Appendix 1.
Technical Memorandum
Summary of Prioritization Methodologies

Frequently Used Terms

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

Duration: The length of time over which a rainfall event occurs, usually expressed in hours.

Drainage Infrastructure (System) (Capacity): Storm sewer pipes, structures, curb and gutter when present, culverts, ditches, ponds, control structures and "green" infrastructures like wetlands and streams. 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.

Flood Frequency (Return Interval, Return Period): Flood Frequency, Return Interval and Return period all refer to the same thing, which is the reciprocal of the statistically derived percent chance of a flood happening in any given year. As an example, the 1% chance and 10% chance peak annual events are usually expressed in its reciprocal form, as a XX-year flood. (i.e. 100-year, 10-year respectively). The more correct expression is in the form of percent chance a flood happens in any given year, for example the 100-year flood is the flood with a 1% chance of happening in any given year, but the public and popular usage is more familiar with the form expressed as "100-year." When applied to rainfall events, an expression of a certain frequency rainfall (i.e., 100-year rainfall) must also include duration of rainfall to specify a unique number. For engineering purposes, it is assumed that the 100-year flood happens in a 100-year rainfall event of some duration, as there are rarely direct measurements of stream flow.

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

Historic Event: A flood that happens that causes uniquely identifiable damages. In this report the historic event is the April, 2013 flood.

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 weigh 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 set a goal of providing Drainage Infrastructure for as a minimum. This report recommends a 10-year, 6-hour duration rainfall over the Service Area as an initial minimum standard by which to prioritize projects.

Underlying Assumptions and Recommendations for Prioritizing Drainage Projects

Any system of prioritization and concept project development will, of necessity, embody certain assumptions, choices, policies and general principals. The following is a list of those underlying principals integral to these recommendations.

1. In order to more effectively communicate the Village's goals, this prioritization framework uses the concept of "Service Level Drainage Events" based on 6-hour duration rainfalls, of a 2-year and 10-year return frequency, occurring over a Service Area defined as the sub-watershed upstream of a given point on the drainage system. This service level will provide capacity for over 95% of all the rainfall events the Village experiences in a given year. As the Village approaches reaching a given service level Village-wide, a new and higher service level can be established as a Village-wide goal, in step with the future replacement and renovation of infrastructure in an on-going program. Virtually all new development that has occurred in the Village under the Countywide Ordinance (enacted in 1991) has provided Drainage Infrastructure to convey and store runoff in excess of these Service Level Drainage Events, but there is a very large portion of the Village that does not have Drainage Infrastructure capable of safely and without impact conveying and storing these Service Level Drainage Events. Many parts of the Village have very little or no defined Drainage Infrastructure, so conveyance occurs overland and storage of flood flows is in streets, backyards and sometimes basements. We recommend that the Village adopt a goal of serving all areas of the Village with Drainage Infrastructure capable of storing and conveying the Service Level Drainage Events adopted. This policy would not preclude designing and constructing Drainage Infrastructure to handle far larger floods, but it helps to focus priority of expenditure on areas that are currently underserved. In summary, this 2014 Program assumes the level of service drainage event is the flood that occurs in a 10-year, 6-hour duration rainfall event carried in a combination of storm sewers and overflow swales or ditches. Carrying the flood in pipes is capped at the flow from a 2-year, 6-hour duration for areas to be served by new storm sewers. This concept was derived from the following:

    a. The Village of Downers Grove has set, as a goal, a policy of providing Drainage Infrastructure of a minimum uniform capacity to all properties as a service to the residents. Drainage Infrastructure is typically characterized as having a fixed capacity, however in fact the capacity is also dependent on a series of interrelated assumptions and policies. It is customary to talk about capacity in terms of a return interval, in the form of 2-year, 10-year, 100-year, etc. This return frequency is applied to rainfall events, but a further complicating factor is that there is no one single rainfall event that corresponds to a particular return frequency, as there are multiple durations of events having the same return frequency. So to fully describe a storm, both the duration of the rainfall and the frequency are required to further characterize the storm in relation to the demand produced on the infrastructure to determine its capacity. The capacity is expressed then in a flow rate and volume of runoff to be stored. Finally, the spatial location and aerial extent of the rainfall event is important as the response of Stormwater Infrastructure is highly dependent on the "where" and "when" questions which drive flow rates in creeks and pipes.

b. The custom of talking only about return frequency is often confusing, as storms which appear to happen frequently are all termed as "10-year" or "100-year." The public is frustrated by the idea that "flooding solutions" do not appear to work, when in reality the "solution" is developed for a specific return period, duration, aerial extent and spatial location of rainfall event and not all of the possible combinations of rainfall events which happen in nature, and which all can be thought of as a single return frequency.

