues within the Village:

- Inadequate stormwater storage
 - Lack of detention basins in some areas ? detention basins form themselves naturally
 - Undersized detention basins
- Inadequate stormwater conveyance
 - Areas with no storm sewers, undersized storm sewers
 - Underperforming streams
 - No formal overland flow routes
 - Deteriorated overland flow routes
- Insufficient maintenance of storage facilities and conveyance system

2.1 Problem Classification

The consultants then recommended specific solutions to each problem area with the following prioritization guidelines:

1. HIGH (critical problems): problems that result in an immediate danger to public health, safety, life, or complete loss of property value; structural damage (including any flooding of the first floor of a primary structure; basement flooding

of more than 6-inches that resulted from overland flow through a window or door; or garage flooding of more than 7-inches.) Problems that cause disruption of major traffic routes were also classified as critical.

2. **MEDIUM (chronic problems):** problems that are less severe than critical and do not result in costly damage or repairs, including shallow street flooding, disruption of minor traffic routes, basement flooding of less than 6-inches resulting from overland flow, garage flooding of less than 7-inches, or yard flooding of more than 12-inches (which is not also associated with structural flooding).
3. **LOW (nuisance problems):** minor, isolated problems that are less severe than chronic and do not generally result in damage or require repair, or are not caused by surface flooding/drainage problems. Nuisance problems include yard flooding of less than 12-inches; basement flooding resulting from foundation cracks, sump pump failure, seepage or other non-overland causes; or other minor, isolated problems.

2.2 Solutions

The recommended solutions include:

