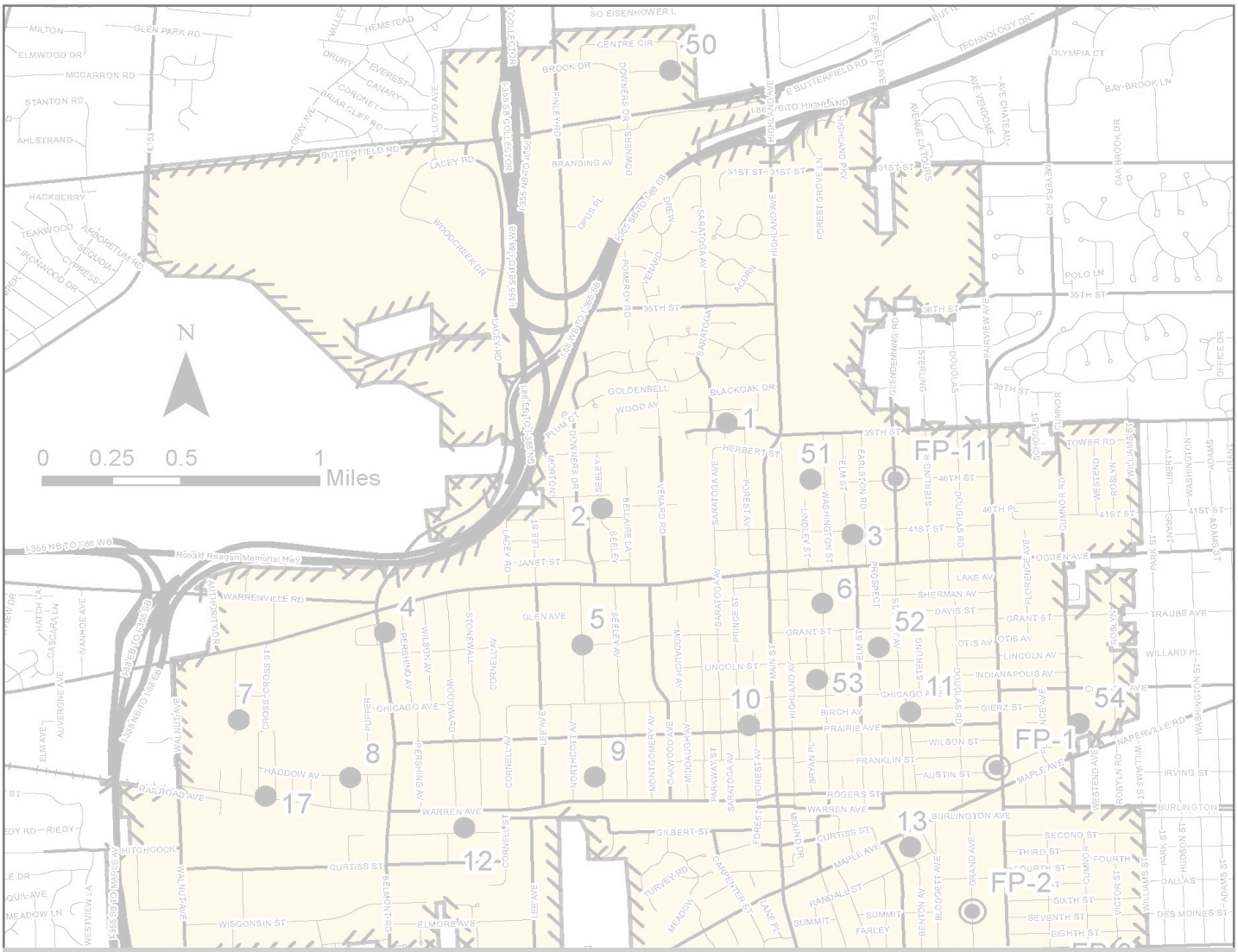

Village of Downers Grove

2014 Stormwater Project Analysis

FINAL REPORT

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June 19, 2014

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Frequently Used Terms

The following terms are used extensively and below are definitions and clarifications.

Drainage Infrastructure (System) (Capacity): Storm sewer pipes, structures, curb and gutter when present, culverts, ditches, ponds, control structures and "green" infrastructure like wetlands and streams. Localized Poor Drainage Areas (LPDA's) are also an existing form of infrastructure. A "system" of Drainage Infrastructure is a series of such devices that form a network to collect and drain floodwater from one point to another, and to store water temporarily that is above the capacity of the system to carry. The capacity of the infrastructure or system is the flow rate that can be conveyed in pipes and ditches without unsafe overflow, expressed in cubic feet per second typically. Capacity is also a volume that can be safely stored temporarily when the pipe or ditch capacity is exceeded.

Floodplain Projects: Projects whose Service Area is over a square mile, or where the source of flooding is overbank flooding from a stream.

Local Drainage Projects: Conceptual drainage improvement projects for relatively small Service Areas.

Priority Need Group: A grouping of projects as High, Medium, or Low need based on the ability for existing Drainage Infrastructure to carry the service level drainage event safely, with High need meaning limited or no existing infrastructure.

Project Cost Index: A cost per acre of impervious area within the Service Area of a floodplain or Local Drainage Project. This index is weighted by dividing the total calculated concept level cost by a factor reflecting the number of structures for which residents reported flooding. The effect of the factor is to weight the ranking towards those areas with more reported structural damages.

