# Village of Libertyville

# Master Stormwater Management Plan

# February 2019

Prepared for:

Village of Libertyville

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**Acre – Feet (ac-ft)** – Flood volumes are typically quantified in acre-feet. One acre-foot is the volumetric equivalent of an acre of land that is flooded one foot deep.

**Base Flood Elevation (BFE)** – The BFE is the water surface elevation of the 1% annual chance flood.

**Design Storm Event -** The term "10-year storm" is used to define a rainfall event recurrence interval that statistically has the same 10% chance of occurring in any given year. **Table 1** shows the recurrence and statistical probability of a storm happening in a given year.

| Recurrence Interval in Years | Probability of Occurrence in any Given Year | Percent Chance of Occurrence in any Given Year |
|---|---|---|
| 100 | 1 in 100 | 1 |
| 10 | 1 in 10 | 10 |
| 5 | 1 in 5 | 20 |
| 2 | 1 in 2 | 50 |

**Table 1. Design Storm Statistics**

**Hydraulic Grade Line (HGL)** – The HGL is the surface or profile of water flowing in a storm sewer flowing partially full. The HGL represents the piezometric head (datum head + pressure head) of a flowing fluid. HGL can be obtained for open channel flow, as well as for pipe flow. If a pipe is under pressure, the hydraulic grade line is the elevation that the water rises to on the ground surface or the line that the water level would rise to in a small, vertical tube connected to the pipe.

**Level of Flood Protection -** This is design storm associated with the elevation at which a structure begins to flood.

**Level of Service** – For this study, the level of service or capacity of a drainage system (including, storm sewers, overland flow paths, drainage swales, open channels and detention basins) refers to the point at which the system begins to surcharge. The surcharged drainage system refers to the condition where stormwater begins to collect in the streets, side yards, overland flow paths and low areas. Storm sewers provide a level of service up to street flooding for a design storm.

**RCBC** – Reinforced Concrete Box Culvert

**RCP** – Reinforced Concrete Pipe

**Structure Low Entry Elevation –** The elevation equal to the elevation at which a structure begins to flood.

**Tailwater** – The water surface in the recioeving system downstream of an outlet pipe. Flow from the outlet pipe can decrease if the tailwater level exceeds the normal of the outlet.

**XP-SWMM** – XP-Software Stormwater and Wastewater Management Model (XP-SWMM) is an unsteady flow, dynamic modeling program that determines the hydrologic response (runoff mode) from a storm event and routes the runoff through a storm sewer network (hydraulic mode).

**Zone A – Special Flood Hazard Area** – FEMA defines Zone A as a SFHA subject to inundation by the 1% annual chance flood with no defined elevation.

**Zone AE – Special Flood Hazard Area** – FEMA defines Zone AE as a SFHA subject to inundation by the 1% annual chance flood with a defined elevation.

**Zone X – Other Flood Areas** – A Zone X is defined as an area of 0.2% chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

# LIST OF APPENDICIES

# EXECUTIVE SUMMARY

Due to localized surface flooding in numerous locations during moderate to heavy rain fall events, the Village of Libertyville (Village) has initiated the development of a village-wide Master Stormwater Management Plan (Master Plan) to identify and develop proposed flood reduction projects to the drainage problems throughout the Village. The methodology for analyzing the storm sewer system for the Master Plan included a comprehensive survey of the storm sewer system, resident meetings, hydrologic and hydraulic modeling of the existing drainage system, identification of system limitations and development of proposed drainage improvements. The proposed drainage improvements in this Master Plan can be incorporated into the Village's current infrastructure projects, green infrastructure and long term capital improvement projects. During the commencement of the study for the Master Plan, the Village experienced a large storm event in July 2017 which recorded over 7 inches of precipitation in 12 hours prompting village-wide flooding. Online flood questionnaires were made available to every resident through the Village website and water bills. Christopher B Burke Engineering, Ltd. (CBBEL) also collected additional first-hand accounts of flooding from residents by going door to door following the historic July 2017 storm event. There were 165 responses to the mailed flood questionnaire and 465 responses to the door-to-door damage assessment. A resident open house was held in September 2017 where approximately 175 residents attended. Overall the outreach effort generated over 800 total responses.

CBBEL identified 10 Flood Study Areas (FSA) where detailed analyses were performed for each FSA. CBBEL developed and calibrated hydrologic and hydraulic models for each FSA using the detailed accounts and pictures from residents. The modeling was verified based on the high water marks observed during the July 2017 storm event. The existing drainage systems in some of the FSAs have approximately a 2-year level of service before street flooding begins with other areas having less than 10-year level of flood protection before structures begin to flood. CBBEL developed proposed drainage improvements to provide a minimum 10-year level of service in the storm sewer and strive to protect all structures (provide a level of flood protection) up to the 100-year design storm event. Long term capital improvement projects include increasing storm sewer sizes, adding relief storm sewers and incorporating stormwater storage. A conceptual engineer's estimate of probable cost for each of the proposed drainage improvement alternatives was prepared. These long term capital improvements projects range in cost from $44 to $75 Million. Based on discussions with the Village, the recommended proposed improvements are summarized in Table 2.

| Flood Study Area | Engineer's Estimate of Probable Cost (2018 Dollars) | Proposed Level of Flood Protection |
|---|---|---|
| Burdick and Ames | $7.6M | 50-Year |
| Rockland Road | $7.3M | 100-Year |
| Winchester/Interlaken/Stonegate | $12.1M | 100-Year |
| Copeland Manor | $6.5M | 100-Year |
| Ellis Avenue | $5.2M | 100-Year |
| Appley Avenue | $800K | 100-Year |
| Liberty Bell Lane and 4th Avenue | $4.4M | 100-Year |
| Harding and Willow | $15K | 100-Year |
| Carriage Hill | $915K | 100-Year |
| Lange and Cook | $706K | 100-Year |
| TOTAL | $45.5M | |

**Table 2. Summary of Proposed Improvements per FSA**

# CHAPTER 1 PROJECT OVERVIEW

## 1.1 INTRODUCTION

The Village of Libertyville (Village) has historically experienced street and structure flooding throughout the Village resulting from a wide range of storm events with varying degrees of intensity and duration. To effectively address the stormwater and flooding issues, the Village has retained Christopher B. Burke Engineering, Ltd. (CBBEL) to develop a Village-wide Master Stormwater Management Plan (Master Plan) to identify and develop proposed flood reduction projects to the drainage problems throughout the Village. The Master Plan presents the results of an extensive stormwater management investigation of the storm sewer system within the Village.

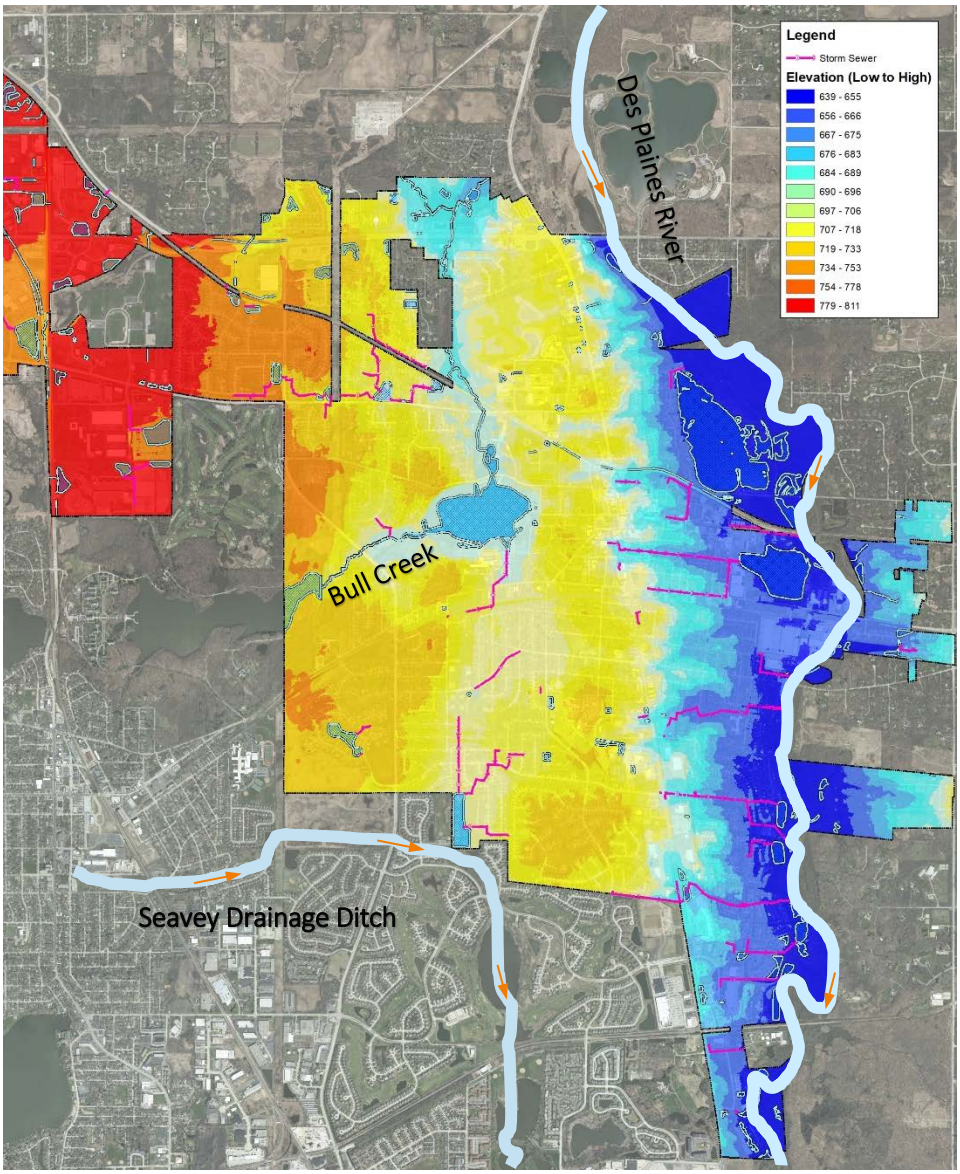



**Figure 1. Village of Libertyville Existing Trunk Sewers and Topography**

The Village is located entirely within the Des Plaines River Watershed which flows north to south through the east side of the Village. Drainage is handled by a separate storm sewer system and a series of lakes, rivers, ponds, storm sewers and other systems that convey water toward the Des Plaines River. The majority of the Village is either tributary directly to the Des Plaines River or to Bull Creek, a major subwatershed within the Des Plaines River Watershed. A small portion of the Village drains south to Seavey Drainage Ditch (Figure 1) which drains south to Indian Creek before outletting to the Des Plaines River south of IL Rte. 22 in the Village of Lincolnshire.

## 1.2 PURPOSE AND SCOPE

The purpose of this Master Plan is to present the findings of detailed analyses and provide recommended improvements in a prioritized manner that will:

- Reduce existing flood/drainage problems, including structure and street flooding,
- Prevent an increase in existing flood/drainage problems as redevelopment occurs, and
- Help preserve and enhance stormwater quality.

This Master Plan includes detailed hydrologic and hydraulic modeling of specifically targeted study areas to identify flood damages and existing bottlenecks in the existing stormwater conveyance system. The detailed modeling was used to identify optimal locations and sizes for capital drainage improvement projects. The scope of the Master Plan includes the identification of projects that provide an optimum level of service in each of the targeted areas. The optimum level of service refers to the most cost-effective project design that provides the most benefits for a given return interval design storm event (10-year, 25-year, 50-year or 100-year).

