

MEMORANDUM

September 18, 2012

TO: Anne Marin – City Administrator, Prospect Heights
Steve Skiber – Director of Building and Zoning, Prospect Heights
James H. Johnson, PE – Director of Public Works and City Engineer
James O'Neill – Public Works Foreman, Prospect Heights

COPY: Donald R. Dressel, PE - CBBEL
Project Files (CBBEL Project No. 11-412)

FROM: Erik L. Gil, PE

SUBJECT: **Elm Street and Willow Road Flooding Problem Area**
Project: 2011-12 Prospect Heights Flood Study
Location: South of the intersection of Elm Street and Willow Road
Prospect Heights, Cook County, Illinois
Watershed: Tributary A to McDonald Creek

INTRODUCTION

Christopher B. Burke Engineering Ltd. (CBBEL) was retained by the City of Prospect Heights (City) to perform a flood risk reduction analysis based on the flooding that occurred from the July 22-23, 2011 storm event. The primary goals of this study were to determine the extent of the flood damage, establish possible causes for the flooding and to provide potential solutions to reduce the risk of future flooding.

This memorandum documents the analysis for the Elm Street and Willow Road Study Area. Separate memoranda will be provided for each of the other study areas, and will be assembled in a single report at the conclusion of the study.

JULY 22-23, 2011 EVENT PRECIPITATION

On July 23, 2011 the City received approximately 4.81 inches of rain in a 3-hour period that resulted in extensive flood damage in certain areas of the City. The City received 6.17 inches of rain in a 24-hour period from July 22nd to the 23rd. The rainfall totals were based on the rainfall values obtained from the gages shown in Table 1 below, which are from both the O'Hare International Airport and the Chicago Executive Airport weather gages.



TABLE 1
July 22-23, 2011 Rainfall Values

Gage ID	Location	3-hour Total (inches)	24-hour Total (inches)
04838	Chicago Executive Airport	4.71	6.06
94846	O'Hare International Airport	6.79	8.21
	<i>Weighted Average =</i>	4.81	6.17
	ISWS Bulletin 70 frequency at Prospect Heights*	100-year	40-year

*Note: The stated frequency is approximate.

Two durations were chosen for discussion purposes, the 3-hour duration and the 24-hour duration. The 24-hour duration is the traditional duration used for many engineering calculations and is the typical one reported by the media. The 3-hour duration was also chosen for comparison purposes for 2 reasons. The first is that most of the flooding problem drainage areas being evaluated in this flood study respond to significant short-duration rainfall events within or shortly after a 3-hour period, that is, the flood peak is typically reached shortly after this time period if rain is no longer falling, as was the case during July 23, 2011. The Des Plaines River, for example, would not respond as quickly to a significant short-duration rainfall event. The second reason is that the rainfall totals for the most severe continuous 3-hour period at the O'Hare International Airport gage exceeded the 100-year frequency as documented in the Illinois State Water Survey (ISWS) Bulletin 70 publication, the reference used by most regulatory agencies in the northeastern Illinois area for rainfall depth design values. The Chicago Executive Airport gage did not exceed the 100-year frequency value for the 3-hour event, but it was sufficiently close to be considered as the 100-year frequency. As can be observed, the two gage values at O'Hare International Airport and at Chicago Executive Airport differed by over 2 inches of rainfall for each of the reported totals. This meant that the July 22-23, 2011 event was a relatively localized storm event. For purposes of this study, a simple weighted average between the two gages was computed to estimate the rainfall totals that fell on the City, assigning a 95% weight to Chicago Executive Airport based on distance from the City as compared to the O'Hare International Airport, which was assigned a 5% weight.

The July 22nd-23rd storm event exceeded the capacity of the storm sewer systems in the older parts of town and resulted in street, backyard, and home flooding. Approximately 161 residents within the City filled out a flood questionnaire after the July 23rd storm event.

REFERENCES AND AVAILABLE INFORMATION

- Meetings with City staff,
- Summary provided by City staff of 161 flood questionnaires submitted by City residents,
- Site visits,
- Cook County 1-foot contour aerial topography,
- City storm sewer maps,



- Approximate high water depths provided by City staff and residents,
- United States Geological Survey (USGS) Hydrologic Atlas (HA),
- Historic Aerial Photographs,
- Federal Emergency Management Agency (FEMA) Federal Insurance Rate Maps (FIRMs)

OVERVIEW

The Elm Street & Willow Road study area is located in the south central area of the City. In general, the study area is bounded by Willow Road on the north, Pine Street on the east Circle Avenue on the west, and the drainage divide on the south with specific flooding concerns along the backyards of the homes along Willow Road and a home along Elm Street. The street map of this location is shown on Figure 1.