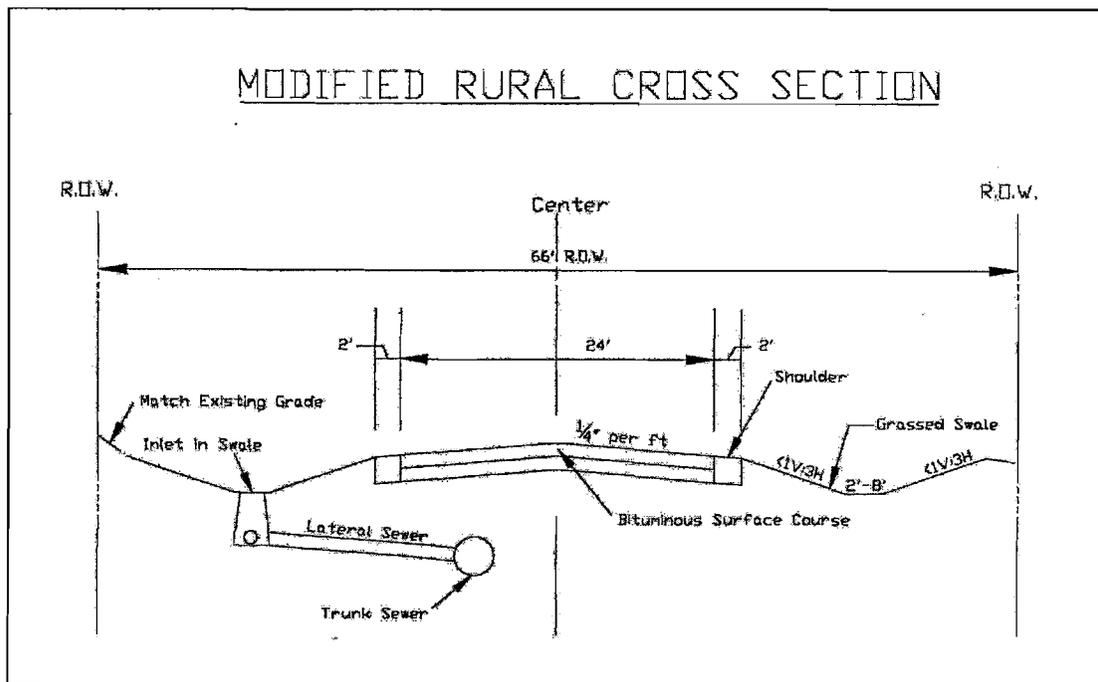
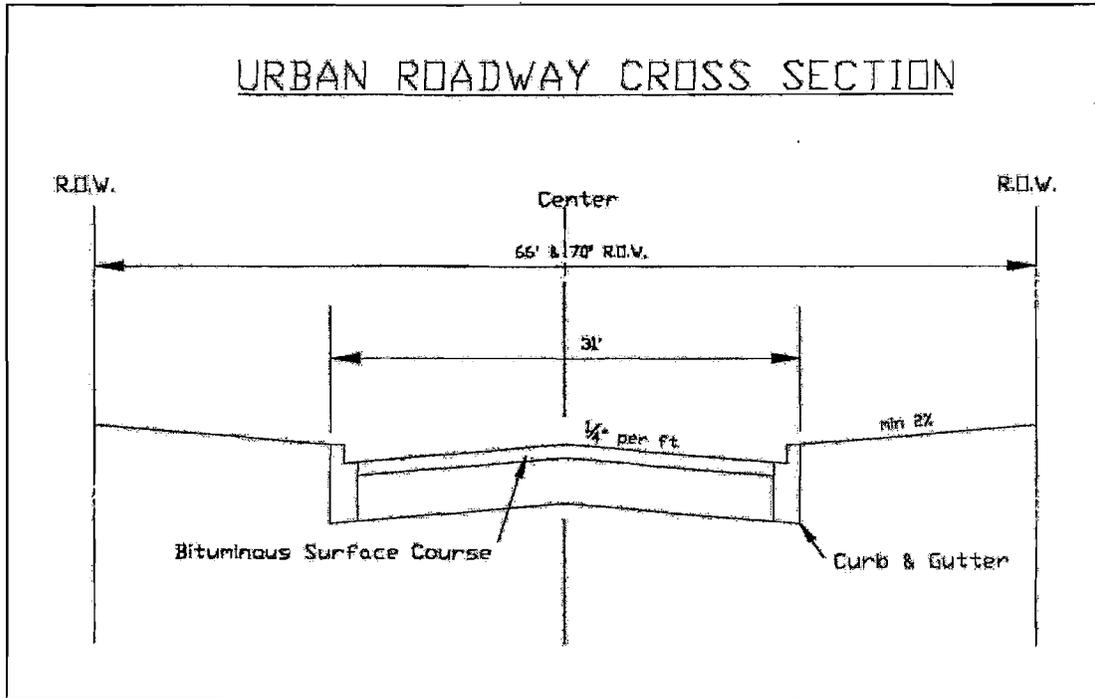
- **Stormwater storage**
 - Existing detention basin improvements
 - New detention basin construction
 - Enhanced natural storage areas
- **Stormwater conveyance**
 - New storm sewers
 - Upgraded or replaced storm sewers
 - New and improved overland flow routes
 - Stream improvements
- **Sufficient maintenance of storage facilities and conveyance pipes and structures**

Although these recommendations are directed towards specific problem areas, detailed design plans are not included. Further work including detailed engineering plans will be required in order to transform the recommended solutions into capital construction projects. Also, the suggested improvements will not solve every drainage issue within their vicinity. Instead, the recommended public improvements will address major flooding and create the capacity for future private improvements directed toward solving nuisance-type complaints.

2.3 Roadway Cross Sections

Many of the proposed stormwater projects will require resurfacing or complete reconstruction of entire streets. Road resurfacing is incorporated into cost estimates for storm sewer placement of 36" or less. Road reconstruction is incorporated into cost estimates for storm sewer placement greater than 36" inches. Generally, cost estimates assume that streets with rural cross-sections (ditches and no curb / gutter) will be reconstructed with a similar rural cross-section. Likewise, streets with urban cross-

sections (curb/gutter and storm sewer) will be reconstructed with a similar urban cross-section. In some areas, changing from a rural to an urban cross-section is recommended to better control overland drainage. It must be noted that curb & gutter alone do not "solve" drainage problems, they may help mitigate small problems, but a blanket installation of curb & gutter will not, by itself fix all the problems. Typical examples of both urban and rural cross sections are shown below.