The outline of this Master Plan is such that all background discussion for the study development, assumptions, modeling techniques and proposed improvement development occurs in the front portion of the document. The background discussion is followed by detailed discussions with exhibits, modeling results and proposed improvements for 10 areas as separate sections. The approach to each study area is similar and was developed using the methods outlined in this report.

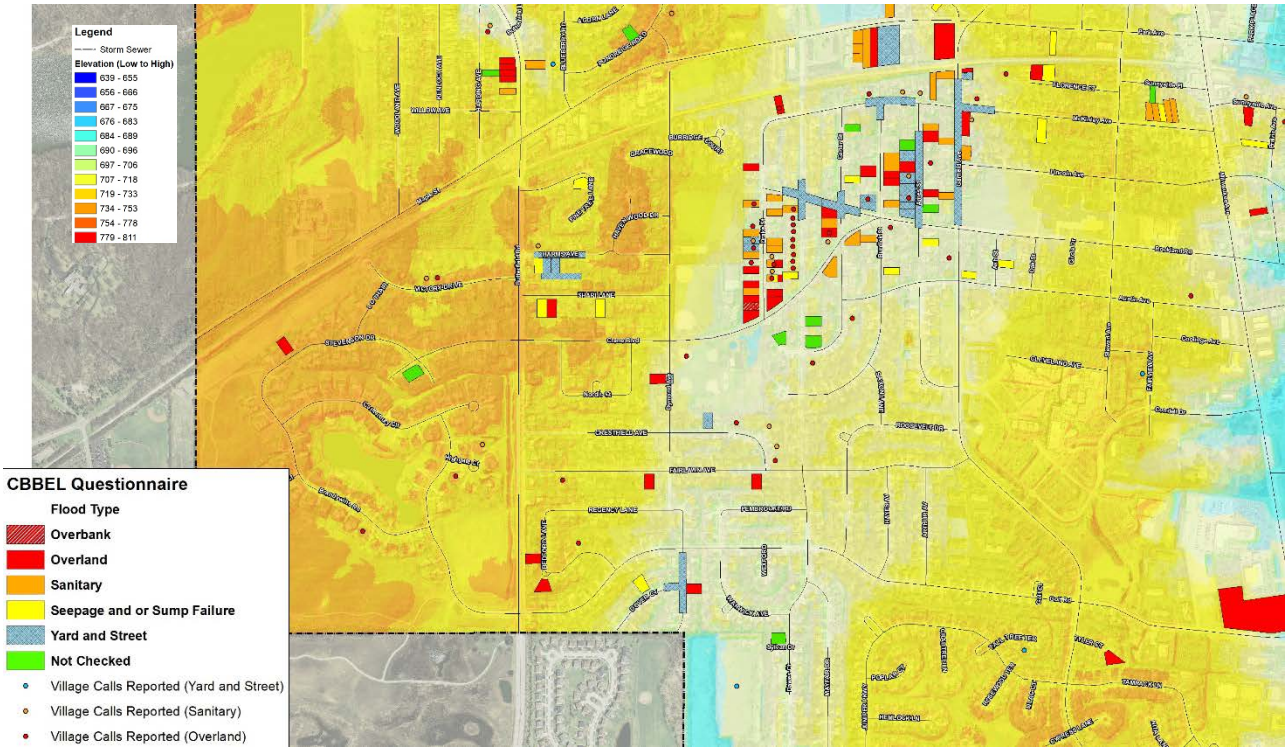



**Figure 2. Compilation of Questionnaire Data (representation)**

# CHAPTER 2 STUDY DEVELOPMENT

During the commencement of this study, the Village experienced a large storm event (July 12-13, 2017), which recorded over 7 inches of precipitation in 12 hours, prompting village-wide flooding. While the Village has experienced flooding in the past, the July 2017 storm event proved to be the storm of record for the Village, which was determined to be approximately a 130-year design storm by Lake County Stormwater Management Commission (SMC).

## 2.1 DATA COLLECTION

Participation from Village staff, decision-makers, and the public were essential to understanding the flooding and drainage issues throughout the Village. This input is necessary to identify the extent and type of flooding problems (overland flow, street flooding, yard flooding, seepage, etc.). The extent and nature of known existing stormwater conditions and concerns in the Village were identified through various means including discussions with the Village Engineering staff, Public Works staff, Trustees, public meetings, as well as interview and questionnaire distribution to residents.

### 2.1.1 Village Staff and Public Involvement

Online flood questionnaires were made available to every resident through the Village website and water bills. CBBEL also collected additional first-hand accounts of flooding from residents by going door to door following the historic July 2017 storm event. There were 165 responses to the mailed flood questionnaire and 465 responses to the door-to-door damage assessment. The door-to-door damage assessment was in support of the Illinois Emergency Management Agency's (IEMA) response to the wide-spread regional flooding from the July 2017 storm event in an effort to quantify damage for disaster relief.

During the 2017 storm event, the Village received numerous calls and made village-wide observations while fielding approximately 75 resident calls and responses. Additionally, CBBEL staff conducted field inspections to observe flooding, interview residents, take pictures and collect data such as High Water Marks (HWM) during the July 2017 storm event.

A resident open house was held in September 2017 where approximately 175 residents attended. Public notice was also posted to promote residents to review, identify and explain problem areas on maps and exhibits throughout the Village. This was demonstrated at the open house where residents spoke to Village and CBBEL staff. Residents were given the ability to mark-up maps and indicate what/where flooding had been experienced in the past and during the July 2017 storm event.

CBBEL also reviewed numerous accounts, videos and photographs of flooding from Village staff and residents, as well as reviewed applicable Village plans, codes, GIS data, previous studies and construction documents. The information shown in Figure 2 is a representation of the information compiled from the residents that provided information at the open house, questionnaires and door to door surveys. Overall the outreach effort generated over 800 total responses. It is noted that flooding is widespread and not limited to only the information obtained from resident questionnaires. As noted throughout this Master Plan, detailed consideration has been taken to quantify the full extent of the flooding problems throughout the Village.

### 2.1.2 Storm Sewer Data Collection


**Figure 3. GIS Database Village of Libertyville Existing Sewer Network**

The Village maintains a database of storm sewer, sanitary sewer and watermain information. The Village also maintains as-built plans of subdivisions including detention basins, detention pond outlet control structures and other detailed information that is readily available. CBBEL and our subconsultant Jorgensen & Associates also collected additional site-specific field survey to supplement missing information. This information was compiled into a GIS database and used for detailed model development (Figure 3).

### 2.1.3 Floodplain Maps

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panels 162,164, 166 and 168, for Lake County and Incorporated areas, effective September 18, 2013; the east portion of the Village contain Zone AE Special Flood Hazard Areas (SFHA) and Zone X (Other Flood Areas) associated with the Des Plaines River (Figure 4). FEMA defines Zone AE as a SFHA subject to inundation by the 1% annual chance flood with a defined elevation.

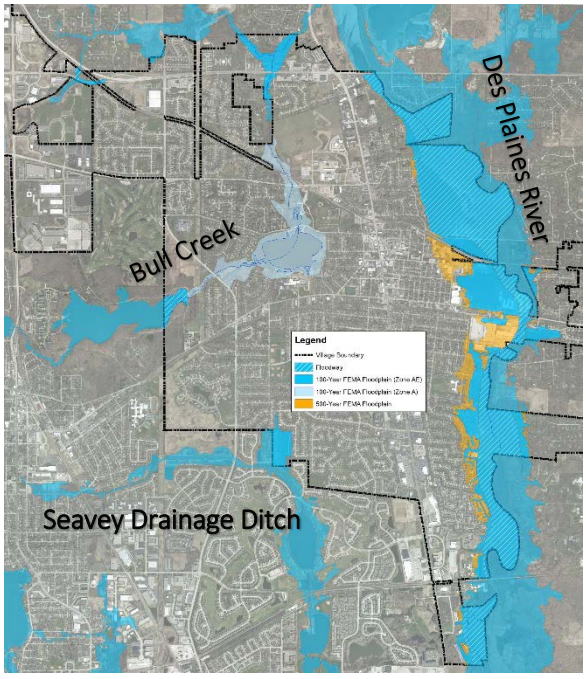



**Figure 4. Adapted from the Lake County FEMA FIRM – Libertyville Study Area**

The Village is susceptible from overbank flooding in low areas along the Des Plaines River. The Zone AE SFHA shown on the FIRM for the areas along the banks of the Des Plaines River includes both residential areas as well as non-residential or commercial areas.

According to the FEMA FIRM panels 161 and 162 for Lake County and Incorporated areas, effective September 18, 2013; the west portion of the Village contain Zone A (SFHA) associated with Bull Creek (Figure 4). SMC has completed a study to determine the BFE of Bull Creek through the Village. The Bull Creek study provides the water surface elevations in Bull Creek for the 10-, 25-, 50- and 100-year design storms. The south portion of the Village, Charles Brown Park contains Zone AE floodplain associated with Seavey Drainage Ditch. The areas adjacent to Charles Brown Park and Bull Creek in the Village are largely residential areas that are susceptible from overbanks flooding from these watercourses (Figure 4).

## 2.2 IDENTIFICATION OF FLOOD STUDY AREAS

By combining the historically known flood problem areas with the wide spread flooding areas seen following the July 2017 storm event, CBBEL created a GIS database to identify Flood Study Areas (FSA) throughout the Village. CBBEL combined the Village storm sewer and utility database with questionnaire data to create a GIS database. The GIS database combines all of the flood questionnaire data and firsthand accounts to provide a tool that displays flooded areas, "hot spots", areas of concentrated overland flooding, type of flooding experienced, etc. Using the database, Village and CBBEL staff conducted multiple meetings to identify these areas, which are a result of the compilation of CBBEL issued flood questionnaires, door-to-door IEMA issued damage assessments and a list of calls fielded by Village staff during and following the July 12th, 2017 storm event. The following study areas are based on the initial flood reduction project list provided by the Village and a meeting between Village and CBBEL staff on October 21, 2017. These study areas have also been configured with respect to the existing stormwater management system and outfall serving each system. The Flood Study Areas (FSAs) are shown on Figure 5 and listed below.