The study area is within the Tributary A to McDonald Creek watershed and is located within a historical depressional area. Photograph 1 shows Elm Street looking south from the 111 Willow Road property during the July 2011 event.



Figure 1
Elm Street & Willow Road
Location Map

PHOTOGRAPH 1
Elm Street Looking South (July 2011)



EXISTING DRAINAGE PATTERN

The flooding problem area is split into two watersheds. The east watershed drains overland into the depressional area just south of the intersection of Willow Road and Elm Street, which floods and impacts the adjacent homes. This depressional area and its extent can be seen on Figure 2 and Exhibit 3A. It is located on both the east and the west sides of Elm Street. The shaded area is the approximate flood limits of the July 2011 storm event. The west watershed drains overland towards the east watershed; however, approximately 10 years ago the City constructed storm sewers along Circle Avenue that now intercept most of the runoff that used to flow east and conveys flows from north to south to Olive Avenue. If this storm sewer is surcharged, then some of the runoff will begin to overflow into the east watershed and contribute to flooding the depressional area. The overall watershed divide, flooding area, storm sewers, and aerial view are shown on Exhibit 3A.



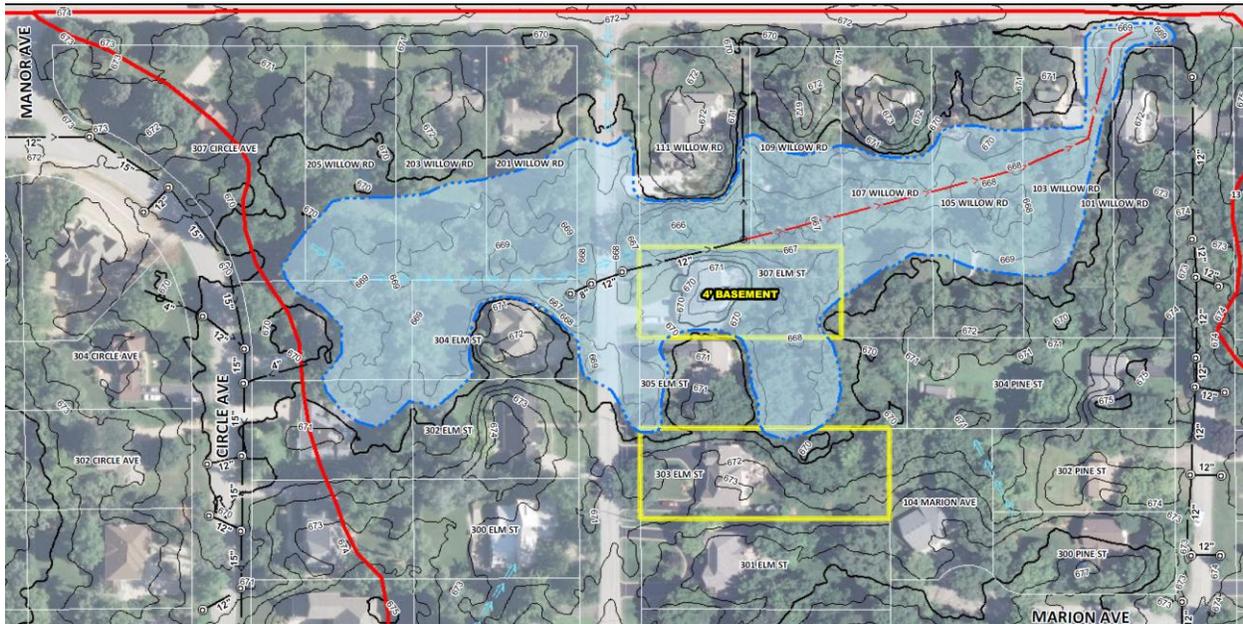


Figure 2
Elm Street & Willow Road
July 2011 Flooding

The existing drainage patterns are very similar to historic patterns that existed prior to development in this area. According to Hydrologic Investigations Atlas HA-67, Floods in Arlington Heights Quadrangle, Illinois, prepared in 1963, shown as Figure 3, there were two depressional areas within this study area prior to development. The elevation depicted on HA-67 associated with these depressional areas is 670.



Figure 3
USGS Hydrologic Atlas

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As can be seen by comparing Figure 2 to Figure 3, the size and shape of the depressional areas shown on the historic HA map are consistent with the extent of the flooding that occurred during the July 2011 event. The flooding levels observed during the July 2011 storm event are approximately equal to the enveloping contour associated with elevation 670. A field tile drains this depressional area and connects to a drainage structure located within the Willow Road ROW, just west of the intersection with Pine Street. This structure is shown on Photograph 2 (Willow & Pine structure).