2. Although perhaps an oversimplification, it is true that surface drainage "flows downhill". As an underlying recommendation, this framework recognizes that drainage problems manifest anywhere along a Drainage Infrastructure system, and while a "flooding" problem can be local and specific, the Drainage Infrastructure in question is serving an area, not just individuals. Consequently, all land contributing to runoff is "served" by the infrastructure, and contributes to problems and benefits from solutions to those problems. This framework utilizes the watershed boundary to a point along the existing drainage system (even if poorly defined system) to map a "Service Area" for the infrastructure. This watershed boundary is used for the purpose of calculating Service Level Drainage Events, and is also used to establish the quantity of impervious area in the sub-watershed, taken from the Villages GIS data base and corresponding to the impervious area used to calculate stormwater utility fees.

3. Drainage improvement projects should focus on providing solutions as locally as feasible, in recognition of the network-nature of a Drainage Infrastructure system and the fact that it is very easy to transfer flooding problems downstream. As one looks progressively downstream at a drainage system, the drainage area served can increase tremendously, and the number of combinations of separate events that can trigger flooding can increase by orders of magnitude. Localizing solutions allow for mitigation of a greater proportion of the combinations of events that can trigger a flood. When comparing and prioritizing projects, it is helpful to distinguish areas where drainage areas have become so large that solutions to local flooding issues will require more complexity, and compare those projects against each other as opposed to flooding where the root cause is limitations in the local infrastructure. The recommended framework then creates two classes of projects: "Local Drainage Projects" and "Floodplain Projects." These two titles are for classification only and are not intended to be completely descriptive of causes of flooding.

4. A recommendation for a prioritization framework should also be sensitive to costs. It should also be weighted towards projects which provide some measure of improvement for those who have experienced significant structural damages in some historic event. The 2014 Program is based on the April 2013 flood event as the most recent "historic event." The recommended "cost metric" is the cost of the improvement project per acre of impervious area served. The project cost for a Service Area is adjusted based on the number of structures reporting significant damage in an historic flood (in this study, the

April 2013 event was used). The reduction factor is a divisor, so the project cost is for prioritization purposes reduced by the structure index, giving higher priority to groupings with concept projects where more structural damage was reported. Floodplain project costs use the same system for developing the Cost Index.

Mechanics of the Prioritization Framework

The following is a step-by-step walk-thru of the prioritization procedure so that it can be replicated and new projects added in the same framework for comparison.

1. Identify a historic flood. For 2014, the historic flood is the April 2013 flood event. In earlier Village-wide studies, such as the "Watershed Infrastructure Improvement Plan." A different historic flood was used, namely the flood that occurred in 2006.

2. Compile damage reports and select damage areas for study. This part of the process was performed by Village staff and summarized in the form of specific project areas to review. For 2014, an initial list of 20 project areas for review was identified by the Village. Later, another area was added so a total of 21 project areas were considered under this framework. Applying this framework, 16 of the projects were considered "Local Drainage Projects" and 5 were considered "Floodplain Projects."

3. Develop "concept level" projects for each area that are judged to provide a drainage improvement. Using available information and field reconnaissance, professional judgment and experience, suggest drainage improvement projects designed to increase the service level of Drainage Infrastructure, with the goal of raising the level of service to meeting or exceeding standard set by the service level drainage event. Project concepts were influenced by absence or presence of existing infrastructure, and "permit-ability" of projects under the Village's version of the countywide ordinance. Projects were not fully 'designed" nor analyzed, but fatal flaws were identified. Where the improvements required flood storage either to displace existing flooding or to mitigate for conveyance improvements, the concept level opinions of cost look to give preference to existing vacant lots for acquisition. Flood barriers such as berms will require easements when located on private property, for which a cost is included. In some cases, neighborhood cooperation and donation of easements for projects can significantly reduce project cost, which will improve the ranking of the project against others of the same Priority Need.

4. Review all projects with Village Staff.

5. Prepare concept level cost estimates and exhibits depicting projects. In concept development and only for costing purposes, it was assumed certain properties would be acquired to develop flood storage. However, the report makes no reference to specific properties, and all land acquisition necessary is assumed to be voluntary. For cost estimating purposes, costs to Acquire the property are assumed using tools like "Zillow," and lots without structures are assumed to cost approximately ¼ of the cost of surrounding homes. Structure demolition where applicable is calculated separately. Costs at this level of plan development are broad unit prices encompassing typical other work associated with the particular type of improvement. Engineering costs of 15% of construction and a contingency of 15% of construction and land costs is added to make up the total project cost.