Service Area: The topographic area within the Village draining to the point in the Drainage Infrastructure system where flooding occurs. All impervious areas upstream of the flooded location are "served" by the system in terms of carrying the flood water generated from that property to the location in question.

Service Level Drainage Events: A standard rainfall event which the Village uses to determine a goal minimum capacity for Drainage Infrastructure. This report recommends a 10-year, 6-hour duration rainfall over the Service Area as an initial minimum standard by which to prioritize projects.

Executive Summary

In the aftermath of the April 2013 floods, the Village undertook a number of data gathering and analysis initiatives which culminated in the identification of a total of 21 locations distributed throughout the Village which would be the subjects of the 2014 Stormwater Project Analysis. The purpose of this study was to develop at least one feasible project for each study area, then recommend a prioritization framework which the Village could use to determine how to focus their expenditures on Stormwater Infrastructure. The result is a suggested project for each area, in a prioritized listing in accordance with the underlying recommended policies used by the Village to set a standard for Stormwater Infrastructure.

In this report, the Local Drainage Projects were prioritized in a two-step process. The first step was to evaluate to what degree the existing infrastructure meets or exceeds the uniform Drainage Infrastructure service level goals that the Village has set. The suggested service level will safely convey and store more than 95% of all rainfall events experienced in the Village in any given year. Based on this, Local Drainage Projects were placed in "Priority Need Groups" of High, Medium and Low. The second step in prioritization was to determine a Project Cost Index, which is the structure damage weighted cost of the conceptual project, divided by the impervious area within the Service Area associated with the project. Within each "Priority Need Group", projects are ordered from least Project Cost Index to highest. Projects with a Project Cost Index greater than $100,000 per acre of impervious are not recommended at this stage, as they are not deemed to be cost effective, but further evaluation and active participation (in the form of land donations, easements, etc.) by those in the Service Area can potentially be solicited to bring the costs below this cut-off threshold.

Floodplain Projects were ordered in priority separately from Local Drainage Projects, and utilized only the Project Cost Index in the ranking.

In total, the Local Drainage Projects identified have a conceptual level project cost of $8,063,000, which excludes the cost of those projects having a Cost Index greater than $100,000/ acre, and Floodplain Projects totaled $6,890,700. Both estimates include allowances for construction, engineering, land acquisition, demolition and contingencies.

Introduction and Purpose of the Investigation

The flooding that occurred in April 2013 was devastating in the portion of the Village affected. The Village staff moved quickly to assemble as accurate a view as possible of the experience of residents and business owners, and had some analysis done in some of the most complex flooding areas. These findings were published in a staff report in August of 2013. A series of information gathering meetings and surveys produced a more comprehensive overview of the damages experienced and these were aggregated into a list of areas for further investigation. The Village requested the services of a consultant to aid them in formulating a program Village wide that will begin to address the need for the Village to develop a minimum and uniform standard of protection as a goal, and help them sort and prioritize their response to the flooding of April 2013 and future flooding. Wills Burke Kelsey Associates, Ltd. responded to the request for Proposal in a submittal dated November 15, 2013 and was selected.

The Purpose of this report is to summarize and bring to its culmination the effort to assist the Village in developing a conceptual drainage project for each of the identified impacted areas, provide a concept level opinion of cost for the project, and to develop and apply a system of

prioritization to the projects and project areas identified that reflects the goals and financial capabilities of the Village for the “2014 Stormwater Project Analysis”.

After reviewing the specific observations of residents collected by the Village, previous studies performed on behalf of the Village such as the “Watershed Infrastructure Improvement Plan” (2007), and a meeting to discuss each of the 21 identified impacted areas with Village Staff, it was determined that the projects should be grouped together as “Local Drainage Projects” and as “Floodplain Projects”, with the distinction being whether the flooding can be reasonably traced to how floodwaters are stored and conveyed in a localized drainage area (called a ”Service Area”) of whether flooding was a more regional effect from a stream carrying a far larger watersheds flows. Of the 21 Project areas, 16 were classified as “Local Drainage Projects” and 5 were classified as “Floodplain Projects”.

Overview of Methodology

The act of developing conceptual Drainage Infrastructure improvement projects and then comparing them to determine an order in which to implement them necessitates making explicit certain goals and standards, then developing guidelines to systematize the process. These have been developed for this report in the form of recommendations, which are more fully discussed in Appendix No. 1 but are summarized below.

- The Village will set a goal of seeing that a minimum uniform standard of Drainage Infrastructure is provided to all properties within the Village as a service to the residents and business owners. This report recommends as a starting point towards realizing this goal a standard a standard storm event that would be greater than 95% or more of all the separate rainfall events that occur on average in any given year. This standard storm will be called the “Service Level Drainage Event”.
- Where flooding is reported, the area will be reviewed first to see what Drainage Infrastructure currently exists and whether or not it is of sufficient capacity to safely convey or store the runoff from “Service Level Drainage Events” from the “Service Area”. Those areas which do not have Drainage Infrastructure of the necessary capacity will be given higher priority in implementing projects than those which do.
- Conceptual Projects are at this stage only developed to the feasibility and reconnaissance level, with enough information to define a budgetary cost. Solutions to flooding will be implemented as locally as possible so that overall existing drainage network capacity is not compromised.
- Drainage is an important service to all properties, regardless of position in the landscape. Those at the “top of the hill” are in need of “drainage infrastructure” just as much as those at the “bottom of the hill”, as they all generate runoff. Therefore, all properties that drain to a specific project area are part of that projects “Service Area”, not just the properties that experience flooding.
- Project cost is a consideration in comparison, but only in subordination to the primary goal of providing a uniform minimum level of service to all properties.