PHOTOGRAPH 2
Drainage Structure at SW Corner of Willow Road and Pine Street



This structure (Photograph 2) has 2 inflow pipes and 1 outflow pipe. An 18-inch sewer from the west that conveys and drains right-of-way runoff along the south side of Willow Road and discharges into the structure, an approximate 8-inch tile from the south that drains the study area depressional area and discharges into the structure, and an approximate 8-inch tile that conveys water from the structure north. This 8-inch drain tile continues north-northeast until it discharges into McDonald Creek.



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Just based on the sizes of these pipes, the capacity to convey water away from this structure is limited.

The flooding problem area, the existing storm sewer system and the drainage divides are shown on Exhibit 3A. These streets have a rural section, that is, there is no curb and gutter, and the residential lots are approximately ½ acre in size. There are approximately 20.0 acres of land that are directly tributary to the Elm Street & Willow Road depressional area. The watershed to the west is approximately 30.8 acres in size, and while much of the flow is captured by the Circle Avenue storm sewer, there is a possibility that once the storm sewer is surcharging water can flow east towards the Elm Street & Willow Road depression.

During a rain event, water begins to collect within the low spots of the Elm Street & Willow Road depressional areas. During storm events that exceed the capacity of the drain tile system it will begin to collect and flood the low-lying areas within the depression. The prevalent flow direction is east, from Circle Avenue to Pine Street. For most moderate to heavy rain events the amount of water flowing into the depressional area is greater than its capacity to drain, therefore, water accumulates in these low areas to flooding depths that are below any well-defined spillover elevation, causing damages to the affected properties and the roadway.

Photograph 3 shows another view of Elm Street flooded during the July 2011 storm event (looking west) from the 111 Willow Road property. The photograph was taken at 9:35 am according to the digital file. Based on this photograph and Photograph 1, the approximate high water level (HWL) of the July 2011 storm event in this area is 669.5. According to the Cook County 1-foot aerial topography, the 669.5 HWL limit inundates a substantial area between Circle Avenue and Pine Street, which is shown on Exhibit 3A. This inundation is formed by a level pool from west to east.

Once water reaches the Elm Street & Willow Road depressional area, it can only drain by entering the drain tile that flows east towards the Willow Road & Pine Street structure. There is a private relief sewer shown on the City's storm sewer atlas along the 111 Willow Road property that takes water from the east depressional area to the Willow Road 18-inch storm sewer. There is no structure on Willow Road, so it is assumed that this is a blind connection. The water would have to reach elevation 670 before it would begin to overflow north across Willow Road near the outlet structure.



**PHOTOGRAPH 1
Elm Street Under Water (Looking West)**



Table 1 summarizes the 2 flood questionnaires returned in this study area.

**TABLE 2
Elm Street & Willow Road Study Area
Flood Questionnaire Summary**

Location	Questionnaires Submitted to the City	Basement Flooding (questionnaires reporting)	Basement Flooding Depth Reported (ranges)	Total Damage Reported*
Elm Street	2	1	4 feet	\$16,000
TOTAL	2	1		\$16,000

*Note: The reported damages are taken directly from the flood questionnaire.

STORMWATER DEFICIENCIES

Based on field visits, assessment of the topography, verbal communication with Public Works staff, and the limited existing storm sewer system shown on the City atlases for this area, the following stormwater deficiencies have been identified for this area:

1. The areas that flood are located within a “bowl” or depression with respect to the surrounding area. This can be clearly observed from Figure 3 that this condition existed prior to development, and from Figure 3A which shows the Cook County topography. Historically, “bowl” areas were poorly drained, and farmers installed field tiles to drain them. This “bowl” condition also indicates that most rainfall that falls on the watershed will ultimately be conveyed to the “low” spot and collect and pond if the conveyance system cannot drain the flow of runoff into it.
2. There is no storm sewer system to drain this area, just the drain tile which does not have sufficient capacity to convey the amount of runoff entering it during moderate or greater storm events as evidenced by Public Works staff and residents.
3. The private sewer along 111 Willow Road helps drain the area, but ultimately, the flow is controlled by the Willow Road & Pine Street structure. The only outlet in the structure is the 8-inch drain tile. This drain tile does not have sufficient capacity to drain the system such that flooding would not occur.
4. No dedicated overland flow path exists to drain this area. The overflow point should a larger storm event occur would be Willow Road, immediately west of the intersection with Pine Street.

APPROACH TO SOLUTIONS

This area experiences flooding because historically this area was a depression, and it appears that development did not substantially alter the grades, thereby the depression continues to collect water from the contributing areas as it has done before. While the field tile provides a means of draining this area, its capacity is exceeded for moderate to significant storm events, and the area floods. This area was developed prior to the requirement for detention storage.