6. Determine Priority Need Group and Project Cost Index to develop prioritized list. Steps 1-5 above are required for both Local drainage and Floodplain Projects. These steps

result in not only an identified project but also in the "Project Cost Index" discussed in steps 11 and 12 below. A "Priority Need Group" is also determined for Local Drainage Projects in the following step numbers 7-11. The Priority Need Group is used to determine to what degree the Service Area already has Drainage Infrastructure that has the capacity to convey or store the Service level drainage event. High priority need indicates very little or no existing Drainage Infrastructure, while low priority need indicates that the Service Area already has a Drainage Infrastructure system with a capability at or approaching the capacity required for the service level drainage event. Floodplain Projects are only ranked against each other, and only in relation to the Project Cost Index calculated in step 12 below. Finally, the list is further subdivided based on whether or not the Project requires some form of Land Acquisition or intergovernmental agreement, in which case it is recommended that only moneys through preliminary engineering and land acquisition be programmed until land and agreements are obtained.

7. Determine the Project "Service Area." This is the drainage area to the downstream limit of the proposed infrastructure, and includes all upstream lands which drain to either new proposed Drainage Infrastructure or to the existing infrastructure being relieved. Within the Service Area, determine the impervious area (from existing GIS data base).

8. Calculate 2-year and 10-year, 6-hour duration service level drainage event flows from Service Area. Use 1-subarea modeling of the Service Area with assumed times of concentration calculated by Standard methodologies. The corresponding rainfall events are 10-year 3.35" and 2-year 2.28" of 6-hour duration (Huff 1st Quartile distribution).

9. Calculate capacity of existing Drainage Infrastructure and volumes stored in LPDA. Existing Drainage Infrastructure in this context refers to the existing storm sewers, roadside ditches or sideyard swales designed for the purpose of flood conveyance and contained in restrictive easements. Where none of these are evident, the existing capacity is considered to be zero for this calculation. Capacity is flowing fully at the slopes indicated by topography for ditches. Storm sewer capacity is determined from slopes calculated from differences in inverts for storm sewers, as taken for the GIS data base. The LPDA volume used for the calculation was taken from the plan representation of LPDA in the Villages GIS data base, and assuming that area represented the inundation from a 100-year flood, then digitizing underlying contours taken from available Village mapping to calculate the total volume.

10. Determine the Priority Need Group from existing conveyance and Flood storage as follows. The Priority Need Group is based on a scoring system which compares the capacity of the existing Drainage Infrastructure to the service level drainage event and the score consists of two calculated parts, each with a maximum value of 100 for a maximum score of 200. Higher scores indicate that the capacity of the existing Drainage Infrastructure is farther from the standard of the service level drainage event. The conveyance portion of the score is determined from the degree to which the existing infrastructure already provides storm sewer conveyance up to a 2-year event and total conveyance up to a 10-year event. The second part of the score is based on whether the project is displacing the volume of an existing LPDA with new flood storage. Projects that provide improvement of conveyance to systems below the Village's standard, and provide flood storage displacing existing LPDA flood storage, receive the highest priority grouping. Three Priority Need Groups are formed: High (score 200-121), Medium (score 120-81) and Low (score 80-0). These ranges were determined from sensitivity testing of the actual projects, which showed that there were breakpoints in the scoring such that

High priority reflected displacement of LPDA volume in areas where there was the least amount of infrastructure available to drain an LPDA, and medium encompassed those projects where some existing Drainage Infrastructure was present but of low capacity and upgrades needed to usually include new flood storage. Those situations correlate generally with structural damages reported.

11. Determine Project Cost Index. The rating is the structure damage adjusted cost per acre of impervious area served. The lower the adjusted cost per acre, the higher the project will be ranked within the sub-set of projects within the same Priority Need Group.

12. Determine Project Cost Index for Floodplain Projects. For Floodplain Projects, take the structure damage adjusted project cost, and divide by the total impervious area within the Village limits of the watershed up to the downstream point of the project. This cost per acre of impervious is then used to order the Floodplain Projects, and lower costs are rated higher in the prioritization.

Appendix 2.