- Winchester / Interlaken / Stonegate – Areas (1,5,6,7,9,10) north of Winchester Road between Butterfield Road extending east to Bull Creek. Also included with this area are the following areas south of Winchester Road:
  - Sherborne Court
  - Wellington Avenue
  - Interlaken Lane
  - Stonegate Road
  - Wilshire Drive
- Copeland Manor – Areas (2&17) including Glendale Road:
  - 7th Avenue
  - 4th Avenue
- Burdick & Ames – Area (3) including Highlands Subdivision:
  - Dymond Road, Shari Lane, Crane Boulevard, Burdick Street, Ames Street, Drake Street, Dawes Street, Carter Street (Etc.)
  - Charles Brown Park
- Ellis East and West Avenue – Areas (8&14) including:
  - Sandstone Drive
  - *East Winchester (Parliament Court to Lake Minear)
- Appley – Area (11) including 2nd Street and Oak Spring Road
- Rockland – Areas (12&13) including:
  - 2nd Avenue extending east to the Des Plaines River
  - Windsor Terrace, Meadow Lane, 7th Avenue, Riverside Drive
- Liberty Bell and 4th Avenue – Areas (15&18)
- Lange and Cook – Area (16) including Elm Drive
- Carriage Hill
- Harding and Willow – Area west of Butterfield Road and north of IL-176

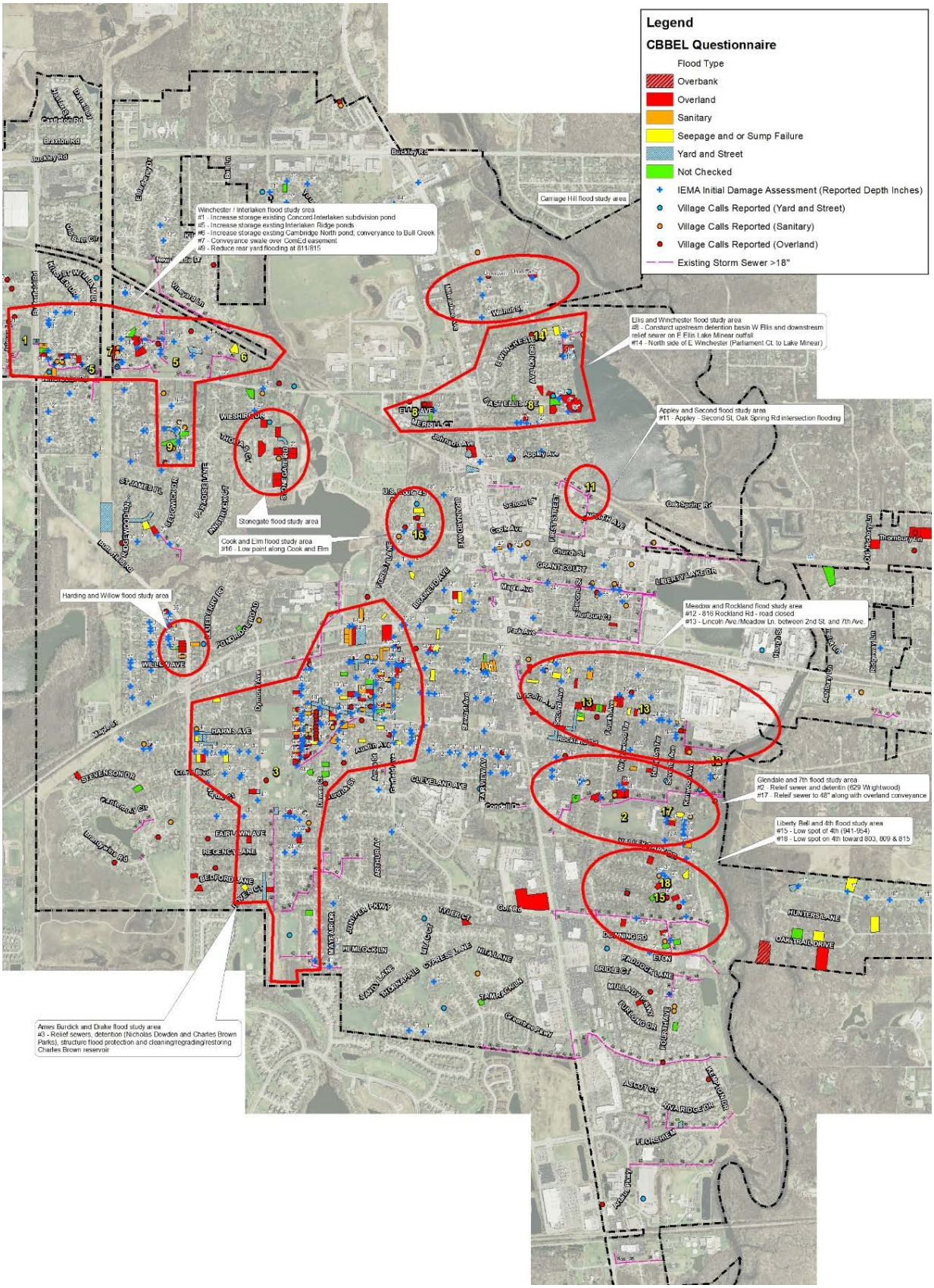



**Figure 5. Flood Study Areas – Village of Libertyville**

The naming convention for FSA are intended to be a general location description of the roadways that bound areas and should not be considered the limits of the detailed study for flood reduction measures. The methodology for analyzing the stormwater management system for each FSA follows a holistic approach to capture interactions with adjacent subbasins and the total tributary areas to areas of concern. This process included the collection of the storm sewer system plans, supplemental storm sewer survey collection, resident meetings, firsthand accounts, detailed hydrologic and hydraulic modeling of the existing drainage system, identification of system limitations and development of proposed drainage improvements.

## 2.3 FACTORS CONTRIBUTING TO FLOODING

The Village has older sections of town that were developed prior to modern stormwater management practices as well as newer sections built after implementation of the Lake County Watershed Development Ordinance (WDO). In general, with the exception of Interlaken Ridge, Concord at Interlaken, Cambridge and Stonegate Subdivisions along Winchester Road, the newer sections have much fewer drainage problems for smaller storm events. The drainage problems in the older sections consist of insufficient stormwater storage, overland flow routes and storm sewer conveyance. In some cases, the storm sewer conveyance systems are clay drain tiles or other antiquated pipes that are failing. Storm events that exceed a few inches of rain in a short time period cause significant street, yard and residential structure flooding. These problem areas are also compounded by the fact that there is high demand for residential lots in older sections and teardowns are common during the redevelopment process. The newer homes are generally larger than the previous homes, generate more runoff and are perceived by the surrounding neighbors as a significant contribution to the flooding problem. The Village has adopted Appendix P of the Village Code to address increased runoff from residential lot construction.

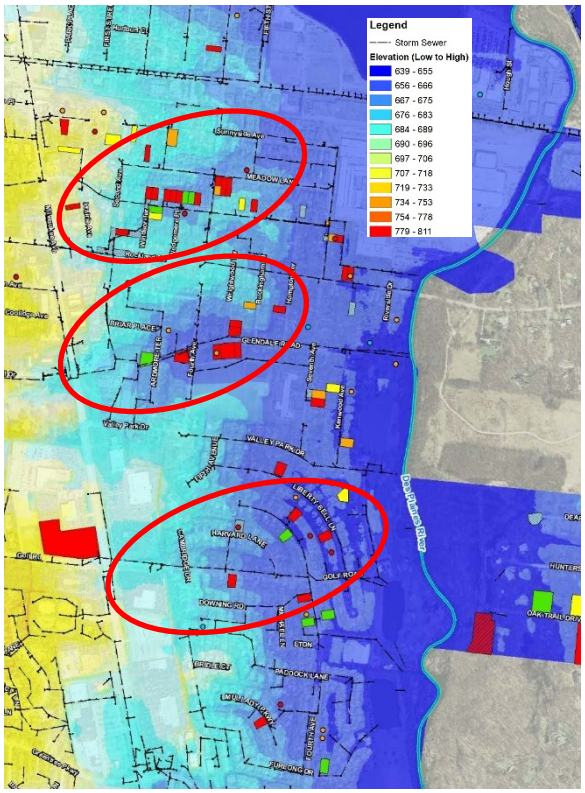



**Figure 6. Historical Overland Flow Paths Blocked & Limited Open Space**

In the areas that experience flooding, there is limited stormwater storage, insufficient overland flow routes and the storm sewer system was not designed based on current rainfall standards. Figure 6 shows a common occurrence on the east side of the Village where historic drainage ways leading to the Des Plaines River are blocked by residential structures. In addition, the older residential structures were not constructed sufficiently high in comparison to the streets, leading to flooding once the flood depth in the street exceeds the curb. The flooding can result from water entering basement window sills, stair wells, first floor openings, footing drains or excessive seepage from severely saturated ground adjacent to the home.

The land use throughout the Village is composed of high-density residential areas with small lot sizes and minimal open space. These conditions which result in the significant flooding experienced by the Village during severe storm events also contribute to the difficulties in retrofitting the existing system to reduce the risk of future flooding. There are very few open places where excess runoff can be directed and stored; specifically, in the older sections of the Village.

## 2.4 STORMWATER AND SANITARY SEWER INFLOW AND INFILTRATION

Runoff in the Village is drained by a separate storm sewer system where stormwater is conveyed in a different system than the sanitary flow. Inflow and infiltration (I & I) are terms used to describe the ways that groundwater and stormwater enter into sanitary sewer systems. Dedicated wastewater or sanitary sewers are pipes located in the street or on easements that are designed strictly to transport sanitary wastewater from homes or places of business to a wastewater treatment plant.

Inflow is stormwater that enters into sanitary sewer systems at points of direct connection to the system including footing/foundation drains, roof drains, downspouts, drains from window wells, outdoor basement stairwells, drains from driveways, groundwater/basement sump pumps, etc. These sources are typically improperly or illegally connected to sanitary sewer systems. Excessive standing water on the streets and yards from severe rainfall events can exacerbate the inflow in the sanitary system.

Infiltration is shallow groundwater from saturated soils that enters sanitary sewer systems through cracks and/or leaks in the sanitary sewer pipes. Cracks or leaks in sanitary sewer pipes or sanitary manholes may be caused by age related deterioration, loose joints, poor design, installation or maintenance errors, damage or root infiltration. Groundwater can enter these cracks or leaks when the soil above the sewer systems becomes saturated from excess runoff standing for prolonged periods. Infiltration can also be compounded when sanitary and storm sewer lines have been constructed in the same trench. During extreme rainfall events, the storm sewer system can become surcharged and pressurized. The pressurized storm sewer has the ability to push water out of the storm sewers and into neighboring sanitary lines.

When I & I enters the sanitary sewer, it takes up space that is required for the wastewater and can quickly cause an overloaded sanitary sewer system to back up during significant rain events. The proposed improvements to improve capacity of the Village's existing storm sewer system will alleviate the potential for stormwater flooding to contribute to I & I.

# CHAPTER 3 EXISTING CONDITION XP-SWMM MODEL ANALYSIS

## 3.1 EXISTING CONDITION HYDROLOGIC AND HYDRAULIC MODEL DEVELOPMENT

An XP-Software Stormwater and Wastewater Management Model (XP-SWMM) was created for each FSA. The XP-SWMM software is a dynamic modeling program that determines the hydrologic response (runoff mode) from a storm event and routes the runoff through a storm sewer network (hydraulic mode). The XP-SWMM software was chosen for the analyses for its ability to simulate overland flows and surface storage in combination with a storm sewer network to identify localized flooding problems.

### 3.1.1 Subbasin Delineation

The Village's utility database, additional pick-up survey areas and plan information was combined with the 2007 Lake County 1-foot aerial topography in the GIS database. The tributary area in each of the FSA's were delineated and subdivided into subbasins ranging in size from 2 acres to 50 acres based on storm sewer data, land use and aerial topography. More specific detail was used in areas where drainage boundaries were required to capture known drainage problems identified by Village staff and residents on a block by block basis.