The area was inundated approximately to elevation 669.5 during the July 23, 2011 storm event. The volume of water stored below this elevation is approximately 3.7 acre-feet. While sufficient field information is not available to determine the flow capacity of this field tile, the City did perform sewer cleaning operations but was not able to complete the cleaning all the way from Elm Street to the Willow Road & Pine Street structure because of blockages, either tree roots or collapsed sections, or both.

In general, structural approaches for alleviating flooding problems can be categorized into two types: storage creation, or conveyance improvements. Typically, conveyance improvements alone may cause impacts to downstream properties, and detailed modeling



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would be necessary to determine the location and magnitude of these impacts, which is beyond the scope of this study. The existing field tile is relatively old and it is probably no longer conveying water to its original capacity. Therefore, this study area stores stormwater runoff within the depression and releases it at a relatively low rate through an old drain tile.

Aside from possible public improvements, it is recommended that the City encourage all residents to flood-proof their homes, especially those who have experienced flooding in the past. This will reduce the risk of future flooding due to overland flow, seepage and sump pump failures. A list of simple and inexpensive flood-proofing measures has been included as Attachment 1 of this memorandum. This recommendation is in addition to any other drainage improvements on public or private property.

The first approach to this flooding problem area is to replace the existing drain tile with a storm sewer. Grates should be added at select locations along the backyards to accept as much flow as the storm sewer system can convey to the Willow Road & Pine Street structure. This approach will restore the original capacity of the field tile. The flow into the Cook County Highway Department (CCHD) right-of-way cannot be increased without approval by CCHD, and in addition, the outlet is still controlled by the 8-inch field tile. Therefore, the storm sewer system cannot be larger than the existing field tile unless a more comprehensive project is undertaken, as discussed under the third approach. This approach will require easements from all the properties along Willow Road between Elm Street and Pine Avenue, and the heavily vegetated backyards will be disturbed during the construction process. It should be noted that the flow based on implementing these improvements will still be controlled by the Willow Road & Pine Street structure, and that the levels of flooding would be unchanged for a storm with similar intensity as the July 2011 storm event. It is anticipated that the rate at which the flooding recedes would improve and that possibly for lesser storm events the flooding levels could be less due to the restoration of the original flow capacity of the field tile.

The second approach would be to install a relief storm sewer along Elm Street and connect it to the Willow Road 18-inch sewer, assuming that inverts allow a gravity connection. It is CCHD's policy not to allow new connection points into their drainage system that did not already drain into their right-of-way – their recommendation would be to use the existing connection at the Willow Road & Pine Street structure. Because the Willow Road right-of-way drains into the depressional area and its runoff does not appear to be effectively captured by the right-of-way drainage system, CCHD may be open to discussions for this approach. However, it is likely that the storm sewer installed along Willow Road is not deep enough to accept a connection from the depressional area. Therefore, the storm sewer along Willow Road would have to be lowered for this approach to be feasible. Alternatively, a pump station can be installed. It should be noted that any conveyance improvements will still be controlled by the Willow Road & Pine Street structure, and that the levels of flooding would be unchanged for a storm with similar intensity as the July 2011 event. It is anticipated that the rate the flooding recedes would improve and that possibly for lesser storm events the flooding levels could be less.



An ancillary measure to the above two approaches would be to add storage within the backyard areas of the properties already within the depression. This would create additional stormwater volume to store the water so that water level reached would be lower when compared to existing conditions. However, the impact to the backyards by excavating their backyards down 2 to 3 feet, the likely moist soil conditions that would be encountered and anticipated to be present nearly continuously, and the need to plat drainage easements enveloping these areas would require an almost unanimous buy-in among the impacted residents.

The third approach would be to replace the existing field tile with a larger system capable of conveying more flow, and this replacement would extend until a suitable downstream storm sewer or to McDonald Creek. The approach would incur the highest cost of all the approaches, would require detailed analysis of how much additional flow can be sent downstream and how much storage can be provided downstream to accept this flow so that no negative impacts occur to downstream properties. This approach will require coordination with residential property owners, CCHD, and depending on where storage is provided, permits from the Illinois Department of Natural Resources – Office of Water Resources and the U.S. Army Corps of Engineers may be required.

These three approaches are depicted as alternatives in the next section.