Development of Conceptual Projects and Prioritization of Projects for 2014

The process began with review of Resident's responses to questionnaires and reports taken in person by Village staff to understand what was observed, and what the effect of the April 2013 flood was on each local drainage area and Floodplain area, respectively. The report section "Project Exhibits" includes an overall location map referencing the project areas by number. Appendix 2 generally summarizes these observations by project area. It also includes cross reference to drainage areas in other studies previously performed.

In the April 2013 flood event, which was a long duration, large aerial extent and consequently high runoff volume event, much of the flooding can be categorized and attributed to a few generalized causes:

- Inadequacy of existing conveyance systems (pipes, culverts and ditches) to carry away safely the cumulative runoff from the area served creates a ponding affect. This ponding fills closed depression areas (LPDA's) or results in overflow of excess beyond conveyance capacity into and through areas not designed for conveyance, such as between homes, down driveways, through backyards, etc.
- Long duration storms create saturated soils conditions and percolation of water into the ground, where it can move and accumulate in places that can cause basement seepage, pavement failures and other damages. There are many reports of flood damages, particularly to basements, in the April 2013 event that would be best characterized as this type of "groundwater flow". Infrastructure designed around surface flooding will indirectly reduce these occurrences by reducing ponding conditions which feed these types of flows, but not all groundwater movement is from this cause and seepage can occur due to sanitary service backups as well. The information collected is often inconclusive as to whether structure flooding is directly attributable to surface flows. Although from an affected homeowner's or business owner's perspective it may make little difference, but the effectiveness of the Villages standard with respect to surface flow may do little for these other causes.
- Street flooding was widely reported, with damages to vehicles trying to cross the flooded areas, which also causes damages to adjacent properties due to the run-up of waves from vehicles. Relatively long durations of street flooding attest to the volume of this particular storm event, and result in inhibited access for emergency vehicles and the stranding of property owners cut off by flooded driveways and intersections.

After gaining an understanding of the property owners and staffs observations, a potential Drainage Infrastructure improvement project was formulated. The components of these projects are included in the individual exhibits under the report section "Project Exhibits", along with the service area for each project. The area was field reviewed for feasible conveyance routes and potential areas for flood storage. The DuPage County Watershed Plan, as embodied in the Countywide Stormwater and Floodplain Ordinance, emphasizes flood storage as more effective than conveyance. In Downers Grove, substantial flood storage occurs in LPDA's, but often with damaging results. Many of the projects identified look to displace LPDA flood storage into controlled basins where it can be stored more safely, but often requiring acquisition of property.

In keeping with current Village policy, land acquisition is generalized as an area on the exhibits and will be pursued on a voluntary basis. Many projects will require permanent and construction easements from landowners to implement as well.

The capacity of the existing Drainage Infrastructure was determined and compared to the Service Level Drainage Event. Each of the Local Drainage Project areas was then described by a High-, Medium-, or Low-Priority Need Group based on to what degree the existing infrastructure can carry the Service Level Drainage Event from the Service Area. High Priority was assigned to those areas with the least existing infrastructure and low to those areas with the most, with bonus to those areas where the conceptual project displaces existing LPDA storage.

Conceptual project construction costs, generalized land acquisition costs, engineering and contingencies were determined for each project and then weighted to reflect the number of properties reporting structural flood damages in the April event. Finally, this weighted project cost was turned into a Project Cost Index by dividing it by the total impervious area within the Service Area. Those projects whose Project Cost Index is greater than $100,000/acre are listed, but not recommended unless further investigation or cooperation of property owners shows that project costs can be reduced below this threshold.

The final prioritization list for Local Drainage Projects combines the Priority Need Group and the Project Cost Index. All “High” Priority Need Group projects are ranked above “Medium” Priority Need Group projects, which rank above “Low” Priority Need Group projects. Then within those groups projects are ordered from least Project Cost Index to highest. Although the table includes those with Project Cost Indexes above the $100,000/acre threshold, they are not recommended at this time. Floodplain Projects are only ordered by Project Cost Index as the concept of Priority Need Group does not meaningfully apply to regional conveyance such as a stream.

Table 1 lists the projects in order by map reference number. Table 2 lists the projects in order from High to Low in Project Priority Group. Within the Project priority Group, projects are ordered by Project Cost Index from lowest to highest. Note that the three projects whose Project Cost Index is over $100,000 will need some form of either landowner or local involvement to help further reduce Project Cost Index below the $100,000 threshold. Projects marked in yellow will require land acquisition or intergovernmental agreements to implement. Floodplain Projects are ordered only by Project Cost Index, from lowest to highest.