### 3.1.2 Land Use

Hydrologic parameters including area, Runoff Curve Number (RCN) and Time of Concentration (Tc) were calculated using the National Resource Conservation Service (NRCS) TR-55 methodology based on topography and land use using current aerial photography for each of the subbasins. The directly connected impervious areas in each subbasin were identified using digital shapefiles and assigned appropriately. The land use was characterized using a combined land use cover shapefile created from shapefiles provided by Lake County and a hydrologic soil group shapefile. The RCN value calculated for non-directly connected impervious areas of each subbasin was based on the ratio of impervious to pervious area in the subbasin for a particular hydrologic soil group.

### 3.1.3 Data Entry

CBBEL entered the hydrologic parameters, trunk and lateral storm sewers (survey) into the XP-SWMM software. In addition to the storm sewer network, overland flow paths and depressional storage areas were entered into the model using Lake County 1- foot aerial topography. CBBEL also entered the appropriate tailwater elevation to represent the associated receiving waters, including the Des Plaines River 10-year flood elevation.

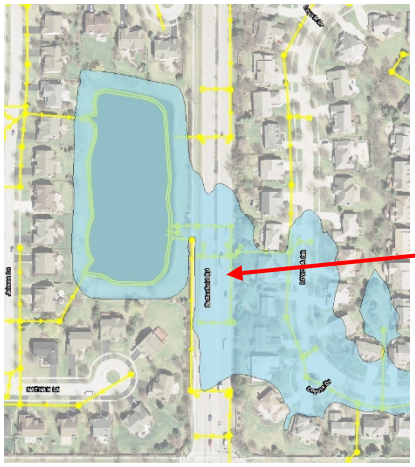
### 3.1.4 Existing Condition Modeling Calibration

The purpose of the XP-SWMM analysis is to simulate the existing storm sewer system, overland flow system, storage areas and the interactions between these components to identify system bottlenecks and evaluate proposed drainage system improvements. Prior to completing these analyses, it is important that the model

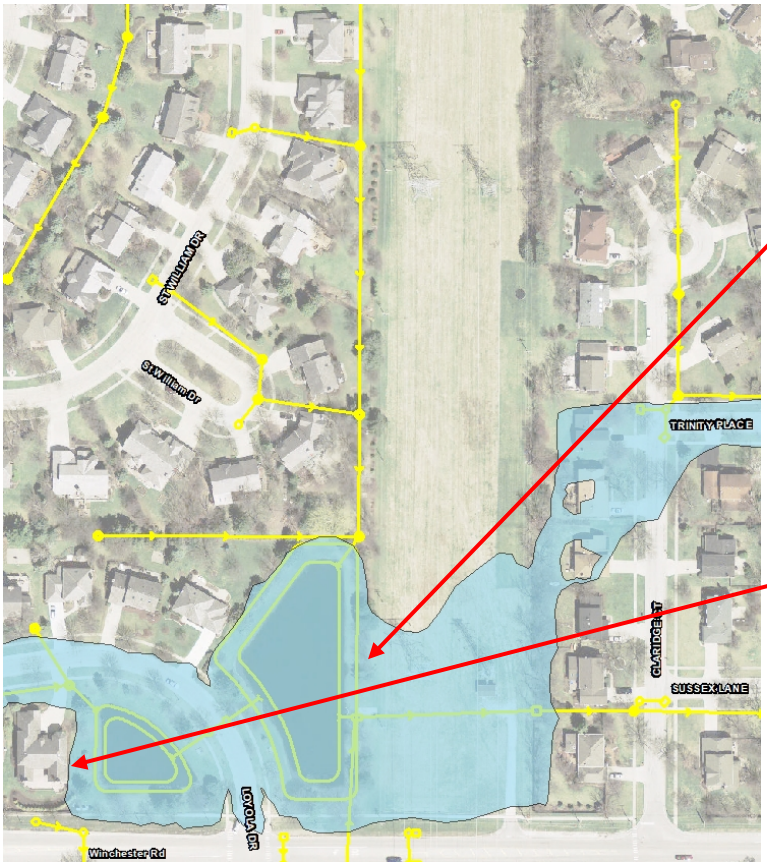
be calibrated to known storm events. For this study, the firsthand accounts and photographs collected from the July 2017 storm event proved to be an invaluable tool during the calibration process.

This field data was combined with measured precipitation rainfall data for the July 2017 storm event and entered into the XP-SWMM model. The simulated high-water marks throughout the Village, within each FSA were compared to observed high water marks. As part of the calibration process, the RCNs and $T_c$ were modified until the peak of the output hydrographs from the XP-SWMM analysis reasonably matched the observed high-water mark. This was done by reducing the calculated RCNs by approximately 18% and increasing the calculated Tc throughout each study area for the land use component only.

The elevations of the high water-marks used for calibration were determined through comparing resident and staff photographs with aerial photography and the Lake County 1-foot aerial topography. Debris lines in photographs and videos were identified and the elevation calculated from the aerial topography. Additional detail for this process was obtained by using the original detailed LIDAR data to create a digital terrain model (DTM) in GIS where elevations of a specific location shown on an aerial photograph could be assigned an elevation to the nearest tenth of a foot. A few examples of locations where the calibration was verified are shown in Figure 7.



Butterfield Road Overflow




Commonwealth Edison ROW

Western Interlaken Ridge Pond: Facing West
Estimated High Water Mark = 716.7'

**Figure 7. July 2017 Inundation Areas and XP-SWMM Analysis – Verification of Results**

## 3.2 CRITICAL DURATION AND DESIGN STORMS

Following the calibration process, a critical duration analysis was completed using the XP-SWMM model for each FSA. The critical duration was determined utilizing rainfall depths published in the Rainfall Frequency Atlas of the Midwest, by the Midwestern Climate Center and the Illinois State Water Survey (ISWS) Bulletin 71 and Huff rainfall distributions. The critical duration refers to the duration of a storm that produces maximum water surface elevations, flood depths or flow rates for each FSA. For example, the 100-year critical duration analysis included executing the XP-SWMM model for the 1-hour through 48-hour duration storm events. The storm event producing the highest flood elevation is the critical duration storm event, and all proposed improvements are then designed for the critical duration storm. There are multiple FSAs for which an XP-SWMM analysis was completed, therefore each FSA is independent and has independent critical durations. This will be discussed further in the Master Plan for each FSA. Upon completion of the critical duration analysis, the XP-SWMM model was run for the 2-year through 100-year return interval for the critical duration storm events in each FSA.

The rainfall depths published in Bulletin 71 for design storms are the design standards used throughout northeast Illinois to design stormwater infrastructure and are referenced in most local and county ordinances. The rainfall data used in the statistical analysis to develop the rainfall depths is based on measured rainfall data collected from 1901-1980 and does not include more recent storm events. Based on rainfall data collected by Lake County since 2011, the measured intensity of 5 large storm events has exceeded the 10-year design frequency and one of those storms has exceeded the 100-year design frequency when compared to Bulletin 71 rainfall depths. This recent trend of measured rainfall data suggests that higher intensity storm events are occurring more frequently, and this trend is anticipated to continue. Based on a study conducted by CBBEL, when recent rainfall data (1985-2013) is included in the statistical analysis for design storm return intervals, rainfall depths used for design are shown to increase. The ISWS is scheduled to release new rainfall depths in 2019, which are expected to be higher than current rates.

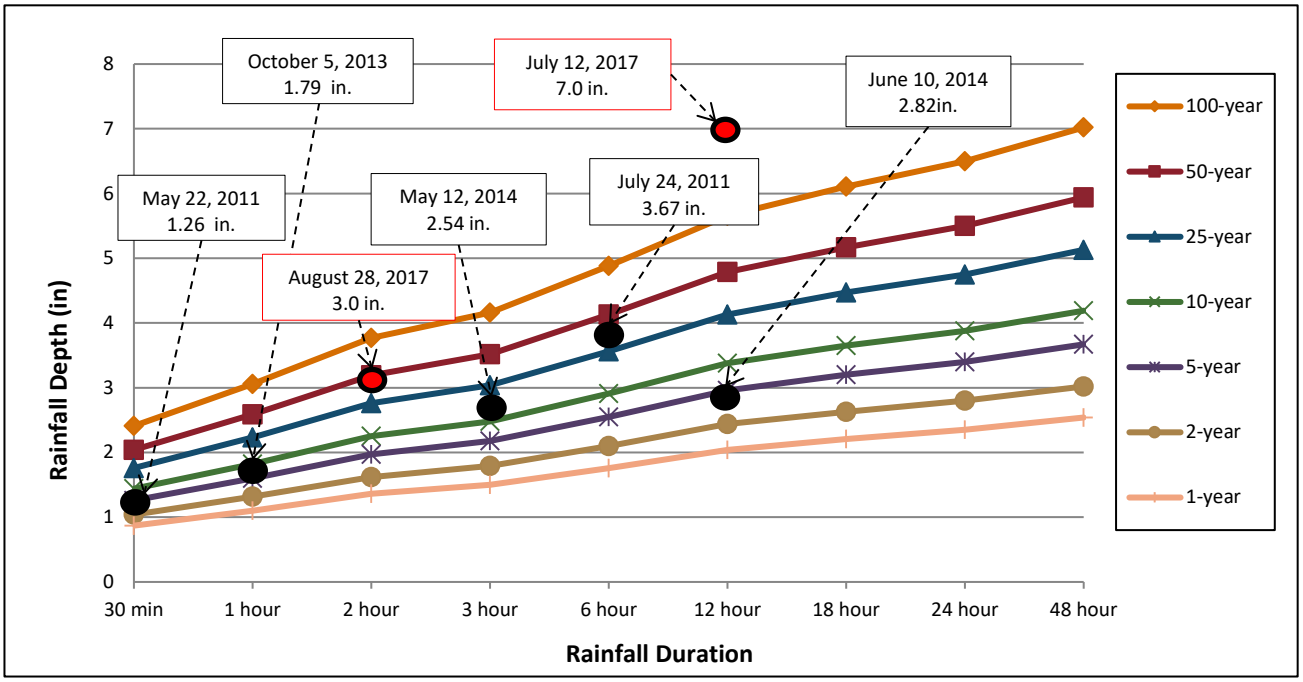



**Table 3. Lake County Libertyville Rain Gage Data Compared to Illinois State Water Survey Bulletin 70**

## 3.3 MODEL RESULTS

A distinction has been made to define the **level of service** or capacity of the existing storm sewer system. Throughout this Master Plan, the level of service or capacity of a storm sewer refers to the point at which the systems begin to surcharge, which means stormwater begins to collect in the streets because the storm sewer is at capacity. Using this criteria, CBBEL determined that the many of the storm sewers throughout the FSAs have a 2-year level of service. Therefore, the Village's existing storm sewer system can convey runoff from less than 2 inches of rain over a 1- to 3-hour period before the storm sewer begins to surcharge and stormwater begins to collect on the streets in the lowest areas.

CBBEL used the critical duration water surface elevations from the calibrated XP-SWMM analysis to create existing condition inundation maps for the 10-, 50-, and 100-year design storms as well as the July 2017 storm event for each of the FSAs. The inundation maps were combined with Village flood response maps and flood questionnaire responses from the open houses to identify specific flooding impacts within each FSA. The existing condition inundation areas for each FSA is discussed further in the Master Plan for each FSA.

### 3.3.1 Estimated Number of Structures Impacted by Flooding

CBBEL determined elevations of individual structures using elevations derived from the Lake County 1-foot aerial topography and survey data. The aerial topography was developed using LIDAR or Light Detection and Ranging technology. CBBEL used the LIDAR data to create a digital terrain model (DTM) to assign an elevation to a structure and determine the low entry elevation for the structure. A desktop GIS analysis was used to determine the number of structures impacted by flooding through overland flow entering the structure. A structure is considered impacted by flooding when the water surface elevation of the surrounding water exceeds the lowest entry elevation of a structure and the water can enter the structure through a window well, low opening, front door, etc.