ALTERNATIVE DRAINAGE SOLUTIONS

The possible drainage solutions for the Elm Street and Willow Road study area were developed at a concept level based on feasibility of implementation and cost effectiveness. Based on this analysis, CBBEL identified the following alternatives to reduce the risk of flooding in this area:

1. As part of the on-going road bond improvements, Elm Street is identified for construction during 2012. Under this alternative, the existing drain tile below Elm Street should be televised, and if appropriate, would be replaced in-kind. The intent of this recommendation is to take advantage of the existing road resurfacing project. Furthermore, the drain tile continues east within the 111 Willow Road property. Typically, easements for drain tiles were not dedicated. However, the City can approach the property owner to determine if there is interest in that the road contractor replace the drain tile to the extent possible (as far east as possible) within the 111 Willow Road property given the relatively open space grass backyard. Access would still be from Elm Street, and should be an activity that the contractor can perform without any special measures. The contractor should be able to restore the backyard to existing conditions and not impact any trees. Extending beyond this property east would have more extensive impacts to the backyards, would require easements from multiple property owners, and would be best done as a complete project through the Willow Road & Pine Street structure (Alternative 2).



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2. This alternative would be a continuation of Alternative 1 to replace the entire length of the field tile through the Willow Road & Pine Street structure with a storm sewer. This alternative would also include cleaning the field tile downstream of the Willow Road & Pine Street structure. Easements would be required from the affected property owners, and significant impacts to the vegetation would occur. A permit from CCHD would be required to replace the field tile connection at the Willow Road & Pine Street structure.
3. This alternative would still include all of the improvements proposed under Alternative 1, but would also include a relief storm sewer along Elm Street, from the catch basin structure just east of Elm Street, north to Willow Road. This alternative would require work in the CCHD right-of-way, and a permit from them. The inverts will likely not allow a gravity connection, therefore, a pump station would be required, or the entire sewer along Willow Road through the Willow Road & Pine Street structure will need to be lowered.
4. This alternative would still include all of the improvements proposed under Alternative 1 and 2, but would also include excavating stormwater storage basins in the backyards of the multiple properties west and east of Elm Street. The approximate depth of these basins would be 2 to 3 feet below the existing ground elevations, and slope down at a 5 to 1 slope. Structures and storm sewers would need to be installed to tie into the existing system to drain these basins. Permanent Drainage easements and temporary construction easements would be required impacting at least 11 properties.
5. A more comprehensive project would involve upsizing the field tile the entire length to a suitable outlet at Elmhurst Road. The size would be determined by the feasible level-of-protection that can be achieved in combination with providing mitigating additional stormwater storage at some hydraulically connected location. The feasibility of creating mitigating storage within the sewer alignment would need to be evaluated.



RECOMMENDATIONS

Based on this analysis, CBBEL presents the pros and cons of each alternative, and provides estimated costs and a recommendation.

TABLE 3
Elm Street & Willow Road Flooding Problem Area
Alternatives Analysis Summary

Alternative	Description	Pros	Cons
1	Replace field tile under Elm Street and within 111 Willow Road	<ul style="list-style-type: none"> • Cost-effective • Work limited to City ROW and 111 Willow Road • Can be implemented this year with the road program 	<ul style="list-style-type: none"> • Will not eliminate flooding or level of inundation for any storm events • Drainage easements may be required for the replaced drain tile within 111 Willow Road
2	Replace field tile from west of Elm Street to Willow & Pine structure	<ul style="list-style-type: none"> • Will decrease amount of time road is flooded • May lower the flooding levels for smaller storms 	<ul style="list-style-type: none"> • Will not eliminate flooding or level of inundation for large storm events • Will require drainage easements • Will likely require all affected residents to agree on the project • Will require permit from CCHD
3	Alternative 1 <i>plus</i> relief sewer along Elm St to Willow Rd, and lowering Willow sewer or install pump station	<ul style="list-style-type: none"> • Will decrease amount of time road is flooded • May lower the flooding levels for smaller storms 	<ul style="list-style-type: none"> • Will not eliminate flooding or level of inundation for large storm events • Will require drainage easements • Will require permit from CCHD • Pump station is a significant cost
4	Alternative 1 & 2, <i>plus</i> excavating the backyards for more storage	<ul style="list-style-type: none"> • Will decrease amount of time road is flooded • May lower the flooding levels for larger storms 	<ul style="list-style-type: none"> • Will not eliminate flooding, but may lower level of inundation for large storm events • Will require drainage easements • Will likely require all affected residents to agree on the project • Will require permit from CCHD
5	Replace entire drain tile system	<ul style="list-style-type: none"> • Will significantly reduce flooding 	<ul style="list-style-type: none"> • Larger cost project • Will require work outside City ROW • Detailed modeling will be necessary to properly size sewer and storage to not have downstream impacts • Would likely require permits from federal and state agencies • Funding, agreements with CCHD, and permits all imply a long-term implementation time frame (at least over 1 year)

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Table 4 below provides a summary of conceptual cost estimates associated with each of the above alternatives. The detailed conceptual cost estimates can be found under Attachment 2.