3.0 Future Steps

Implementation of these solutions will require substantial resources of both time and money. The solutions will range from \$140M for major stormwater facilities (pipes and storage basins) to \$340M to include extension of smaller diameter pipes (those brought to the edge of each lot) and related road improvements.

These costs can be sub-totaled by classification type as follows:

High	\$158M
Medium	\$135M
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Total	\$340M

Given the magnitude of the projects recommended, the Village will need to balance the order in which problems are included in the Community Investment Program with annual funding levels. Aside from cost, factors to consider in determining this balance should include:

- Area affected by the proposed project
- Necessary order of construction (i.e. some downstream improvements may be required before upstream projects can be included)
- Strategic grouping of other needed projects (e.g. water main replacements)
- Partnerships (public and private)

In addition to improvement of the Village's major stormwater system, implementation of the Watershed Improvement Plan will broaden access for landowner connections to address private nuisance surface water and groundwater discharge problems. A natural outgrowth of the Watershed Improvement Plan should include a reexamination of the current cost-share program and other policies to further enhance stormwater and flood management throughout the Village.

4.0 Glossary

Prior to listing the various terms, acronyms, and abbreviations used throughout this report, it may be helpful to define one of the most often misunderstood terms used in drainage studies – the 100-year storm (alternatively, the 100-year flood, 10-year event, 25-year protection, etc.) These various terms are an attempt to describe a concept rather than a specific item. A 100-year storm is that storm which has a 1% chance of occurrence in any given year. Similarly, a ten-year flood has a 10% chance of occurring in a given year and, consequently, a 90% chance of not occurring.

It seems that the reason these terms are confusing or sometimes met with ridicule is viewing them in the absolute: a 100-year event will not occur only once within a century. Nor does it convey that lesser chance events (a 250-year or 500-year) can also occur in the same year. Consider flipping a coin. There is a 50/50 chance of a result of tails. Two flips in a row do not guarantee one result of heads and one of tails. Similarly, two

or three 10-year events can happen in the same month or even the same week. The terms were an attempt to simplify a statistical concept.

Terms, Acronyms, and Abbreviations:

- a. BFE – Base Flood Elevation
- b. BMP – Best Management Practice
- c. BNSF Railroad – Burlington Northern Sante Fe Railroad
- d. CD – Compact Disc
- e. CLOMR – Conditional Letter of Map Revision
- f. CN – Curve Number
- g. Critical Problems – drainage problems or problem areas resulting in structural damage were classified as critical problems. Includes flooding of the first floor of a primary structure, basement flooding of more than 6-inches resulting from overland flow through a window or door, or garage flooding of more than 7-inches. Also includes problems causing disruption of major traffic routes.
- h. Depressional Area – depressional surface water storage areas as regulated by the Village of Downers Grove Ordinance No. 4761.
- i. Downers Grove Ordinance – Village of Downers Grove Stormwater and Flood Plain Ordinance
- j. DuDOT – DuPage County Division of Transportation
- k. EEOPC – Engineer’s Estimated Opinion of Probable Cost
- l. FEMA – Federal Emergency Management Agency
- m. FEQ – Full Equation Software
- n. FIS – Flood Insurance Study (distributed by FEMA)
- o. General Improvement – upgrade of existing stormwater and roadway infrastructure to improve roadway drainage and provide storm sewer access within 200 feet of any lot.
- p. GIS – Graphical Information System
- q. HEC-RAS – Hydrologic Engineering Center River Analysis System
- r. HGL – Hydraulic Grade Line
- s. HWL – High Water Level
- t. IDNR – Illinois Department of Natural Resources
- u. IDOT – Illinois Department of Transportation
- v. IEPA – Illinois Environmental Protection Agency
- w. ISWS – Illinois State Water Survey
- x. LOMR – Letter of Map Revision
- y. Problem Area – drainage problem areas identified for further analysis, typically areas of reported chronic or critical drainage problems noted by the Village or reported by residents.
- z. Project Team – Village of Downers Grove Stormwater Infrastructure Improvement Plan Project Team comprised of four engineering consulting firms and Village Staff.
- aa. RCP – reinforced concrete pipe
- bb. SCS – Soil Conservation Service
- cc. Stormwater Improvement Plan – the Village of Downers Grove 2007 Stormwater Infrastructure Improvement Plan.
- dd. Stormwater Project – one or more proposed stormwater infrastructure enhancements, such as storm sewer replacement or detention storage, to improve conditions in a problem area or subwatershed.