The **low entry elevation** of the structures in this analysis was determined using the Village structure footprint boundary layer overlaid onto the DTM created for the Village. The lowest elevation from the DTM, inside each structure footprint was assigned to that structure. This elevation plus 1 foot was determined to be the low entry elevation per methodologies used in previous detailed watershed plans and master stormwater management plans. The low entry elevation was compared to the XP-SWMM results to determine if the structure on the property was impacted by flooding for a particular design storm. Therefore, if the water level got to this elevation (a foot above the lowest structure elevation) the structure was considered impacted. The design storm that produces a water surface elevation exceeding the low entry elevation is the **level of flood protection** with respect to structure flooding. This methodology was confirmed by reviewing multiple properties within the study areas. A discussion of the structures impacted in each FSA is provided further in this Master Plan.

It should be noted that this represents an estimate of the number of structures impacted by overland flow. A separate analysis was completed based on a comparison between the flood elevation and the lowest property elevation, and the number of properties impacted was significantly higher compared to the number of structures impacted.

## 3.4 QUANTIFICATION OF EXISTING DAMAGES FOR BENEFIT COST ANALYSIS

CBBEL created an Illinois Department of Natural Resources (IDNR) – Office of Water Resources (OWR) Damages model for each of the FSAs. The IDNR Damages model, currently in version 4.31, is an economic modeling tool published by IDNR-OWR and used to determine the average annual flood damages for a structure from return interval storm events.

The IDNR Damages model compares peak water surface elevations for various return interval storm events and low entry elevations with stage-damage data for each structure to calculate average annual flood damages. The water surface elevations were extracted from the existing condition XP-SWMM analysis. The stage-damage data were obtained from USACE curves.

Additional items included in the damage analysis input include indirect damages (15% which is intended to capture traffic damages), time for capitalization (50 years), the interest rate for capitalizing damages (2.25%, Federal Discount Rate for 2018) and the default contents value as a percentage of the structure value (35%). These values are consistent with IDNR-OWR methodology for calculating damages due to flooding. The structure value and structure type (two story, ranch, etc.) was extracted from the Lake County Assessor's Office and is based on 2018 assessments. The existing condition damages for each FSA is discussed further in the Master Plan for each FSA.

# CHAPTER 4 PROPOSED IMPROVEMENTS

Upon concurrence and verification of the existing condition inundation areas, CBBEL developed proposed drainage improvements that will allow the storm sewer system to provide a minimum 10-year level of service and strive to protect all structures (provide a level of flood protection) up to the 100-year design storm event. The proposed 10-year level of service goal will reduce the hydraulic grade line in the storm sewer network below the street elevations for the 10-year critical duration design storm event, which is similar to current WDO standards.

The proposed drainage improvements to achieve this goal include long term drainage improvement projects and include significant improvements to the drainage system for each FSA.

## 4.1 LONG TERM DRAINAGE IMPROVEMENTS

CBBEL identified long term capital improvement projects for each FSA that include increasing storm sewer sizes, adding relief storm sewers and incorporating stormwater storage to reduce flooding from the 10-year design storm below the street elevation and provide residential structure protection for larger events. These generally included new stormwater storage basins, relief sewers and overland flow routes. A concept plan was prepared for each improvement alternative. These long-term improvements were analyzed with the XP-SWMM model to determine the effect on peak water surface elevations and to verify that the proposed drainage projects did not negatively impact downstream areas. A delineation of the proposed condition 10-, 25-, 50-, and 100-year flood inundation areas for each alternative in each FSA was created to quantify the structures removed, properties removed, reduction of street flooding and overall reduction in flood depths. The proposed water surface elevations were entered into the Damage model to determine the reduction in flood damages (benefits) resulting from the proposed improvements. The proposed condition improvements can be seen in the detailed discussion for each of the FSAs.

### 4.1.1 Engineer's Estimate of Probable Cost

A conceptual engineer's estimate of probable cost for each of the proposed drainage improvement alternatives was prepared. There are many unknowns including soil conditions, utility conflicts and right-of-way limits that will affect the ultimate design and cost of the improvements. Because of this, the engineer's estimate of probable cost includes a 20% contingency. Permitting, design and construction engineering for each project has also been included in the estimates as a percentage of the total cost of the project.

**Figure 8. Typical Storm Sewer Construction**

In preparation of the conceptual engineer's estimate of probable cost, CBBEL has completed a unit price analysis utilizing recently submitted bid prices from eleven awarded CBBEL projects in various municipalities in the Chicagoland area to develop applicable unit prices for the proposed improvements in the Village. These

eleven projects were used to develop estimated unit prices as they are similar in scope and size to the improvements identified for this Master Plan.

Average unit prices were adjusted for inflation from each of the respective bid dates to 2018 equivalent values during calculation. Inflation values were based on monthly inflation rates retrieved from www.statbureau.org, which were calculated using the US Consumer Price Index.

CBBEL calculated the quantities for the improvements based on the assumptions below:

- The patching width shall be the width of the storm sewer trench (per the IDOT trench backfill table) plus one additional foot on each side.
- Roadways with proposed storm sewers 60" in diameter and greater are shown to be completely reconstructed. If the proposed storm sewers are smaller than 60" in diameter then we assumed patching and resurfacing on the streets unless additional utilities need to be relocated due to the proposed storm sewer.
- The Surface Course is 2-inches, Binder Course is 4-inches, and Aggregate Base Course is 12-inches for roadways to be reconstructed.
- The Surface Course is 1.5-inches and the Leveling Binder is 0.75-inches for resurfaced roadways.
- Pavement Removal is for reconstructed roadways only; roadways to be resurfaced will receive a 2-inch surface removal.
- Aggregate Subgrade Improvement, Removal and Disposal of Unsuitable Material, and Geotechnical Fabric for Ground Stabilization are 5% of the reconstructed pavement.
- Trench backfill was calculated for proposed storm systems only; water/sanitary mains and services are included in those unit prices.
- Roadways with proposed storm sewer larger than 48" will have a parallel sanitary sewer installed.
- Roadways with a proposed box culvert or elliptical storm sewer will have a new water main installed.
- Each roadway intersection with a proposed storm sewer includes 200 feet of concrete curb and gutter removal and replacement, 400 square feet of concrete sidewalk removal and replacement, and the installation of 80 square feet of detectable warnings, 4 inlets (Inlet, Type A, High Capacity Frame and Grate), and 100 feet of lateral 12" RCP storm sewer.
- Each flared end section of proposed storm sewer includes 10 square yards of riprap with filter fabric.
- Each location where proposed storm sewer crosses an existing sewer line or water main includes 50 feet of that utility to be removed and replaced during installation.
- Boring pits for augured pipes are assumed to be 30' long x 20' wide.

The detailed engineer's estimates of probable costs developed for each alternative in each study area are in included in in the following corresponding Appendices for each FSA.

### 4.1.2 Benefit / Cost Ratio

A benefit cost ratio (BCR) was calculated for each project in each FSA using the difference between the existing damage dollar amount and the proposed damage dollar amount (benefit), divided by the engineer's

estimate of probable cost the project. CBBEL determined existing damage values that a structure is expected to experience for multiple flood events using the IDNR Damages software (described in Section 3.4). The benefit is a result of constructing the proposed flood reduction project where damages have been removed by lowering water surface elevations. This was verified using the XP-SWMM analyses for purposed conditions and entering the proposed water surface elevations for each storm event.

The benefits of a project are calculated as the difference between the existing average annual flood damages and the proposed average annual flood damages. This value divided by the cost of the project is the BCR.

The BCR is an indicator that in this case is used to summarize the overall value the proposed project. It should be noted that some of the cost associated with flooding that are not included in this analysis are:

- Displacement costs
- Land enhancement benefits as a result of a flood control project
- Flood insurance costs

In addition to the benefits quantified in through the BCR, capital projects provide many benefits that cannot readily be quantified. These benefits include:

- Reduction in:
  - Street flooding: improved emergency access during storm events would be realized by reducing the frequency, depth and duration that street flooding occurs.
  - Yard flooding
  - Infiltration and inflow into the sanitary sewer system
  - Basement seepage
- Increased property values

## 4.2 RESIDENTIAL STRUCTURE FLOOD PROOFING

It is anticipated that the level of flood protection in the Village could also be increased through flood-proofing of residential structures by homeowners and this is strongly encouraged. Flood-proofing of residential structures is the single most cost effective measure that can be completed to protect homes from flooding. A few of these measures include:

- Overhead sewer: This can greatly reduce the occurrence of sanitary sewer backup into a structure. An overhead sewer consists of an ejector pit, ejector pump and backflow valve. All plumbing drains in the basement are directed to the new ejector pit and pumped into the building drain. The overhead sewer system reconfigures the existing sanitary plumbing system inside a residence such that the lowest elevation that the main sanitary line leaving the structure is above the ground elevation or above the above the basement floor, typically along the basement ceiling which is overhead. In this system, the sanitary pit and pump are installed indoors so less maintenance is required, and there is nothing installed in the service line that has potential to get stuck or obstruct the line.

- Sanitary backflow valve: Valve that allows water to flow in one direction, but automatically closes when the direction of flow is reversed. When the HGL in the sanitary sewer line exceeds the adjacent basement floor elevation, the check valve will engage preventing sanitary backup into the basement.
- Sump pump with battery backup: In the event of an electrical outage during a flood, a battery backup to provide power to the sump pump is recommended to prevent basement flooding.

**Figure 9. Window Well Elevation**

- Directing downspouts away from structures: Downspouts that outlet near a structure allows stormwater to infiltrate and collect against the foundation resulting in seepage and/or additional strain on the sump pump. Directing downspouts away from the structure is a simple flood-proofing measure to help reduce the amount of water against the foundation.
- Raising window wells or other low entry points: Raising the window wells and low entry points increases the level of flood protection around a home by blocking overland flood access into the structure (Figure 9).

Completing these flood-proofing measures in homes that are susceptible to flooding can provide a level of freeboard above the street flooding elevation that will significantly improve the effectiveness of the long-term capital improvement projects to be discussed in this report. Additional flood proofing measure and specific details area provided in Appendix 12.

## 4.3 GREEN INFRASTRUCTURE

### 4.3.1 Green Infrastructure Improvements

**Figure 10. Green Road**

Over the last 20 years many communities throughout our region have increased sustainability by adding green infrastructure to their toolkit of approaches for the management of stormwater. Green infrastructure techniques include using vegetation to control stormwater, restoring wetlands to retain floodwater, installing permeable pavement to mimic natural hydrology, and using or capturing and re-using stormwater more efficiently on site. By attempting to mimic natural hydrologic functions, such as infiltration and evaporation, these approaches prevent stormwater from flowing into surface waters or storm sewer systems already under great stress using natural features. Green infrastructure is typically used to compliment or assist traditional stormwater management practices and is not meant to replace traditional grey stormwater management practices. Although green infrastructure practices cannot single-handedly mitigate the flooding during extreme storm events, they provide a reduction in stormwater runoff volumes and improve water quality. Green infrastructure should be an integral part of stormwater management strategies given the cost-effectiveness of green approaches across a variety of categories. On a national scale, policies that favor or stimulate the wider adoption of green infrastructure strategies have been gaining notoriety while providing opportunity and available financial resources.