TABLE 4
Elm Street & Willow Road Flooding Problem Area
Alternatives Analysis Cost Summary

Alternative	Description	Estimate Cost
1	Replace field tile under Elm Street and within 111 Willow Road	\$83,000
2	Replace field tile from west of Elm Street to Willow & Pine structure	\$225,000
3	Alternative 1 <i>plus</i> relief sewer along Elm St to Willow Rd, and lowering Willow sewer or install pump station	\$565,000
4	Alternative 1 & 2, <i>plus</i> excavating the backyards for more storage	\$635,000
5	Replace entire drain tile system	\$952,000

Based on the above, CBBEL recommends Alternative 1 be completed as part of the 2012 Road Bond program, and that Alternative 2 be explored with the residents.

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Attachment 1
Flood-proofing Techniques



TIPS ON FLOOD PREVENTION FOR HOMEOWNERS

- Clean gutters and install gutter covers to prevent clogging.
- Redefine and clear swales throughout yard to allow an appropriate drainage way for storm water runoff.
- Raise the low entry elevation at which storm water can enter your home by berming around basement doorways or windows. A pump may be required to drain water away from inside the berm.
- Verify existing sump pump and outlet pipe have sufficient capacity for discharging during intense storm events.
- Provide a relief outlet for the sump pump outside of the house that is a safe distance from the foundation in case of surcharge, frozen outlet pipe, or other blockage.
- Install a backup source of power for sump pump in case of electrical power failure.
- Extend downspouts away from the foundation 5-10 feet.
- Repair foundation cracks throughout basement to prevent seepage.
- Raise the low-entry elevation of window wells and/or install drains in the window wells and connect them to the sump pump system.
- Install glass block windows in place of basement windows (except escape window) to prevent water inflow or infiltration.
- If a storm sewer structure is adjacent to the lot, an underdrain system could be installed to collect excess runoff, any remaining seepage or any infiltration resulting from hydrostatic pressure.
- For homes with a reverse-slope driveway, raise the sidewalk elevation to reduce the risk of standing water in the street draining down the driveway and into the garage.
- To further reduce the risk of flooding for homes with reverse slope driveways, it may be necessary to convert the lower level garage into a basement and completely fill in the reverse-slope driveway.

The recommendations provided above may not eliminate flooding or flood damage within the residence; however, if installed correctly they should effectively reduce the risk of flooding. It is should also be noted that any of the recommendations may be implemented

individually, however, many suggestions may be used in conjunction with one another to provide a greater impact in helping to reduce the risk of future flood damage.

WEBSITE LINKS FOR FLOOD PREVENTION

Lake County Stormwater Management Commission Website

<http://www.co.lake.il.us/smc/citizens/default.asp>

“Repairing Your Flooded Home” by FEMA and the Red Cross

http://www.co.lake.il.us/smc/fwa/ARC_RepFloodedHome.pdf

“Drainage Around Your Home” by the National Resource Conservation Service

<http://www.co.lake.il.us/smc/citizens/drainbro.pdf>

“Homeowners Guide to Retrofitting: Six Ways to Protect Your Home from Flooding” by FEMA

<http://www.fema.gov/rebuild/mat/rfit.shtm>

“Guide to Flood Protection in Northeastern Illinois” by the Illinois Association for Floodplain and Stormwater Management

http://www.illinoisfloods.org/documents/Guide_to_Flood_Prot--March_06.pdf

Attachment 2
Cost Estimates



CHRISTOPHER B. BURKE ENGINEERING, LTD.

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Christopher B. Burke Engineering, Ltd.
 9575 West Higgins Road, Suite 600
 Rosemont, Illinois 60018
 Project # 11-412
 Date: Sept. 17, 2012

Prospect Heights, Proposed Drainage Improvements
 Elm/Willow - Alt 1

ITEMS	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
STORM SEWER, RCP 12"	FOOT	200	\$75.00	\$15,000.00
PROPOSED MANHOLE, 4'DIA	EACH	3	\$5,000.00	\$15,000.00
CLASS D PATCHES, 12 INCH	SQ YD	30	\$75.00	\$2,250.00
TRENCH BACKFILL, SPECIAL	CY	40	\$45.00	\$1,800.00
TREE REMOVAL	ACRE	0.1	\$15,000.00	\$1,500.00
TREES	EACH	4	\$500.00	\$2,000.00
TOPSOIL FURNISH AND PLACE, 4"	SQ YD	350	\$5.00	\$1,750.00
SEEDING WITH EROSION CONTROL BLANKET	SQ YD	350	\$5.00	\$1,750.00
TRAFFIC CONTROL	LSUM	1	\$5,000.00	\$5,000.00
CONSTRUCTION LAYOUT	LSUM	1	\$2,000.00	\$2,000.00
CATCHBASIN	EACH	1	\$4,000.00	\$4,000.00
CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	20	\$40.00	\$800.00