- ee. Subbasin – smaller areas within a subwatershed. Subbasins are typically delineated based on area tributary to a depressional area.
- ff. Subwatershed – smaller divisions of a watershed, can be further divided into subbasins.
- gg. Tc – Time of Concentration
- hh. TR-20 87 – Technical Release 20 software, version 1987.
- ii. TR-20 87 – Technical Release 20 software, version 1992.
- jj. WIN TR-20 – Windows version of Technical Release 20 software.
- kk. Watershed – all the land area which drains into a single stream, creek or river.
- ll. WSE – Water Surface Elevation
- mm. XPSWMM – XP Software Stormwater & Wastewater Management Model

Additional general stormwater definitions are provided in Section 26-5 of the Village of Downers Grove Stormwater and Flood Plain Ordinance

5.0 Timeline of Key Stormwater Events

- 1863 First subdivision established by Samuel Curtiss
- 1939-1941 Completion of first aerial photographs of the entire Village
- 1959-1961 Development of first Stormwater Master Plan, focusing primarily on construction of storm sewer pipes.
- 1965 Adoption of a Village flood control ordinance.
- 1965 Creation of first area flood atlas by NE Illinois Planning Commission.
- 1968 National Flood Insurance Act.
- 1971 Second Stormwater Master Plan - "Storm Sewers and Creek Improvements."
- 1971 First stormwater detention facility constructed in the Village.
- 1972 Federal Clean Water Act (CWA).
- 1972 Adoption of a comprehensive flood control ordinance and flood control map.
- 1975-1977 Development of first Village-wide 1-foot topographic map with aerial photo, with expressed intent to map all depressional storage areas. Many such areas were later designated by code as Localized Poor Drainage Areas.
- 1976 Adoption of comprehensive stormwater runoff ordinance, including stormwater detention.
- 1976-1983 The Village adopted a program wherein revenue sharing funds were utilized only for stormwater management projects. Included projects were various storm sewers and the 100 acre-foot Barth Pond.
- 1981-1983 First flood insurance rate maps issued by FEMA.
- 1981 Adoption of Village maintenance policy for storm sewer structures in private stormwater detention easements.
- 1983 Adoption of Village maintenance policy for creeks.
- 1987 Major flooding event throughout DuPage County. County initiated countywide Stormwater Management Plan.
- 1992 Implementation of Countywide Stormwater and Flood Plain Ordinance, including comprehensive wetlands protection.
- 1994 National Flood Insurance Reform Act.
- 2002 Village code revised to provide cost reimbursement by developers to Village for consultant review of stormwater permits.

- 2003 Downers Grove Stormwater and Flood Plain Oversight Committee recommended funding an update to the Village Stormwater Master Plan.
- 2003 Village NPDES permit issued (result of 1972 CWA).
- 2004 Total Maximum Daily Load (TMDL) approved by IEPA for East Branch of the DuPage River (result of 1972 CWA).
- 2004 Construction of downtown regional detention facility beneath parking deck.
- 2004 Issuance of first digital version of countywide flood plain maps.
- 2006 Pubic release of first digital version of the comprehensive Village-wide Drainage Control Map.
- 2006 Completion of Stormwater Master Plan Update, the first comprehensive Village-wide plan covering all types of natural and constructed stormwater systems within the Village.
- 2007 Completion of Watershed Improvement Plan, a detailed planning document to guide future Village-wide stormwater infrastructure improvements.
- 2008 Completion of 5-year NPDES permit development period.

6.0 Village Map