2014 Drainage Program

Table 1. Local Drainage Projects in order by number

Project Name and Number	Priority Need Group	Land Acquisition or other government agreement required	Concept Total Project Cost	Project Cost Index adjusted cost per acre impervious
1. Black Oak Drive Between Saratoga and Candlewood	Low	Yes	$ 244,400	$ 10,838
2.1 Downers Drive/Virginia Street/Seeley Ave./40th st.- Bellaire to Seeley	Medium		$ 393,800	$ 72,926
2.2 Downers Drive/Virginia Street/Seeley Ave./40th st.	Low	yes	$ 664,300	$ 7,756
3. Elm and Earlston Between Ogden and 41st St.	Low		$ 429,000	$ 31,591
4. Pershing Between Ogden and Grant	Medium	Yes	$ 1,233,000	$ 44,869
6. Washington south of Ogden/Highland Court	Medium	Yes	$ 1,580,250	$ 99,075
7. Drendel Road South of Indianapolis	Medium	Yes	$ 252,300	$ 38,227
8. Chase Avenue between Haddow and Warren	Low	Yes	$ 902,600	$ 33,405
9. Walbank North of Warren	Low	Yes	$ 13,000	$ 1,389
10. South of Praire Between Forest and Price	Low	yes	$ 784,050	$ 29,926
11. Debolt/Linden/Gierz	Low		$ 240,500	$ 42,642
12. Hitchcock Between Cornell and Glenview	High	Yes	$ 943,500	$ 120,962
14. Middaugh and Jefferson	High	Yes	$ 694,000	$ 48,702
15. West Side of Lyman between Kenyon and Blanchard	Medium	Yes	$ 422,050	$ 211,025
16. Hobson Triangle Area	Low	Yes	$ 565,000	$ 56,841
17.1 Francisco at Burlington south	Medium		$ 177,450	$ 110,906
17.2 Francisco at Burlington north	Medium		$ 66,300	$ 39,464
Floodplain Projects in order by number				
FP-1 STJC north of Railroad		Yes	$ 3,411,750	$ 12,627
FP-3 Deer Creek Fairview East		Yes	$ 2,009,430	$ 5,358
FP-4 Benton and Elmwood Between Maple and Randall		Yes	$ 1,469,500	$ 2,221

2014 Drainage Program

Table 2. Local Drainage Projects in order by Priority Need and Project Cost Index

Project Name and Number	Project Priority	Land Acquisition or other government agreement required	Concept Total Project Cost	Project Cost Index adjusted cost per acre impervious
14. Middaugh and Jefferson	High	Yes	$ 694,000	$ 48,702
12. Hitchcock Between Cornell and Glenview	High	Yes	$ 943,500	$ 120,962
		Subtotal "High"	**$ 694,000**	
7. Drendel Road South of Indianapolis	Medium	Yes	$ 252,300	$ 38,227
17.2 Francisco at Burlington north	Medium		$ 66,300	$ 39,464
4. Pershing Between Ogden and Grant	Medium	Yes	$ 1,233,000	$ 44,869
2.1 Downers Drive/Virginia Street/Seeley Ave./40th st.-Bella	Medium	Yes	$ 393,800	$ 72,926
6. Washington south of Ogden/Highland Court	Medium	Yes	$ 1,580,250	$ 99,075
17.1 Francisco at Burlington south	Medium		$ 177,450	$ 110,906
15. West Side of Lyman between Kenyon and Blanchard	medium	Yes	$ 422,050	$ 211,025
		Subtotal "Medium"	**$ 3,525,650**	
9. Walbank North of Warren	Low		$ 13,000	$ 1,389
2.2 Downers Drive/Virginia Street/Seeley Ave./40th st.	Low		$ 664,300	$ 7,756
3. Elm and Earlston Between Ogden and 41st St.	Low		$ 429,000	$ 31,591
11. Debolt/Linden/Gierz	Low		$ 240,500	$ 42,642
1. Black Oak Drive Between Saratoga and Candlewood	Low	Yes	$ 244,400	$ 10,838
10. South of Praire Between Forest and Price	Low	Yes	$ 784,050	$ 29,926
8. Chase Avenue between Haddow and Warren	Low	Yes	$ 902,600	$ 33,405
16. Hobson Triangle Area	Low	Yes	$ 565,000	$ 56,841
		Subtotal "Low"	**$ 3,842,850**	
		Total	**$ 8,062,500**	
		,-indicates projects whose cost/acre impervious are above		
		$100,000, not included in either subtotal for group or total		

Floodplain Projects In Order by Project Cost Index

FP-4 Benton and Elmwood Between Maple and Randall		Yes	$ 1,469,500	$ 2,221
FP-3 Deer Creek Fairview East		Yes	$ 2,009,430	$ 5,358
FP-1 STJC north of Railroad		Yes	$ 3,411,750	$ 12,627
		Total	**$ 6,890,680**	

Appendix 1. describes the mechanics of this process more fully. Appendix 3. includes tables summarizing the calculations for the capacity of existing Drainage Infrastructure, calculations related to Project Cost Index and calculations related to scaling to determine Priority Need Group. The next sections of the report describe each individual project more fully and are followed by exhibits illustrating the conceptual project and the Service Area for Local Drainage Projects.

Local Drainage Project Descriptions

1. Black Oak Drive Between Saratoga and Candlewood

Problem Description: A number of components appear to contribute to the potential for flooding, with the primary problem flooding associated with flows that overflow from or bypass existing Stormwater Infrastructure. Flows occur in undefined overflows through side yards into the intersection of Candlewood Court and Candlewood Drive. Overflows from that intersection flow between homes and then west between the backyards of homes facing Black Oak Drive and Candlewood Drive, before breaking through between homes on Black Oak Drive headed for Lacey Creek near Saratoga Ave.

Local Drainage Project: Create a minimum of 0.5 ac-ft of flood storage to capture additional overflow from east of Highland. Create additional pipe capacity to carry flows from the intersection of Candlewood Drive and Candlewood Court to join the existing storm sewer flowing in the rear yards. Create localized berming to inhibit bypass flow of the storm sewer, which will require the acquisition of easements. At the west end where the storm sewer enters the Saratoga right-of-way, a relief manhole is planned to relieve hydraulic head on the sewer.