CBBEL has identified areas where green infrastructure could be implemented throughout the Village. Recommendations of types and locations are as follows:

- Green roads
  - Future Village projects as warranted (Figure 10)
- Rain gardens in the Village and open spaces
- Rain barrels and downspout disconnection
  - Program for downspout disconnection and rain barrel assistance (Figures 11 and 12)
  - Limited to private property
- Permeable pavement
  - Pilot program in business districts or alleys

**Figure 11. Downspout Disconnection**

**Figure 12. Rain Barrel**

### 4.3.2 Green Infrastructure Limitations

Green infrastructure systems have a growing record of reducing runoff from smaller and more frequent rain events. However, these systems do not target low-frequency, high-volume rainfall events. Care should be taken to realize that while green infrastructure can be used to compliment a stormwater management system for frequent storm events, flooding will continue throughout the Village from extreme rainfall events due to the undersized storm sewer system. Many green infrastructure practices rely on high infiltration rates. The Village's predominantly high clay soil content throughout make green infrastructure initiatives that rely on infiltration very difficult.

It is important to understand the magnitude of the flooding problem in the Village, the capacity of the existing storm sewer network and the relation of limitations of green infrastructure. In typical urban flood problem areas, the storage volumes required to reduce the flood depths to an acceptable level are significant. Flood volumes are typically quantified in acre-feet. One acre-foot is the equivalent of an acre of land that is flooded one foot deep. Comparing runoff volumes for a 0.25 acre lot in the Village to volumes provided by green infrastructure, the limitations of green infrastructure are apparent:

- Capacity limitations
  - A single 0.25 acre lot in the Village would generate up to 37,200 gallons of runoff during the July 2017 storm event:
    - 677 rain barrels (55 gallons each) per property are required to store this water
  - 1 acre-ft of flood storage equals:
    - 5,925 rain barrels (55 gallons each)
    - 8,250 feet of green alleys (0.08 acre-feet per 660 ft block)
    - 2,520 feet of roadway with pervious pavement

The construction of green infrastructure techniques like green streets and rain gardens also has a heavy reliance on the in-situ soils for infiltration. Soil amendments to achieve proper infiltration rates to meet performance stands can increase construction costs and are limited in effectiveness by the underlying soils. Roadway jurisdictions and requirements can also limit the use and increase construction cost of green streets. Vegetation used in rain gardens and bio retention areas also requires establishment and maintenance.

# CHAPTER 5 PROPOSED PROJECT DISCUSSION

This Master Plan identifies long term capital improvement projects for each of the FSAs. The recommended projects are described in the following sections.

## 5.1 WINCHESTER / INTERLAKEN / STONEGATE – AREAS (1,5,6,7,9,10)

### 5.1.1 Limitations of Existing System – Cause of Flooding

This area is combined into three sub-areas as the main trunk storm sewer, system of ponds and road side ditches interact with one another and are hydraulically connected. The existing and proposed analyses for these areas must be all inclusive to avoid unintended downstream impacts while providing the optimal benefit for the entire system. The existing level of service of the storm sewer system is a 10-year design storm while the level of flood protection is a 25-year design storm event. Some areas tributary to this system (north of Winchester Road) have a higher level of flood protection.

**Figure 13. Claridge Drive Overflow July 2017**

*Winchester Road:* The area north of Winchester Road drains from west to east to Bull Creek through a system of storm sewers and detention ponds. The detention basin west of Butterfield Road (Concord at Interlaken Subdivision) has a large tributary area and overflows during a 100-year storm event (Figure 14). During the July 2017 storm event, the detention pond overtopped Butterfield Road and the overflow meandered through the downstream subdivision (Interlaken Ridge Subdivision) along Loyola Drive causing structure flooding (Exhibit 1).

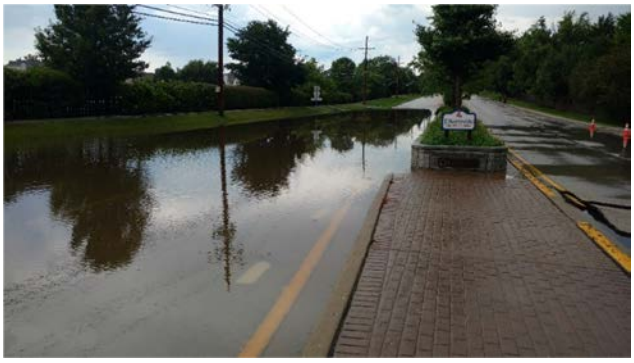


**Figure 14. Butterfield Road Overtopping July 2017**

The downstream receiving storm sewer system through the Interlaken Ridge subdivision along Loyola Drive as well as the detention basins on either side of Loyola Drive (at Winchester Road) have insufficient capacity based on the current WDO. The detention basins (Interlaken Ridge Subdivision) at the east end of Loyola Drive also overtopped (Figure 15), east into the Commonwealth Edison right of way before flooding the rear yards and structures along Claridge Drive downstream in the Cambridge Subdivision


**Figure 15. Loyola Pond Overtopping July 2017**

(Figure 13). The overflow from the east Loyola Pond overtopped the pond embankment rather than the concrete weir as originally designed (Figure 15). The embankment and weir are currently in poor condition. Historical overland flow paths through this area have been replaced with storm sewers and residential structures that block the flow path to Bull Creek. The resulting overland flow routes are through residential side yards with insufficient capacity. Overall there is insufficient storm storage within watershed and limited available open space for significant new storage.

*Interlaken Lane:* This area south of Winchester Road has insufficient storm sewer capacity based on current WDO standards. The storm sewer system drains north through the Interlaken Woods and Sherborne Subdivisions before discharging the detention basin north of Winchester Road in the Cambridge Subdivision (Exhibit 1). The rear yards along Interlaken Lane are low in comparison to the pavement elevation along Interlaken Lane. Storm sewer surcharge first occurs in rear yards and the overland flow route out of rear yards is above home elevations causing structure flooding.

**Figure 16. Detention Basin East of Stonegate Road July 2017**

*Stonegate Road:* The storm sewer system draining this area flows north and east into the existing detention basin at the north end of Stonegate Road. The existing detention basin drains east into Bull Creek and the tailwater condition from Bull Creek prevents the detention basin from discharging while water surface elevations are high during large storm events (Figure 16). The detention basin and the storm sewer system serving the area do not meet current WDO standards. The existing detention basin outfall has also deteriorated and is in need of repair. During large storm events, the existing storage within the basin is not effectively accessed and offsite drainage from the north and west currently bypasses the detention pond. Runoff coming to the Stonegate Road detention from the north is from the Winchester Road storm sewer surcharging as well as the undersized Wilshire Court detention basin overtopping to the south (Exhibit 2). The Wilshire Court detention basin is located south of Winchester Road in the rear yards of the residences at the northeast corner of Wilshire Court. The overtopping of the Wilshire Court detention basin to the south causes additional runoff directed south toward the Stonegate Road detention basin. The homes at the east end of Wilshire experience frequent rear yard flooding resulting from this inter-basin flow to Bull Creek.

### 5.1.2 Winchester/Interlaken/ and Stonegate Proposed Improvements

CBBEL developed two alternatives for this area to provide a 50-year and 100-year level of flood protection for the entire study area. The proposed improvements in this area are hydraulically connected are not independent of one another.

The 50-year Level of Flood Protection improvements are shown Exhibits 3 and 4 and include the following:

- Revise the restrictor of the Windhaven Road detention basin immediately south of the Interlaken Ridge ponds. Install a new storm sewer line just east of ComEd R.O.W. to drain the depressional area within the R.O.W.
- Reestablish the overflow for the east Loyola Pond to meet existing elevations across the length of the berm with a clay core and overflow weir.
- Install a new large diameter relief storm sewer from Windhaven Road along Winchester Road to the eastern Cambridge North Subdivision detention basin.
- Install new storm sewer to drain Wilshire Court detention basin, routing flow to the eastern Cambridge North Subdivision detention basin. Reconstruct the outfall at Cambridge North Subdivision detention basin.
- Upsize the storm sewer along Interlaken Lane and in the rear yards extending to Sherborne Court. Tie the two existing storm sewer systems along Sherborne Court together as they are currently separated. Install new storm sewer to drain Sherborne Court detention basin north and outlet into the proposed storm sewer along Winchester Road.
- Upsize the storm sewer discharging into the existing detention basin on Stonegate Road. Reconstruct the detention basin overflow and outlet control structure Stonegate Road detention basin.

The 100-year Level of Flood Protection improvements are shown Exhibits 5 and 6 and include the following:

- Install a new overflow structure and modify existing restrictors at Concord-Interlaken Subdivision detention pond (west of Butterfield Road).
- Install a new large diameter relief storm sewer from Concord-Interlaken Subdivision detention pond along Butterfield Road and Winchester Road to the eastern Cambridge North Subdivision detention basin.
- Revise the restrictor of the Windhaven Road detention basin immediately south of the Interlaken Ridge detention ponds. Install a new storm sewer line just east of ComEd R.O.W. to drain the depressional area within the R.O.W.
- Reestablish the overflow for the east Loyola Pond to meet existing elevations across the length of the berm with a clay core and overflow weir.
- Install new storm sewer to drain Wilshire Court detention basin, routing flow to the eastern Cambridge North Subdivision detention basin. Reconstruct the outfall at Cambridge North Subdivision detention basin.
- Upsize the storm sewer along Interlaken Lane and in the rear yards extending to Sherborne Court. Tie the two existing storm sewer systems along Sherborne Court together as they are currently separated. Install new storm sewer to drain Sherborne Court detention basin north and outlet into the proposed storm sewer along Winchester Road.
- Upsize the storm sewer discharging into the existing detention basin on Stonegate Road. Reconstruct the detention basin overflow and outlet control structure Stonegate Road detention basin.

Table 4 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 25-year | 50-year | 7 | 49 | 0.16 | $5,880,250 |
| | 100-year | 16 | 79 | 0.09 | $12,133,940 |

**Table 4. Winchester, Interlaken and Stonegate FSA Summary**

Based on the SMC Bull Creek Floodplain Study, the area along Stonegate Road may still be susceptible to overbank flooding from Bull Creek. The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 1-6 and the engineers estimate of probable cost for each alternative for this FSA are included in Appendix 2.