Summary of Residents Reports by study area

13-0254

Downers Grove 2014 Stormwater Program Project List

New Number	Old number	Project Name	General notes from Initial Review	Complaints		
1	2	Black Oak Drive Between Saratoga and Candlewood	Check complaint, might be floodplain/crossculvert/roadway overflow issue	**Black oak: A-** Retention at 39th and highland overflowed, water flowed between homes on black oak and candlewood, home at lowpoint surrounded, basement flooding from description? **Candlewood:** A- 39th street flooding backup (fixed last year?) flow between homes	V3: LA-D. Critical west of Highland, Chronic on Candlewood drive. Replace inlet grates with type 11 thoughout watershed to improve maintenance related issues. LA310	Runnoff flows between homes in no defined infrastructure, home access cut off, possible basement flooding
2	3	Downers Drive/Virginia Street/Seeley Ave./40th st.	Stream flows through back yards , resident on 40th street lost landscaping, culvert for driveway downstream at Jehovahs witness facility	Virginia--A-house surrounded by water; B-water in losest and 2nd level, flooded septic; Seeley-- A-small amount in basement through window well, flow coming from east across seeley; B-crawl space flooding; C-small flooding of basement; D-flow down side yard and coming from across the street, basement flooding(small); E-street flooding; F-burned out sump pump; G-basement flooding(seepeage overheated sump pump) and flow on street	V3: LA-C. A series of stormsewer installations and upsizes, with storage. Proejct $14mil to $18mil	Ephemeral creek running through backyards casuing nuisance damages
3	5	Elm and Earlston Between Ogden and 41st St.	Flow west to east between 4225 elm and 4229 elm, no infrastructure at all on Elm flows to LPDA101	Earlston--A-small basement flooding; Elm--A-basement flooding, street flooding between Ogden and 40th;B-basement; C-lost power and sump pump stopped basement flooding, garage and yard flooded (garage had hole in it); D-street flooding and flooding in side yards; E- basement flooding	CBB-SJN-E, no LPDA but near sj101, no projects	SJN-E north of Ogden is identified to flow south, but my actually more likely flow north between eEarlston and Glenndenning, across 41st street into LPDA 17 and ultimately into LPDA 16 potential for a sewer on elm running north and emptying into upstream end of wetland bank north of 41st st.
4	6	Pershing Between Ogden and Grant	Massive drainage area to low spot on Pershing Avenue	A and B both report basement flooding, not reported from overland, storm sewers need cleaning, not a complaint but appears multifamily north of low point on east side would be cut off by street flooding	CBB-SJN-B, sjn26	Could excavate basin north of alley between belmont and pershing, all vacant and already part of LPDA 26
5	7	Grant and Downers Intersection	Culvert already under Bike trail, check complaint	All complaints are from A Grant, no storm sewer on grant, neighbors drainage on each side of her, nothing specific related to april event, just onging complaints	not in SJN,	1540 seems to be at high point of grant, no real project recommended
6	8	Washington south of Ogden/Highland Court	Discharge of storm sewer near east end of highland court aggravates Washington street drainage and drains between homes	A Highland court-runoff from Dogspot (break in curb line) and Sears runs into B, then into A, overland flow into basement and garage; Washington street--A- Dogspot complaint; B-water off of Highland Ct.; C-water in basement,cracks in foundation; D- street flooding; E-street flooding; F-basement flooding; G-general; H-water in basement; I-street flooding; J-basement flooding; Highland--K-reported sump pump failure	CBB-SJN-D, LPDA sj90, no projects	North end of washington-highland court is a local drainage between proerties problem, potentially need new storm piping; Washington low point will require new basin somewhere
7	11	Drendel Road South of Indianapolis	need map	Drendel- A,B,C,D,E all report street flooding significant, one resident says storm sewer is plugged.	CBB- SJN-A Not identified with any project	vacant land on west side of street might be able to excavate storage for storm sewer improvement