2. Downers Drive/Virginia Street/Seeley Ave./ 40th St.

Problem Description: Overall this area represents a large watershed with a number of problem areas, but there are two specific and related areas of concern from the April 2013 flood. Ultimately, both areas center on a drainage way that flows northwest, with the upstream end at a point where two large diameter drain tiles surface discharge. This discharge point occurs at the north lot line (rear yard) of homes at 1456 and 1500 Virginia Street. An existing 20” diameter clay field tile runs between the two homes, and it has reached the end of its useful life. Upstream on Seeley, the Village has already replaced a substantial section of this tile with a larger diameter storm sewer. Bellaire Lane, parallel to and east of Seeley, lacks developed Stormwater Infrastructure, and excess runoff travels easterly to the LPDA on Seeley between the residences at 4209 and 4217 Seeley through side yards, causing damages. The drainage way is not well defined, and all but very low flows follow the topography instead of the lot lines of homes along its path, causing some nuisance and street flooding.

Local Drainage Projects: The project area was subdivided into two separate project areas and evaluated separately, as the specific recommendations for the two areas have some degree of independence despite draining to the same discharge point ultimately.

Local Drainage Project 2-1: Construct inlets and storm sewers on Bellaire to collect excess runoff in the low areas behind 4217 Seeley, and then convey these flows in a storm sewer between 4209 and 4217 Seeley. Discharge this Storm sewer into the existing 30” diameter storm sewer on Seeley. This infrastructure will reduce the overflow between homes traveling an undefined route and causing flood damages.

Local Drainage Project 2-2: Replace the remaining existing 20” diameter field tile from Seeley to its outlet. This part of the project is combined with acquiring property and developing additional online flood storage in the open channel to balance flows and to displace LPDA flood storage, which requires the acquisition of property. To further relieve street flooding and balance flows, outlet the storm sewer already draining south on Downers Drive from Herbert street on the west (downstream) side of Downers Drive.

3. Elm and Earlston Between Ogden and 41st St.

Problem Description: The area is characterized by topography that includes moderate relief flowing to a large expanse of no relief. The problem is magnified by having no existing Stormwater Infrastructure particularly west of Earlston on Elm Street. Areas west of Elm drain through sideyards to a low point on Elm, then overflow further through sideyards to Earlston where it collects in LPDA 101. The most likely drainage pattern from Earlston is by the overflow of LPDA 101 to the north across 41st St. into LPDA 17 where it will overflow into the DuPage Wetland complex along Earlston north of 41st street. In April 2013 flood complaints included multiple reports of basement flooding, street flooding and yard and garage flooding.

Local Drainage Project 3: Construct inlets and connecting storm sewer in low spot on west side of Elm Street in front of 4224 and 4228 Elm Street in the Right-of-way. Construct a storm sewer between lots 4225 and 4229 on Elm and 4224 and 4228 on Earlston draining to the east. Construct a storm sewer on Earlston draining north past 41st St. and outletting to the DuPage Wetland Complex in the Earlston ROW. This project will potentially require discussion with the County although believed permittable. The project will require easements in residential sideyards for the storm sewer that replaces the existing uncontrolled overflow.

4. Pershing between Ogden and Grant

Problem Description: A large Service Area drains overland to a closed depression on Pershing Street identified as LPDA SJ 26. The depression is drained by a storm sewer of very limited capacity. In April 2013 basement flooding was reported and street flooding cutting off access to residences was observed. Street flooding also cuts off access to the north on Pershing Street, potentially cutting off emergency services to a multifamily building.

Local Drainage Project No. 4: Acquire properties in order to create a minimum of 1.6 acre feet of flood storage to displace a portion of the LPDA flood storage. Construct an outlet for the flood storage via a storm sewer built in public right-of-way for an alley running north and south, Between Pershing and Belmont. Construct storm sewer to drain east from alley along Grant Street to connect to existing system at the intersection of Pershing and Grant Street.

5. Grant and Downers Intersection

Problem Description: Complaints taken by the Village were reviewed in detail. The nature of the complaints indicates that the problems appear to be much localized house-to-house drainage concerns between neighbors. It does not appear that Public Stormwater Infrastructure is at the heart of the issue, and consequently no Local Drainage Project was developed to mitigate the concerns.

6. Washington south of Ogden/Highland Court.

Problem Description: There are two separate problems identified within the same Service Area. The first is caused by runoff from commercial properties along Ogden Avenue discharging to residences fronting Highland Court. The second part of the problem is that a large area contributes drainage to a closed depression identified as LPDA SJ 90. This area is outleted by a storm sewer of very limited capacity that drains south to the intersection of Grant Street and Washington Street. The drainage of Washington street is further impeded by a cross connection on Grant Street with the storm sewer system that drains the area of LPDA 81 and the school property farther west.

Local Drainage Project No. 6: Acquire acreage sufficient to substantially displace the existing LPDA flood storage volume. At the concept level this is estimated at as 1.34 acres of property to provide a minimum of 3 acre-feet of new flood storage. This would outlet to the existing storm sewer system. On Washington, a second component is to construct a small diameter sewer

along the south property lines of the commercial properties fronting Ogden to carry the nuisance discharges from there collection systems as well as investigating a route to safely convey larger overflows, combined with the property owners maintenance of their onsite systems. The solution to the Highland Court problem requires easements, and utility investigations before a project concept can take further form.