Permitting and coordination for the proposed project includes the following agencies:

- Lake County Division of Transportation (DOT)
- Lake County SMC
- Illinois Environmental Protection Agency (IEPA), NPDES permit
- US Army Corps of Engineers (ACOE)

## 5.2 COPELAND MANOR – AREAS (2&17)

### 5.2.1 Limitations of Existing System – Cause of Flooding

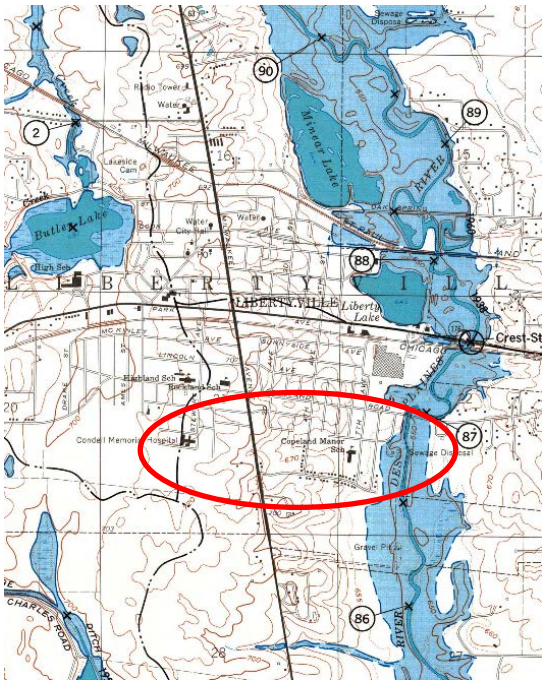



**Figure 18. USGS Hydrologic Atlas (Historic Drainageways)**

The Copeland Manor study area includes a large tributary area beginning from the west side of Milwaukee Ave where drainage from the Condell Medical Center is collected and drains east through a historic drainage path to the Des Plaines River. This runoff combines with a portion of the runoff collected in the Rockland Road trunk storm sewer (from the north). The two trunk storm sewer systems combine along the rear property line of the Cambridge Plaza shopping center before continuing east to Ardmore Terrace. As the system continues east, through a system of side yards and storm sewer with steep downhill grade between Ardmore Terrace and 4th Avenue, the trunk storm sewer continues through the Copeland Manor Elementary School property before reaching Glendale Avenue and outletting to the Des Plaines River at the east end of Glendale Avenue at Riverside Drive (Exhibit 7). The invert of the trunk storm sewer is at elevation 641.4 feet and the 10-year water surface elevation is 651.8 feet according to the FEMA FIS for the Des Plaines River at this location. The areas along Kenwood Avenue and Riverside Drive are susceptible to overbank flooding along the Des Plaines River.

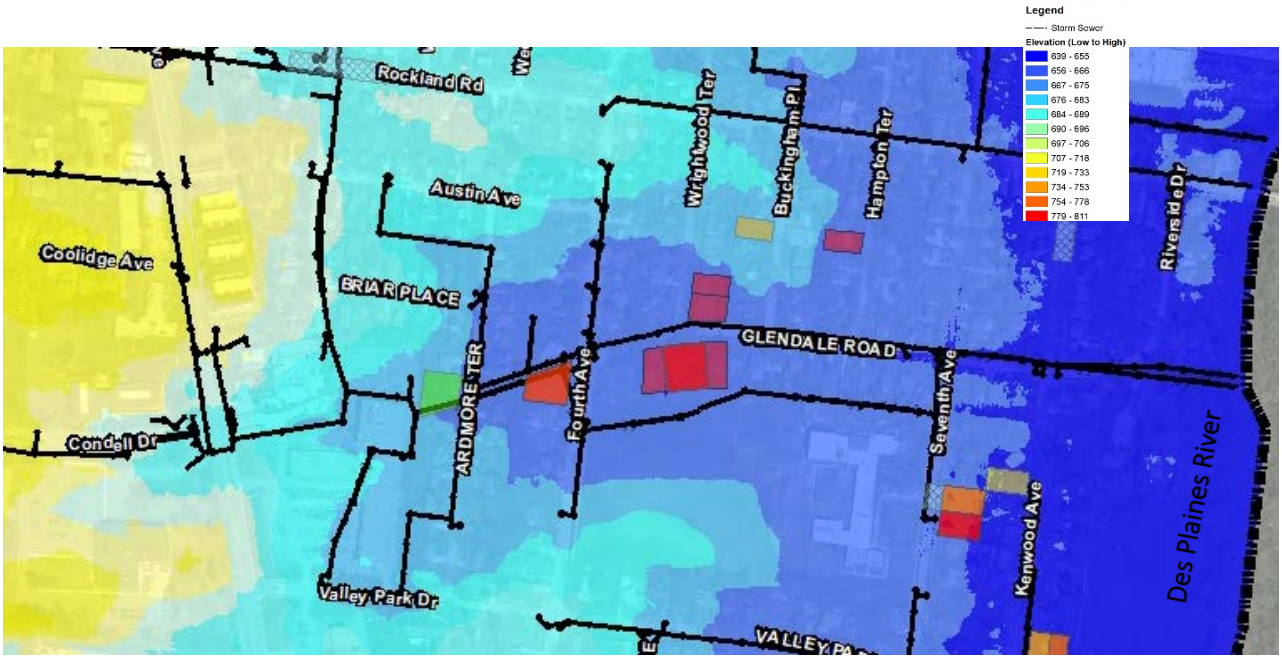



**Figure 17. Copeland Manor FSA Topography**

The existing level of service and level of flood protection of this storm sewer system is a 5-year design storm. During storm events in excess of the 5-year design storm, roadway flooding begins along 4th Avenue filling the low area on 4th Avenue (Figure 19). Overland flow begins to flow west to east from Ardmore Terrace through a low area and continues east along Glendale Road causing structure flooding (Figure 17). The system has insufficient storm sewer capacity based on current WDO. Following a review of the USGS hydrologic Atlas for this area, the historical overland flow routes have been blocked (Figure 18). It should be noted that structure flooding in this area and for this analysis is the result of runoff from upstream tributary areas exceeding the capacity of the storm sewer system and overland flow paths in route to the Des Plaines River to the east. With the exception of areas along Kenwood Avenue and Riverside Drive previously noted, flooding in this FSA is not from overbank flooding from the Des Plaines River, which is consistent with the observed water surface elevations experienced during the July 2017 storm event.

**Figure 19. 700 block of 4th Avenue, August 2017 Storm Event**

### 5.2.2 Copeland Manor Proposed Improvements

CBBEL developed three alternatives for this area to provide a 25-year, 50-year and 100-year level of flood protection for the FSA. Open space for detention is limited in this area and overland flow paths are blocked. Large storm sewers are required to safely convey runoff during large storm events to the Des Plaines River. The proposed storm sewers outlined below increased in diameter as the level of flood protection increases. The proposed improvements have been determined using a 10-year tailwater elevation in the Des Plaines River.

The 25-year Level of Flood Protection improvements are shown Exhibit 8 and include the following:

- Install a new trunk storm sewer along Glendale Road from Wrightwood Terrace to the Des Plaines River.
- Remove and replace the storm sewer along 4th Avenue west of Copeland Manor Elementary School (School) and connect into the existing storm sewer on School property.
- Upsize the existing storm sewer on School property, and tie into new storm sewer along 7th Avenue between 724, 7th Avenue and Glendale Road. Connect the new 7th Avenue storm sewer into proposed Glendale Road storm sewer.
- New parallel outfall at the Des Plaines River

The 50-year Level of Flood Protection improvements are shown Exhibit 9 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

The 100-year Level of Flood Protection improvements are shown Exhibit 10 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

Table 5 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 5-year | 25-year | 18 | 50 | 0.25 | $5,332,310 |
| | 50-year | 21 | 52 | 0.28 | $5,952,035 |
| | 100-year | 26 | 59 | 0.26 | $6,491,370 |

**Table 5. Copeland Manor FSA Summary**

These improvements provide a level of flood protection with respect to local flooding as a result of limited storm sewer conveyance and detention capacity. Kenwood Avenue and Riverside Drive are susceptible to overbank flooding along the Des Plaines River. The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 7-10 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 3. Permitting and coordination for the proposed project includes the following agencies:

- Lake County SMC
- IEPA, NPDES permit
- ACOE

## 5.3 BURDICK & AMES – AREA (3)

### 5.3.1 Limitations of Existing System – Cause of Flooding

This FSA consists of the 550-acre drainage system tributary to the Charles Brown Park detention basin at the south end of the park. The tributary area includes Drake Street, Dawes Street, Carter Street, Burdick Street, Ames Street and Crane Boulevard (Exhibit 11). This FSA in this Master Plan is among the most severe, suffering from frequent flooding on a yearly basis. The flooding in this area has consisted of high standing water in the streets, parkways and yards resulting in impassable streets and water impacting numerous residential structures.

**Figure 20. 500 block of Drake Street – July 2017**

The general direction of drainage in this FSA is from north to south towards the Charles Brown Park detention basin. Stormwater runoff is collected in small diameter lateral storm sewers and conveyed into larger trunk line storm sewers that generally drain towards the Charles Brown Park detention basin. The area around Burdick and Crane was developed prior to 1939 and the remaining subdivision surrounding this area was developed in the 1950s through 1970s. This is several decades prior to modern stormwater management design standards. The existing drainage system consists only of storm sewers to convey the stormwater runoff south to the Charles Brown Park detention basin. There are no overland flow paths to safely convey stormwater runoff to the Charles Brown Park detention basin if there is a rain event that exceeds the capacity of the storm sewer system.

**Figure 21. 400 block of Ames Street – July**

The trunk storm sewer responsible for conveyance south is a 36-inch diameter reinforced concrete pipe generally flowing southwest along Crane Boulevard north of Dowden Park (Exhibit 11). The 36-inch diameter trunk line storm sewer continues south through Dowden Park. South of Dowden Park, the36-inch increases to 42-inch before outletting into the Charles Brown Park detention basin.

The Charles Brown Park detention basin is drained via pumps to Seavey Drainage Ditch at the south end of Charles Brown Park. During large storm events, Seavey Drainage Ditch can overflow back into the Charles Brown Park detention basin, short-circuiting the pump station. The high-water surface elevation in the Charles Brown Park detention basin prevents the storm sewer system from draining the upstream areas. The BFE associated with Seavey Drainage Ditch is high enough to flood homes in the neighborhood.

The calibrated XP-SWMM model results indicate that the frequent flooding in the study area is due to the following factors:

- Undersized trunk line storm sewers in comparison to modern stormwater design standards,
- Lack of overland flow paths to safely convey stormwater once the storm sewers are surcharged,
- Limited stormwater storage within the study area, and

- The ground elevation of the flooded areas is below downstream ground elevations and outlet receiving system. For example, the ground elevation on Burdick Street is approximately 699.0 feet is approximately 2.0 feet below the BFE (according to the FIS) of the Charles Brown Park detention basin, which is the ultimate receiving system for the storm sewer system.

**Figure 22. Drake Rear Yards – July 2017**

The results indicate that the storm sewer system does not have 2-year capacity, as peak water surface elevation on Burdick Street, Crane Street and Drake Street is above the street elevation during this event. The existing level of service of the storm sewer system and the level of flood protection is a 2-year design storm.

### 5.3.2 Burdick & Ames Proposed Improvements

CBBEL developed four alternatives for this area to provide a 25-year, 50-year, 100-year and July 2017 level of flood protection for the FSA. While the overland flow paths in the area are blocked, Dowden Park is centrally located in the FSA and is an ideal location to provide open space for detention. Under each of the proposed alternatives, a centrally located detention basin is proposed in Dowden Park that increases in volume as the targeted level of flood protection is increases. Likewise, a proposed storm sewer system (which increases in diameter as the target level of flood protection increases) will convey stormwater from flooded areas to the detention basin in Dowden Park. The proposed detention basin at Dowden Park will continue to drain as Dowden Park does today (south to Charles Brown Park) under existing conditions. The increased storage volume at Dowden Park will provide enough storage to achieve the desired level of flood protection for the area independently from high tailwater conditions in Seavey Drainage Ditch. These improvements have been designed using the tailwater elevation from Seavey Drainage Ditch.