8	12	Chase Avenue between Haddow and Warren	runoff from golf course maintenance facility	**Chase:** A-seepage into kitchen, downstairs of split level, under back door; B- Chase and Haddow entire road flooded; C-ditch erosion; D-pressure on foundation, pipe replacement last summer with smaller pipe?, open filed with a creek, lots of debris preventing flow, did not rehook up french drain; furthest south on east side of street front yard flooding culvert at driveway, water in the house, culvert drains to ditch under train station, pump out of golf ocourse? From video	CBB- SJN-A Not identified with any project	see if golf course can restrict flood flow further, improve ditch/culvert system
9	14	Walbank North of Warren	Flow in back yards between seeley and Walbank south, flow down Walbank to Warren depression **Sterling Pond**	Walbank--A, basement flooding;B-crawlspace;C-basement; D-lost car at warren and walbank;E-water in lowest level; F-basement; G-basement; H-intersection flooded; I-basement flooded	CBB-SJN-C LPDA SJ 40 and 42	new storm sewer constructed (Burke plan) but with restrictor must solve stroage problems to permit and open
10	15	South of Praire Between Forest and Price	Sag on Forest avenue flows west, garage and inlet, flows to Prince street	Prince--A, basement flooding;B- basement flooding; C-basement flooding; D-Basement flooding; Forest--A-drainage across backyards, storm sewer backup; B-basement flooding; C- flow from main st., landscaping, sump pump backflow, basment flooding; D-basement; E-basement; F-street flooding; G-basement and gargage flooded	CBB-SJN-D LPDA SJ71 Not identified with any projects	large drainage area from north, posssilbe vacant lot at 4824 Prince for storage
11	15B	Debolt/Linden/Gierz	none	**Debolt:** A-Linden in bad condition between Chicago and OPraire, water flow from Gierz to linden down east side of deblot, utility pole at Praire and Linden through sewer line?; B-landscaping damage only, bad drainage at Gierz and Linden a problem, new house on Gierz a problem, curbs on gierz bring debolt more water, Gierz from Linden to douglas has only two small drainas for 27 houses; **Gierz:** A-2 inches of water in basement	CBB-SJN-E, LPDA sj107, project sJN 104	
12	17	Hitchcock Between Cornell and Glenview	Depression North of Hitchcock homes has no outlet, residents pump out, set up piping for pumpout.	Hitchcock--A-crawl space and seepage; B- basement flooding(small), backyard no drain; C-bckyard drainage, basement flood; D- basement and 6" on first floor; E-basement (small); F-basement flood; G-basement flooding; H-basement; I-basement; J-basement (sewer backup); K-basement; Gilbert and cornell intersection street flooding	CBB-SJN-B, no LPDA, Project SJN503	catchbasin in back yard, storm sewer to front yard for pump out
13 (re-named as FP-4)	18	Benton and Elmwood Between Maple and Randall	connection to big storm sewer, 500 year floodplain	**Benton**: A-Basement flood; B- Basement flooding, water coming out of street manholes; C- Stormsewer backup, street flooded, basement flood, water from backyard through windowwells and broke windows; D- Basement flood; E-street flooding at Randall and Benton 2'-4'; F-sanitary backup, window well window broken by water coming in; **Elmwood:** G-water filled basement and entered first floor; H- Flooded crawlspace; I- yard and garage flooded, Flooded basement/crawl; J-Basement flooded, 9' in basement; K-crack in foundation; L-assume from description flooded basement	CBB-SJN J, project sjn517, immediately south is project sjn183/112	overflow-potential home purchase
14	22	Middaugh and Jefferson	flow on Middaugh? Check complaint	Jefferson--A-street flooding basement backup; B-yard and street flooding, flooded shed, basement minor and seepage; C-basement seepage, front and backyard flooding; Middaugh--A-subsidence cracking; B-basement flooding through window wells	not SJN, SJS- B near sjs58 project	vacant land in LPDA 58 and 65, vacant on Middaugh
15	23	West Side of Lyman between Kenyon and Blanchard	steep grade on Lyman, check complaints		SJS-C, between 408 and 409	
16	24	Hobson Triangle Area	Weak overall drainage system, lots of septic fields flooded, homes near downstream end at Janes		PRC F	

FP-1	B	St. Josephs Creek North of BNSF to Hummer Park	business flooding, culvert sized for 2-year, overflow route broblem?			
FP-2	C	St. Josephs Creek South of BNSF to 55th Street	Own 3 vacant lots, includes substantial damaged structure, grate on upstream end of big storm			
FP-3	D	Deer Creek from Fairview east to Village Limits	Massive flooding, overflow north from westmont ponds	**55th Pl.:** A-no floodin;B- sewer backup; C-seepage and sump pump overflow; **55th St.**: A-storm sewer backup from front of houseflow between houses filled window well, window broke and flooded basement; B-flood to ceiling of finished sub-basement; C-57 inches of water in lowest level; D-basement seepage, 2 sump pumps working; **56th Ct.:** A-overflow from King Arthur Apartments, flooded yard,in 1st floor family room and down into basement; **56th St.:** A- yard flooded, flooded window well and boke window under pressure; B-2-floors flooded; C-3 feet of water in yard; D-water from floor drains and toilet (sewer backup?); E-84 inches of water in basement; F-basement flooded 2 feet; G-sewer backup, no loss of power; **Deerpath:** A- water in sideyard from creek in 56st to north; B-water flowing over berm seperating westmont from downers gr		
		Sterling Park Pond	Review WIIP project			
Note: project numbers 17-49 and FP-5 thru FP-10 reserved for additions to 2014 list						
Completed or Moving Forward					V3:LA-E	
50	1	Brooke Drive and Center Circle				
51	4	40th and Washington				
52	9	Stanley Avenue between Lincoln and Grant				
53	10	Washington Street north of Chicago Avenue				
54	16	Cumnor between sheldon and Chicago				
55	25	Downers Grove Estates Drainage Improvements				
FP-11	A	40th and Glendenning Wetland Complex			V3: LA-E	