SUB TOTAL = \$52,850.00
 CONTINGENCY (30%) = \$15,855.00
 CONSTRUCTION TOTAL = \$68,705.00
 DESIGN ENGINEERING (10%) = \$6,870.50
 CONSTRUCTION OBSERVATION (10%) = \$6,870.50

TOTAL PROJECT COST INCLUDING ENGINEERING = \$82,446.00

NOTE: THIS ESTIMATE DOES NOT INCLUDE ROW ACQUISITION, TEMPORARY OR CONSTRUCTION
 EASEMENTS, OR RELOCATING ANY UTILITIES

Christopher B. Burke Engineering, Ltd.
 9575 West Higgins Road, Suite 600
 Rosemont, Illinois 60018
 Project # 11-412
 Date: Sept. 17, 2012

Prospect Heights, Proposed Drainage Improvements
 Elm/Willow - Alt 2

ITEMS	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
STORM SEWER, RCP 12"	FOOT	750	\$75.00	\$56,250.00
PROPOSED MANHOLE, 4'DIA	EACH	5	\$5,000.00	\$25,000.00
CLASS D PATCHES, 12 INCH	SQ YD	30	\$75.00	\$2,250.00
TRENCH BACKFILL, SPECIAL	CY	40	\$45.00	\$1,800.00
TREE REMOVAL	ACRE	0.4	\$15,000.00	\$6,000.00
TREES	EACH	10	\$500.00	\$5,000.00
TOPSOIL FURNISH AND PLACE, 4"	SQ YD	1600	\$5.00	\$8,000.00
SEEDING WITH EROSION CONTROL BLANKET	SQ YD	1600	\$5.00	\$8,000.00
TRAFFIC CONTROL	LSUM	1	\$10,000.00	\$10,000.00
CONSTRUCTION LAYOUT	LSUM	1	\$5,000.00	\$5,000.00
CATCHBASIN	EACH	1	\$4,000.00	\$4,000.00
CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	20	\$40.00	\$800.00

SUB TOTAL =	\$132,100.00
CONTINGENCY (30%) =	\$39,630.00
CONSTRUCTION TOTAL =	\$171,730.00
DESIGN ENGINEERING (10%) =	\$17,173.00
CONSTRUCTION OBSERVATION (10%) =	\$17,173.00
PERMITTING (5%) =	\$8,586.50
EASEMENTS (2 LOTS)=	\$10,000.00

TOTAL PROJECT COST INCLUDING ENGINEERING = \$224,662.50

NOTE: THIS ESTIMATE INCLUDES A COST OF \$5,000 PER EASEMENT REQUIRED. ESTIMATE DOES NOT INCLUDE ANY PRIVATE UTILITY RELOCATIONS

Christopher B. Burke Engineering, Ltd.
 9575 West Higgins Road, Suite 600
 Rosemont, Illinois 60018
 Project # 11-412
 Date: Sept. 17, 2012

Prospect Heights, Proposed Drainage Improvements
 Elm/Willow - Alt 3

ITEMS	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
STORM SEWER, RCP 12"	FOOT	500	\$75.00	\$37,500.00
PROPOSED MANHOLE, 4'DIA	EACH	4	\$5,000.00	\$20,000.00
CLASS D PATCHES, 12 INCH	SQ YD	230	\$75.00	\$17,250.00
TRENCH BACKFILL, SPECIAL	CY	320	\$45.00	\$14,400.00
TREE REMOVAL	ACRE	0.1	\$15,000.00	\$1,500.00
TOPSOIL FURNISH AND PLACE, 4"	SQ YD	400	\$5.00	\$2,000.00
SEEDING WITH EROSION CONTROL BLANKET	SQ YD	400	\$5.00	\$2,000.00
TRAFFIC CONTROL	LSUM	1	\$1,000.00	\$1,000.00
CONSTRUCTION LAYOUT	LSUM	1	\$2,500.00	\$2,500.00
CATCHBASIN	EACH	1	\$4,000.00	\$4,000.00
CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	50	\$40.00	\$2,000.00
PUMP STATION	LSUM	1	\$225,000.00	\$225,000.00

SUB TOTAL =	\$329,150.00
CONTINGENCY (30%) =	\$98,745.00
CONSTRUCTION TOTAL =	\$427,895.00
DESIGN ENGINEERING (10%) =	\$42,789.50
CONSTRUCTION OBSERVATION (10%) =	\$42,789.50
PERMITTING (5%) =	\$21,394.75
EASEMENTS (6 LOTS)=	\$30,000.00

TOTAL PROJECT COST INCLUDING ENGINEERING = \$564,868.75

NOTE: THIS ESTIMATE INCLUDES A COST OF \$5,000 PER EASEMENT REQUIRED. ESTIMATE DOES NOT INCLUDE ANY PRIVATE UTILITY RELOCATIONS