7. Drendel Road South of Indianapolis

Problem Description: The April 2013 storm caused very significant Roadway flooding. There were reports that the storm sewer was plugged at the time. A Runoff from the east, from properties fronting Cross Street, accumulates in the backyards of properties on Drendel bypassing backyard inlets. Although not identified by study as an LPDA previously, the area is characterized as drainage to a closed depression.

Local Drainage Project No. 7: Acquire property to displace LPDA flood storage occurring on private property. Acquire 0.34 acres (estimate) of property in order to provide minimum 0.93 acre feet of flood storage. Connect the outlet for the flood storage provided to the existing storm sewer system on Drendel. Augment the existing storm sewage system by constructing a storm sewer outlet to the storm sewer that runs on the east side of Drendel. After obtaining easements from property owners, construct a berm to capture runoff from the east in the backyards and concentrate captured runoff at the existing inlets located at the lot lines.

8. Chase Avenue between Haddow and Warren

Problem Description: The series of storm sewers, culverts and ditches, along the eastside of Chase Ave south of Haddow Ave to flow not only from the adjacent residences on chase but also from a substantial tributary area to north on the golf course on the April 2013 flood, water overflowed across Haddow and flooding of the adjacent homes particularly on the eastside of the roadway was prevalent. Problems reported included first floor and basement flooding, substantial street flooding, and erosion of the ditch system.

Local Drainage Project No. 8: There are two parts to the proposed local drainage improvement. The first part requires the cooperation and involvement of the golf course to the north. It is our understanding that an existing tile, which drains from north to south and is ultimately connected to the storm sewer system. This tile is proposed to be repaired on behalf of the golf course. We recommend that a berm be created to the north of the golf course maintenance facility in order to reduce the amount of overflow that occurs to the south. The berm will capture more flow to be drained by the newly repaired tile system rather then become overland flow into the depression on the north side of Haddow.

The second part of the proposed drainage improvements would include acquiring properties to provided flood storage in order to improve the permittability of the drainage improvements. We estimate that 0.22 acres of property will need to be acquired to provide a minimum of 0.59 acre feet of flood storage. This flood storage would then be coupled with storm sewer improvements along Chase Avenue, providing additional inlets, in the Chase right-of-way on the east side and improving the outlet from the most southerly home directly to the existing swale.

9. Walbank North of Warren

Problem Description: In the April 2013 flood the intersection of Warren and Walbank has flooded historically more than once and most recently in the 2013 flood. A number of homes along there reported the roadway flooding and at least one residence reported flooding and more than one resident reported basement flooding. The problem is multiplied by a continuous

grade down Walbank to the intersection at a relatively steep slope. This tends to cause flow to bypass the existing inlets and accumulate at the depression especially in larger rain fall events.

Local Drainage Project No. 9: The Village has pursued a number of solutions investing in building additional infrastructure very recently to upgrade the capacity of the existing Drainage Infrastructure. We understand, however, that restrictors were placed in this new Drainage Infrastructure pending the construction of a large online reservoir on St. Joseph's Creek. After reviewing the improvements the Village has already constructed in this service area, and considering carefully the overall scheme of improvements originally envisioned, it is our plan that the Village can remove the two restrictors without causing additional downstream problems and without permitting implications. We recommend the removal of the restrictors as the Local Drainage Project, which will then make operational, the Drainage Infrastructure already constructed by the Village.

10. South Prairie between Forest and Prince

Problem Description: LPDA SJ71 flooded in the April 2013 event. This series of closed depressions is drained by an existing storm sewer system of questionable existing condition. In the April event there were numerous reports of basement flooding, backyard flooding, loss of landscaping, street flooding and the flooding of a garage.

Local Drainage Project No 10: Existing Stormwater Drainage Infrastructure is primarily located on Prince Street with very limited capacity to drain from the more easterly Forrest Avenue sag to Prince Street. A small old existing field tile is all that accomplishes that connection under existing conditions. It is reportedly further challenged by recent residential construction. The Local Drainage Project proposes to improve the east/west drainage by constructing new storm sewers in the side yards between existing homes to replace the existing tile function. This storm sewer will be coupled with inlets at the sag on Forrest Avenue, including a sideyard drainage storm sewer for properties east of Forrest Avenue. This project imnprovement will require extensive coordination and cooperation of the residents in order to establish a route in easements in light of existing utilities. In addition 0.15 acres of property should be acquired to create at least 0.4 acre-feet of flood storage to displace existing LPDA storage and to improve the permittability of the stormwater conveyance improvements.

11. Debolt/Linden/Gierz

Problem Description: The topography channels run off from the area to Gierz Street which has been improved with curb and gutter. The intersection of Gierz and Linden Street is not improved, and the accumulated runoff bypasses existing inlets and follows the topography through the sideyards and backyards of properties that front Stanley Avenue at LPDASJ104. In the April 2013 storm, this overflow caused substantial flooding of backyards and sideyards with landscaping damage with at least one report of basement flooding.

Local Drainage Project No 11: Linden should be reconstructed and improved with curb and gutter on at least the west side in order to intercept the accumulated drainage flowing from east to west from the already improved streets. In combination with this a storm sewer draining Linden southerly should be constructed which would then flow westerly on the north side of Prairie to join the existing storm sewer system.

12. Hitchcock between Cornell and Glenview

Problem Description: A substantial closed depression formed by residences fronting Hitchcock and the railroad to the north has no known outlet storm sewer. In the April 2013 flood, a number of homes fronting Hitchcock reported basement flooding from various causes, as well as

substantial ponding in the depression. A second and related problem is a depression at the corner of Cornell Street and Gilbert Street where substantial street flooding occurred. In the April 2013 storm, residents reported basement and backyard flooding. The Village has historically provided equipment for these residents to pump out the depression in the backyard to the front yard storm sewer system. Residents also reported being cut off by the street flooding at the intersection of Gilbert and Cornell.