Appendix 3.

Calculations for Service Level, Project Cost Index and Priority Need Group

Floodplain Project-costs and calculation of Project Cost Index

Project number and location	Component Description	Component quantity	Component Unit cost	Component cost	Impervious area within Downers Grove at end of project	Drainage Area to end of project	Reported homes and businesses Flooded	Flooded structure Adjustment	Land acquistion or agreements required	Land Acq area	Land acquisition costs	Engineering at 15% of Construction	contingency at 15% of construction plus land	Total Project cost	Structure damage adjustment	Structure damage adjusted cost	impervious area in Downers Grove	rating-structure adjusted cost per acre mpervious
FP-1 STJC north of Railroad																		
1.1	Flood berm,lf	600	$ 60	$ 36,000			4		easements on 7 commercial lots		$ 49,000							
1.2	Internal drainage improvements, LS	1	$ 30,000	$ 30,000					same as above									
2	Rogers Douglas Maple new culvert, lf	780	$ 1,000	$ 780,000					all village ROW									
4	comp storage upstream of Rogers, ac-ft	1.2	$ 100,000	$ 120,000					4-lots vacant		$ 160,000							
5	comp storage downstream of fairview, ac-ft	1.29	$ 100,000	$ 129,000					2-vacant lots		$ 160,000							
6	culvert replacement fairview, LS	1	$ 400,000	$ 400,000														
	Hummer Park							with agreement with Park District, assumed at no land cost										
7.1	new channel, lf self mitigating for waters impacts	900	$ 400	$ 360,000														
7.2	new entrance,lf	150	$ 200	$ 30,000														
7.3	comp storage, ac-ft	4.13	$ 100,000	$ 413,000														
				$ 2,298,000							$ 369,000	$ 344,700	$ 400,050	$ 3,411,750	1.4	$ 2,436,964	193	$ 12,627
FP-2	buy 3- flooded properties						2		3-properties		$ 1,065,000		$ 159,750	$ 1,224,750	1.2	$ 1,020,625	268	$ 3,808
FP-3 Deer Creek from Fairview East																		
1	Storage downstream of Fairview, ac-ft	1.8	$ 100,000	$ 180,000			20		partial take of lot	0.5	$ 50,000							
2	Fairview Culvert Replacement, each	1	$ 600,000	$ 600,000														
3.1	clean channel east of Deerpath lane, lf	300	$ 150	$ 45,000					easements on 3 homes		$ 21,000							
3.2	realign channel east of deerpath lane,lf	450	$ 400	$ 180,000					1-lot		$ 100,000							
3.3	comp storage east of deerpath lane,ac-ft	2.6	$ 100,000	$ 260,000					same property as above	0.81								
4	detention basin overflow, lump sum	1	$ 30,000	$ 30,000					adjacent town									
5	berm between detention basin and homes,lf	560	$ 60	$ 33,600					easements on 7 homes		$ 49,000							
6	overflow west from golf course,lf	450	$ 50	$ 22,500					adjacent town									
				$ 1,351,100														
											$ 220,000	$ 202,665	$ 235,665	$ 2,009,430	3	$ 669,810	125	$ 5,358
Benton and Elmwood Between Maple and Randall	calcualtion under Project ranking															$ 699,762	315	$ 2,221