Christopher B. Burke Engineering, Ltd.
 9575 West Higgins Road, Suite 600
 Rosemont, Illinois 60018
 Project # 11-412
 Date: Sept. 17, 2012

Prospect Heights, Proposed Drainage Improvements
 Elm/Willow - Alt 4

ITEMS	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
STORM SEWER, RCP 12"	FOOT	800	\$75.00	\$60,000.00
PROPOSED MANHOLE, 4'DIA	EACH	5	\$5,000.00	\$25,000.00
CLASS D PATCHES, 12 INCH	SQ YD	30	\$75.00	\$2,250.00
TRENCH BACKFILL, SPECIAL	CY	40	\$45.00	\$1,800.00
TREE REMOVAL	ACRE	1.2	\$15,000.00	\$18,000.00
TREES	EACH	10	\$500.00	\$5,000.00
TOPSOIL FURNISH AND PLACE, 4"	SQ YD	5700	\$5.00	\$28,500.00
SEEDING WITH EROSION CONTROL BLANKET	SQ YD	5700	\$5.00	\$28,500.00
EARTH EX	CY	5000	\$30.00	\$150,000.00
12" FES	EACH	2	\$500.00	\$1,000.00
RIPRAP	SQ YD	100	\$100.00	\$10,000.00
TRAFFIC CONTROL	LSUM	1	\$10,000.00	\$10,000.00
CONSTRUCTION LAYOUT	LSUM	1	\$5,000.00	\$5,000.00
CATCHBASIN	EACH	2	\$4,000.00	\$8,000.00
CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	20	\$40.00	\$800.00

SUB TOTAL =	\$353,850.00
CONTINGENCY (30%) =	\$106,155.00
CONSTRUCTION TOTAL =	\$460,005.00
DESIGN ENGINEERING (10%) =	\$46,000.50
CONSTRUCTION OBSERVATION (10%) =	\$46,000.50
PERMITTING (5%) =	\$23,000.25
EASEMENTS (6 LOTS)=	\$60,000.00

TOTAL PROJECT COST INCLUDING ENGINEERING = \$635,006.25

NOTE: THIS ESTIMATE INCLUDES A COST OF \$10,000 PER EASEMENT REQUIRED. ESTIMATE DOES NOT INCLUDE ANY PRIVATE UTILITY RELOCATIONS

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 9575 West Higgins Road, Suite 600
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 Project # 11-412
 Date: Sept. 17, 2012

Prospect Heights, Proposed Drainage Improvements
 Elm/Willow - Alt 5

ITEMS	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
STORM SEWER, RCP 12"	FOOT	3000	\$75.00	\$225,000.00
PROPOSED MANHOLE, 4'DIA	EACH	6	\$5,000.00	\$30,000.00
CLASS D PATCHES, 12 INCH	SQ YD	2000	\$75.00	\$150,000.00
TRENCH BACKFILL, SPECIAL	CY	1500	\$45.00	\$67,500.00
TREE REMOVAL	ACRE	0.1	\$15,000.00	\$1,500.00
TOPSOIL FURNISH AND PLACE, 4"	SQ YD	1600	\$5.00	\$8,000.00
SEEDING WITH EROSION CONTROL BLANKET	SQ YD	1600	\$5.00	\$8,000.00
WATER SERVICE RELOCATIONS	FOOT	200	\$45.00	\$9,000.00
SANITARY SERVICE RELOCATIONS	FOOT	200	\$45.00	\$9,000.00
TRAFFIC CONTROL	LSUM	1	\$30,000.00	\$30,000.00
CONSTRUCTION LAYOUT	LSUM	1	\$5,000.00	\$5,000.00
12" FES	EACH	1	\$500.00	\$500.00
RIPRAP	SQ YD	10	\$100.00	\$1,000.00
CATCHBASIN	EACH	1	\$4,000.00	\$4,000.00
CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	20	\$40.00	\$800.00

SUB TOTAL =	\$549,300.00
CONTINGENCY (30%) =	\$164,790.00
CONSTRUCTION TOTAL =	\$714,090.00
DESIGN ENGINEERING (10%) =	\$71,409.00
CONSTRUCTION OBSERVATION (10%) =	\$71,409.00
PERMITTING (5%) =	\$35,704.50
EASEMENTS (1 LOT)=	\$60,000.00
TOTAL PROJECT COST INCLUDING ENGINEERING =	\$952,612.50

NOTE: THIS ESTIMATE INCLUDES A COST OF \$10,000 PER EASEMENT REQUIRED. ESTIMATE DOES NOT INCLUDE ANY PRIVATE UTILITY RELOCATIONS