Local Drainage Project No. 12: Construct an outlet storm sewer for the closed depression in the backyards of the homes fronting Hitchcock. In order to make the new outlet permittable, provide flood storage in the form of an excavation in the backyards as well. Construct a french drain to extend the influence zone of the outlet and basin further to the west along the line of the backyards. The outlet storm sewer would parallel the railroad all the way to the intersection of Gilbert and Lee Avenue constructed within the right-of-way of Gilbert Street. The storm sewer would drain south on Lee Avenue to a new outlet directly to the creek. Inlets would be constructed to the proposed sewer at the intersection of Cornell and Gilbert Street. This project would require a substantial number of easements for its implementation from the homeowners along Hitchcock. The Project Cost Index would be improved if easements were donated, potentially getting the project below the $100,000/acre threshold.

13. Project Moved to FP-4

14. Middaugh and Jefferson

Problem Description: The proposed Service Area drains to a closed depression identified as LPDA SJ58. The depression drains via storm sewer on Middaugh to the south and then easterly along Jefferson Avenue. However, the natural flow of drainage away from the depression is to the northeast towards the intersection of Brookbank Road and Blanchard Street where there is a second storm sewer system. Part of Middaugh within the Service Area already drains northerly in a ditchline to Blanchard Street. In the April 2013 storm, residents reported significant street flooding and flooding of backyards and out buildings. There were also reports of basement flooding tied to the ponding of water as well as one incident of overland flow into the basement.

Local Drainage Project No. 14: Construct a relief sewer which is not meant to replace but to supplement the existing system. The relief system will drain northerly along Middaugh and then easterly along Blanchard Street in right-of-way, following the ditchline already draining in that direction. It will connect to Blanchard Street storm sewer in the vicinity of 1209 Blanchard Street. Acquire approximately 0.42 acres of property to create a minimum of 1.19 Acre-feet of flood storage to displace LPDA flood storage and improve permittability.

15. West Side of Lyman between Kenyan and Blanchard

Problem Description: Homes fronting Lyman Avenue are on a steep grade from south to north draining to St. Joseph's creek. The homes fronting Washington Street are generally drained easterly towards the backyards of the homes on Lyman Avenue. In the April 2013 storm, runoff from the areas adjacent to Washington Street drain to and through the backyards of the homes on Lyman Avenue, with reports of rear yard and side yard flooding from this problem.

Local Drainage Project No. 15: Construct a berm paralleling Lyman Avenue adjacent to the alley between the residences fronting Washington and Lyman Avenues and running from Blanchard Street to the north terminating at the creek. Within the alley right-of-way, construct a storm sewer which will carry flows collected on Blanchard Street at the low point between Lyman and Washington. In addition, construct inlets along the berm to reduce service flows and

nuisance flows. This alternative may require a substantial number of easements from those homes along Lyman Avenue in order to build the berm. Further investigation may show that there is sufficient room within the alley for both the storm sewer and the berm. Donation of easements and the reduction in storm sewer costs that may be realized when the full extent of existing utilities in the alley may reduce the project cost below the $100,000/acre threshold.

16. Hobson Triangle Area

Problem Description: South of 61st street this area has a steep grade running from north to south to a low point on Puffer located approximately Puffer and 62nd street extended. This low point is drained by a sewer draining westerly then south along Chase.

Local Drainage Project No. 16: Acquire property to construct a minimum of 1 acre foot of flood storage, to displace storage that occurs in the sag. Construct storm sewers along Puffer in order to drain runoff from the intersection of Puffer and 61st street as well as to pick up flows draining generally down the Puffer right-of-way, discharge these storm sewers into the new storage facility. In addition, construct a storm sewer between the sideyards. This additional storage would outlet to the new storm sewer system. The sideyard sewer would be located between homes fronting Puffer at 6200 and 6210 Puffer. The sideyard sewer would be specifically to pick up a closed depression in the backyard that caused significant flooding and the storm sewer would drain northerly in the Puffer right-of-way to the newly constructed flood storage.

17. Francisco Street at Burlington

Problem Description: The drainage pattern in this Service Area is generally from the northeast to the southwest towards Burlington Street with drainage occurring generally through sideyards and along roadways that do not have significant Drainage Infrastructure. In the April 2013 storm, residents reported significant yard ponding that led to the flooding of structures and significant sideyard flows causing nuisance flooding.

Local Drainage Project 17-1: Construct inlets and storm sewers on the west side of Francisco draining the depression located in the vicinity of 4998 Francisco southerly to the north side of the Burlington right-of-way where it can join an existing storm sewer system. This storm sewer currently outlets in an undefined ditch system along Burlington however. This project includes constructing a new crossing of Burlington that would then drain further west to a depression in the Burlington right-of-way adjacent to the railroad. It is not evident how the existing depression drains although it has never been reported flooded. If savings can be relised by open cutting the storm sewer or the project contingency is not required, the Project Cost Index may be reduced below the $100,000/acre threshold.

Local Drainage Project 17-2: Construct an inlet and storm sewer in the alley running east-west between Francisco and Cross Street to intercept drainage that accumulates there and then currently goes into sideyards of homes to the south. The sewer draining westerly can then join the existing storm sewer located on Cross Street.