Local drainage Improvements project costs

Project number	Land area for flood storage	Estimated flood storage	Storm piping Directional drilling	Storm piping less than 30"	Storm Piping Greater than 30"	Roadway Paving	Land Cost	Buildiing Demolition	Closing costs	Flood Storage Cost	Costs other project components	Construction Subtotal	Design Engineering	Contingency	Project concept cost	Structures with basement flooding or worse reported	Structure Index	Impervious area	Structure indexed cost	Indexed cost/acre impervious
			$450/ft	$300/ft	$350/ft	$100/ft		$35,000/structure	$10,000/parcel	$100,000/ac-ft			15%	15%						
1	0.18	0.5		360							2-berms					1	1.1	20.5		
				$108,000			0			$50,000	$30,000	$ 188,000	$ 28,200.00	$ 28,200	$ 244,400				$ 222,182	$ 10,838
2.1				420					2							2	1.2	4.5		
				$126,000			$180,000		$20,000			$ 326,000	$ 18,900.00	$ 48,900	$ 393,800				$ 328,167	$ 72,926
2.2	1.1	2.97		60	560											5	1.5	57.1		
				$18,000	$196,000					$297,000		$ 511,000	$ 76,650.00	$ 76,650	$ 664,300				$ 442,867	$ 7,756
3			300	650												4	1.4	9.7		
			$135,000	$195,000								$ 330,000	$ 49,500.00	$ 49,500	$ 429,000				$ 306,429	$ 31,591
4	1.61	4.35		650					6							2	1.2	22.9		
				$195,000			$300,000		$60,000	$435,000		$ 990,000	$ 94,500.00	$ 148,500	$ 1,233,000				$ 1,027,500	$ 44,869
5	No Project																			
6	1.34	3					3-lots									1	1.1	14.5		
							900000	105000	30000	300,000		$ 1,335,000	$ 45,000.00	$ 200,250	$ 1,580,250				$ 1,436,591	$ 99,075
7	0.34	0.93		160					1							5	1.5	4.4		
				$48,000			50,000		$10,000	$93,000		$ 201,000	$ 21,150.00	$ 30,150	$ 252,300				$ 168,200	$ 38,227
8	0.22	0.59		160					3		berm					4	1.4	19.3		
				$48,000			600,000		$30,000	$59,000	$30,000	$ 767,000	$ 20,550.00	$ 115,050	$ 902,600				$ 644,714	$ 33,405
9											Rem. Rest.					2	1.2	7.8		
											$10,000	$ 10,000	$ 1,500.00	$ 1,500	$ 13,000				$ 10,833	$ 1,389
10	0.15	0.4	450	170					1							10	2	13.1		
			$202,500	$51,000			$350,000			$40,000		$ 643,500	$ 44,025.00	$ 96,525	$ 784,050				$ 392,025	$ 29,926
11				500		350										2	1.2	4.7		
				$150,000		$35,000						$ 185,000	$ 27,750.00	$ 27,750	$ 240,500				$ 200,417	$ 42,642
12	1.15	3.1		1050			easement				300' Fr. Dr.					3	1.3	6		
				$315,000			$80,000			$310,000	$30,000	$ 735,000	$ 98,250.00	$ 110,250	$ 943,500				$ 725,769	$ 120,962
13	1.37	3.7						2	2		open pipe					11	2.1	315		
							$600,000	$70,000	$20,000	$370,000	$150,000	$ 1,210,000	$ 78,000.00	$ 181,500	$ 1,469,500				$ 699,762	$ 2,221
14	0.42	1.19		970					3							5	1.5	9.5		
				$291,000			$120,000		$20,000	$119,000		$ 550,000	$ 61,500.00	$ 82,500	$ 694,000				$ 462,667	$ 48,702
15				820			easement-11 @ $5000				550' berm						1	2		
				$246,000			$55,000				$30,000	$ 331,000	$ 41,400.00	$ 49,650	$ 422,050				$ 422,050	$ 211,025
16	0.36	0.97	120	680					1							4	1.4	7.1		
			$54,000	$204,000			$80,000		$10,000	$97,000		$ 445,000	$ 53,250.00	$ 66,750	$ 565,000				$ 403,571	$ 56,841
99.1			70	350													1	1.6		
			$31,500	$105,000								$ 136,500	$ 20,475.00	$ 20,475	$ 177,450				$ 177,450	$ 110,906
99.2				170												2	1.2	1.4		
				$51,000								$ 51,000	$ 7,650.00	$ 7,650	$ 66,300				$ 55,250	$ 39,464