Flood Plain Projects

Flood Plain Project No. 1 - St Joseph's Creek North - BNSF Railroad to Hummer Park

Problem Description: Studies that the Village had performed immediately after the April 2013 flood identified that a primary source of flooding in this area reported by business and residents alike centered around the existing long culvert whose upstream end is adjacent to Rogers St. and whose downstream end is the easterly end of the ditch paralleling the BNSF railroad. This culvert reportedly flows under private properties and was identified as being capable of carrying no more than the two year flood with no channel to carry greater flows.

Flood Plain Project No FP1: The project includes the replacement of the existing culvert with one of larger diameter but located within public rights-of-way. It is contemplated that the corridor would be from Rogers Street South on Douglas Road and then in the north right-of-way of Maple before outletting to the BNSF ditch. A key component enabling the culvert to be enlarged is to provide upstream flood storage to balance out the additional flows at lower elevations that will occur in the approved culvert. In connection with this work the culvert at Fairview can be improved which would reduce street flooding in that location.

FP-2 St. Josephs Creek South of Railroad Hill street to 55th Street

Problem Description: There is a grate on the upstream end of the culvert at Hill Street that tends to accumulate debris in a flood. In the April 2013 flood, the backyards of the residences in this reach all filled as the creek came out of its banks, and three structures reported flood damages.

Floodplain Project No. 2: A number of potential projects were considered to protect the three homes which reported flood damages, but no projects which were likely to be both effective and permittable were found. These alternatives considered included structural flood protection of the homes by berming and excavation of lots already owned by the Village to provide additional flood storage. The Village is already addressing problems noted with the grate, so no additional projects are recommended.

FP-3 Deer Creek from Fairview East to Village Limits

Problem Description: This stream is large enough to have a defined floodplain/floodway, which extends into the Village of Westmont to the south and east of this subdivision. The creek drains northerly into an apartment complex east of the Village limits, and the stream is carried in pipe between buildings of the apartment complex and residences of Deer Creek, before the pipe daylights to form the upstream end of an open channel. The open channel is located in the middle of a Boulevard cross-section of 56th street with culvert crossings at Deerpath Lane and the downstream Service Area limit at Fairview. The Village had a detailed analysis performed by another consultant and the Fairview Culvert was identified as restrictive. In the April 2013 flood, 20 structures reported structural damages and streets were flooded for an extended period. Floodwater entered the neighborhood by overland flow from the east at the apartment complex and from the south as the detention basin in the neighboring Westmont subdivision overflowed.

Floodplain Project No. 3: There are many components to the recommended project. The component with the greatest impact requires extensive cooperation and coordination between the Village of Downers Grove and the Village of Westmont. An overflow needs to be created for the creek to replace the stream carrying capacity blocked by the presence of the apartments in Westmont and the residences at the east end of 56th street. A feasible route for this overflow is identified to include the ponds and detention basins south of Deer Creek in Westmont and then

northerly to the west of those homes fronting Deerpath lane. In connection with this route a berm would be constructed along the south property lines of those homes fronting Whitefawn in Deer Creek. The culvert at Fairview should be replaced with one less restrictive as well, but properties will need to be acquired to provide compensatory storage.

Flood Plain Project No.4- Benton and Elmwood between Maple and Randall. (Formerly Local drainage Project No. 13)

Problem Description: St. Josephs creek is contained in a long culvert that drains from east of Blodgett Avenue to Elmwood Avenue, crosses Maple Avenue and then discharges along the railroad to the east of Village Hall, and the Village's Maintenance Facility behind homes fronting Maple Ave. Connected to this culvert is a storm sewer that drains Benton Avenue between Maple and Randall Street. This storm sewer drains a depressional area on Benton Avenue and in the April 2013 flood, virtually every home experienced some form of flooding including basement flooding reported by a number of residents. In general, there is no overland relief for flows in excess of the creek culvert capacity and an expansive area becomes a flooded depression in storms like the April 13th event.

Flood Plain Project No. 4: An overflow for the creek culvert needs to be created to drain from south to north adjacent to the residencies that front Maple Avenue. Acquire properties in the vicinity of the low spot on Maple Avenue in order to create an overflow and an open channel that drains north to the junction on the upstream end of the long creek culvert through the Village. Utilize existing park property by opening the culvert for a section and provide additional flood storage. This opening and storage will act as a "pressure relief" and displace flood storage that would otherwise occur. This opening would also serve as a link in the overland flow route to the north.

Flood Storage Basin Online of St. Josephs Creek South of Curtiss

In light of the goals and objectives recommended in this report, WBK was asked to review the online flood storage basin project identified in the WIIP generally located south of Curtiss. The basin is to provide compensatory storage for large diameter conveyance storm sewers which have yet to be constructed, also a project identified in the WIIP. In our opinion, constructing the on-line basin is not consistent with the approach outlined here of allocating the expenditure of funds on new Drainage Infrastructure on a Priority need basis aimed at raising the level of service throughout the Village to a uniform minimum level. Since the need for the Basin is primarily driven by conveying flows from far to the north, it also is inconsistent with looking first at localizing drainage improvements. It is our understanding that the real need for this basin was driven by recommendations that new large diameter conveyances be constructed draining to the creek. This new approach to serving land owners with drainage infrastructure, embodied in this report, is not recommending that these new conveyances be constructed. Absent the conveyance improvements coupled with the basin, there is no benefit to the Village drainage infrastructure in constructing the basin.