Downers Grove Stormwater Improvement Matrix

Site	Part	Service Area (acres)	Service Area in Village (acres)	Impervious Area (Acres)	Impervious Area in Village (Acres)	CN	% Impervious	10-yr Discharge (CFS)	2-yr Discharge (CFS)	Existing Outflow Type	Existing Outflow Capacity (CFS)	Percent of 10-yr Demand Met	Percent of 2-yr Capacity Met	Existing LPDA Storage (Acre-Ft)	Lag Time (min)
1	1	42.8		20.5		90.3	48%	29.3	18.6	Pipe	42.7	146%	230%	0.0	111
2	1	10.2		4.5		85.5	44%	7.3	4.6	Channel				6.2	91
	2	181.2		57.1		85.4	31%	63.7	38.0	Culvert	58.1	91%	153%	0.0	249
3	1	23.0		9.7		87.6	42%	17.2	10.7	D/W culvert	2.6	15%	24%	1.9	78
4	1	43.7		22.9		90.4	52%	30.4	19.4	Pipe	26.4	87%	136%	2.3	108
6	1	36.0		14.5		87.3	40%	19.5	12.0	Pipe	11.6	59%	96%	N/A	148
7	1	20.2		4.4		85.2	22%	11.8	6.8	Pipe/culvert	12.2	103%	179%	0.9	97
8	1	97.8		19.3		84.1	20%	31.7	18.2	Pipe	19.2	61%	106%	57.9	249
9	1	21.8		7.8		84.8	36%	12.6	7.5	Pipe	10.0	79%	133%	N/A	114
10	1	26.9		13.1		88.2	49%	16.7	10.5	Pipe	14.1	85%	135%	3.2	127
11	1	10.2		4.7		88.9	46%	6.6	4.1	Pipe	2.0	30%	49%	0.0	118
12	1	15.5		6.0		87.3	39%	8.4	5.0	None	0.0	0%	0%	6.1	132
14	1	31.0		9.5		85.9	30%	17.4	10.4	Pipe	3.8	22%	37%	0.4	119
15	1	5.8		2.0		87.0	34%	4.4	2.7	sheet flow	0	0%	0%	0.0	64
16	1	45.5	18.3	14.3	7.1	85.6	31%	20.3	12.1	Pipe	15.4	76%	127%	0.0	180
99	1	5.6		1.6		90.2	28%	4.8	3.0	sink	0	0%	0%	N/A	54
	2	3.6		1.4		89.8	39%	1.1	0.7	sink	0	0%	0%	N/A	58

FP Site	Total Watershed Area (Acres)	Watersehd Area in DG (Acres)	Impervious Area in DG (Acres)	100-year flow (CFS)	100-Year Flow Location
FP-1	790	469	193	680	Culvert under RR
FP-2	1945	800	268	643.0	Hill St/Grand Ave
FP-3	1495	350	125		
13	2063	918	315	643.0	Hill St/Grand Ave

Calculations related to Priority Need Group

Project Number	2-yr index flood=QI2	10-yr Index Flood=QI10	existing conveyance=EC	conveyance Rating Cr			Storage Rating Vr	Project Rating Pr	Rating Group	
				((1-EC/QI2)/2+ (1-EC/QI10)/2)x100%	Existing LPDA Storage=Ve	Concept Project Flood Storage=Vp	Vp/Ve	Cr+Vr	Pr/40, rounded up to whole number	Land Acq. Req'd.
1	18.6	29.3	42.7	0	0.00	0.5		0	1	1
2.1	4.6	7.3	0.0	100	6.23			100	3	
2.2	38.0	63.7	58.1	4	6.23	3.0	47.7	52	2	1
3	10.7	17.2	2.6	80	1.92			80	2	
4	19.4	30.4	26.4	7	2.30	4.4	100.0	107	3	1
6	12.0	19.5	11.6	22	4.00	3.0	75.0	97	3	1
7	6.8	11.8	12.2	0	0.94	0.9	98.9	99	3	1
8	18.2	31.7	19.2	20	57.93	0.6	1.0	21	1	1
9	7.5	12.6	5.0	47	N/A			47	2	1
10	10.5	16.7	14.1	8	3.15	0.4	12.7	20	1	
11	4.1	6.6	2.0	60	0.00			60	2	
12	5.0	8.4	0.0	100	6.14	3.1	50.5	150	4	1
14	10.4	17.4	3.8	71	0.43	1.2	100.0	171	5	1
15	2.7	4.4	0	100	0.00			100	3	
16	12.1	20.3	15.4	12	0.00	1.0		12	1	1
99.1	3.0	4.8	0	100	N/A			100	3	
99.2	0.7	1.1	0	100	N/A			100	3	

Note: 5,4=High, 3=Medium, 2,1=low