The 25-year Level of Flood Protection improvements are shown Exhibit 12 and include the following:

- Install a trunk storm sewer along Rockland Road and Austin Avenue to Dowden Park
- Construct laterals along Drake, Carter, Burdick, and Ames Streets.
- Construct a 12.5 acre-foot detention basin south of Crane Boulevard.

The 50-year Level of Flood Protection improvements are shown Exhibit 13 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.
- Construct an 18 acre-foot detention basin south of Crane Boulevard.

The 100-year Level of Flood Protection improvements are shown Exhibit 14 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.
- Construct a 39 acre-foot detention basin south of Crane Boulevard.

The July 2017 Level of Flood Protection improvements are shown Exhibit 15 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.
- Construct a 39 acre-foot detention basin *south* of Crane Boulevard
- Construct a 20 acre-foot detention basin *north* of Crane Boulevard

Flood storage in Dowden Park has been designed to maintain park activities and existing drainage within the park will be improved by the project. The duration of which storm water is stored in the park will be limited to 1-2 days for larger storm events. The inundation duration is decreased from existing conditions as a result of the proposed storage project. Table 6 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 2-year | 25-year (1) | 82 | 137 | 0.45 | $6,845,330 |
| | 50-year (1A) | 85 | 178 | 0.41 | $7,583,255 |
| | 50-year (1B) | 106 | 193 | 0.23 | $14,558,720 |
| | 50-year (1C) | 115 | 214 | 0.20 | $17,098,185 |
| | 100-year (2) | 119 | 247 | 0.16 | $21,339,515 |
| | July 2017 (3) | 120 | 247 | 0.10 | $33,898,800 |

Note: 1B and 1C refers to additional analysis to increase storage volume and conveyance to remove additional structures.

**Table 6. Burdick & Ames FSA Summary**

The recommended level of flood protection is the 50-year design storm based on discussions with Village staff. This recommendation is based upon minimizing the disruption to Nicholas Dowden Park and the opportunity to flood proof homes to further increase the number of structures benefitted. Following this recommendation, the Village requested that CBBEL perform additional analyses to provide a greater level of protection for this study area. The additional analysis focused on increasing the number of structures benefitted for storm events greater than the 50-year design storm (Table 6). The proposed improvements from the additional analysis include increasing storage at Dowden Park and increasing the proposed trunk sewers (elliptical) along Crane Boulevard, Carter, Burdick, and Ames Streets. It is recommended during final engineering design that this project be optimized to provide the most cost-effective level of protection between the 50-year and 100-year frequency events that benefits the greatest number of structures. This may also involve including project alternatives 1B and 1C as bid alternates to the competitively bid recommended project 1A. Consideration will also be given to constructing the larger diameter storm sewers for alternatives 1B and/or 1C as part of project 1A so that these larger diameter storm sewers would be in place for a potential future expansion of the flood storage basin as future funding or conditions dictate.

Flood proofing in this area is also strongly recommended where possible. Appendix 12 contains a suite of flood proofing measures for home owners. Exhibits 11-15 and the engineers estimate of probable cost for each alternative including the additional analyses for this FSA is included in Appendix 4. Permitting and coordination for the proposed project includes the following agencies: Lake County SMC, IEPA (NPDES), and the ACOE.

## 5.4 ELLIS EAST AND WEST AVENUE – AREAS (8&14)

### 5.4.1 Limitations of Existing System – Cause of Flooding

The East and West Ellis Avenue FSAs consist of two main tributary areas separated by Milwaukee Avenue. The tributary area west of Milwaukee is approximately 39 acres and the area east of Milwaukee is approximately 70 acres. Drainage in this FSA is west to east where the West Ellis Avenue area is served by a 15-inch storm sewer under Milwaukee Avenue, continuing east along East Ellis Avenue before connecting into the existing 30-inch trunk storm sewer on Sandstone Drive. The trunk storm sewer along Sandstone Drive continues north to East Winchester Road, connecting to a 54-inch storm sewer that outlets to an open channel separate from Lake Minear. The open channel continues east, outletting directly to the Des Plaines River separate from Lake Minear. Runoff from this FSA primary does not directly discharge to Lake Minear.

Flooding in the west portion of this area occurs in the depressional area located at the west end of West Ellis Avenue (Exhibit 16). During large storm events water surface elevations increase in the depressional area at the west end of West Ellis Avenue and causes structure and street flooding. The existing level of service and level of flood protection of this storm sewer system is a 2-year design storm. This is due to the restrictive existing 15-inch storm sewer crossing Milwaukee Avenue and no overland flow from the depressional area heading east.

**Figure 23. Surcharged Sewer East Ellis July 2017**

Flooding in the east portion of this area is caused by the surcharging trunk storm sewer at the east end of East Ellis Avenue in the rear yards of the homes at 1007 and 1015 Sandstone Drive (Figure 23). The overflow from the surcharge storm sewer on East Ellis Avenue (Exhibit 16) continues east through the side yards, across Sandstone Drive to Lake Minear causing structure flooding to the homes along the east side of Sandstone Drive. There is an existing 12-inch outfall along Sandstone Drive that discharges directly to Lake Minear between 828 and 912 Sandstone Drive, near the midpoint of the block between Minear Drive and Appley Avenue. The existing 12-inch outfall to Lake Minear collects a small tributary area draining Sandstone Drive (Exhibit 16). This system is undersized to accommodate the overflow from the surcharging trunk line at the east end of East Ellis Avenue. The East Ellis Avenue storm sewer system begins to surcharge (at the east end of Ellies Avenue) for storm events greater than the 10-year design storm and the existing level of flood protection for this area is less than a 25-year design storm.

Overall the West and East Ellis Avenue storm sewer system does meet current WDO standards and there is no overland flow path for the West Ellis Avenue area. The overland flow path for the East Ellis Avenue area is through homes. The homes along the east side of Sandstone Drive adjacent to Lake Minear are also susceptible to overbank flooding from the Des Plaines River. The water surface elevations in Lake Minear fluctuate simultaneously with the Des Plaines River as they are hydraulically connected.

### 5.4.2 Ellis East and West Avenue Proposed Improvements

CBBEL developed two alternatives for this area to provide 50-year and 100-year level of flood protection for the FSA with an additional alternative for the 100-year level of flood protection along an alternate alignment. While the overland flow paths in the West Ellis Avenue area are blocked, there is a Village owned parcel that can be used to excavate additional storage for the area (Exhibit 17). This area is located at the west end of Ellis Avenue and largely contains the exiting depression area. A new trunk storm sewer is proposed extending east from the proposed storage area, under Milwaukee Avenue, and separates the west storm sewer system from the east storm sewer system. This redirection provides relief for the east area system without additional improvements (Exhibit 17). CBBEL developed an additional alternative for the 100-year design storm by upsizing the existing storm sewer system, maintaining the existing alignment and upsizing the existing outfall at Lake Minear. This alternative is a shorter distance than the initial alternative but would require easements from property owners on Sandstone Drive to upsize the existing system and outfall at Lake Minear.

**The 50-year Level of Flood Protection improvements are shown Exhibit 17 and include the following:**

- Construct a new storage basin (1.5 ac-ft) at the west end of West Ellis Avenue to expand the storage provided with in the existing depressional area.
- Construct a storm sewer from the proposed storage basin, under Milwaukee Avenue extending along East Winchester Road to the existing outfall pipe at the north end of Lake Minear.
- Upsize the existing outfall pipe at the east end of East Winchester Road outletting to the channel north of Lake Minear.
- Disconnect the Ease Ellis Avenue storm sewer from the newly constructed West Ellis Avenue storm sewer system.
- Construct a new storm sewer along Sandstone extending north to the existing storm sewer on Sandstone Drive.

**The 100-year Level of Flood Protection improvements are shown Exhibit 18 and include the following:**

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

**The 100-year Level of Flood Protection (Alternative 2) improvements are shown Exhibit 19 and include the following:**

- Construct a new storage basin (1.5 ac-ft) at the west end of West Ellis Avenue to expand the storage provided with in the existing depressional area.
- Construct a storm sewer from the proposed storage basin extending to an upsized East Ellis Avenue storm sewer system, to the rear yards along the west side of Sandstone Drive.
- Extend the proposed East Ellis Avenue storm sewer between 1007 and 1015 Sandstone Drive, east to Sandstone Drive, extending south before outletting east to Lake Minear.
- Construct a new outfall and water quality structure between 824 and 828 Sandstone Drive.
- 2-4 easements will be required.

Table 7 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 2-year | 50-year | 6 | 34 | 0.14 | $4,009,995 |
| | 100-year | 9 | 60 | 0.11 | $5,176,560 |
| | 100-year (Alt 2) | 9 | 60 | 0.13 | $4,445,940 |

**Table 7. Ellis East and West Avenue FSA Summary**

The recommended level of flood protection is 100-year based on discussion with Village Staff. Exhibits 16-19 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 5. Permitting and coordination for the proposed project includes the following agencies:

- Lake County DOT
- Lake County SMC
- IEPA, NPDES permit
- ACOE

## 5.5 APPLEY – AREA 11

### 5.5.1 Limitations of Existing System – Cause of Flooding

The intersection of Appley Avenue, Oak Spring Road and Second Street has a large tributary area extending to the north, west and south. The existing storm sewer systems draining to this intersection drain approximately 142 acres with trunk sewers extending along Newberry Avenue west to Milwaukee, First Street south to Church Street as well as Appley Avenue to Bartlett Terrace. The trunk storm sewers combine at the intersection into a single outfall, outletting to the open channel at the southeast corner of Second Street and Oak Spring Road. The combined trunk sewer connects to a storm sewer that is below the normal water level in the open channel where the storm sewer is submerged approximately 5 feet. The open channel on the south side of Oak Spring Road extends southeasterly between the Metra Railroad (Milwaukee District North Line) and Oak Spring Road before outletting to the Des Plaines River. The open channel is a series of depressional areas with poor conveyance in the southeast direction. The level of service provided by the storm sewer system is less than a 10-year storm event (Exhibit 20). There is no reported structure flooding in this area, however the intersection is heavily traveled and impassible for storm events just below the 10-year design storm.

### 5.5.2 Appley Proposed Improvements

CBBEL developed two alternatives for this area to provide 50-year and 100-year level of flood protection for the FSA.

The 50-year Level of Flood Protection improvements are shown Exhibit 21 and include the following:

- Construct a new storm sewer at the intersection of Appley Avenue, 2nd Street, and Oak Spring Road.
- Construct new outfall north of Oak Spring Road to Lake Minear with a water quality structure.

The 100-year Level of Flood Protection improvements are shown Exhibit 21 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

Table 8 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| <10-year | 50-year | NA | NA | NA | $625,525 |
| | 100-year | NA | NA | NA | $792,625 |

**Table 8. Appley FSA Summary**

The recommended level of flood protection is 100-year based on discussion with Village Staff. The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 20-21 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 6. Permitting and coordination for the proposed project includes the following agencies:

- Lake County DOT
- Lake County SMC
- IEPA, NPDES permit
- ACOE

## 5.6 ROCKLAND – AREAS (12&13)

### 5.6.1 Limitations of Existing System – Cause of Flooding

The Rockland study area includes a large tributary area beginning from the west side of Milwaukee Avenue where drainage from approximately 40 acres is collected and routed to the Rockland Road Storm sewer. The Rockland Road storm sewer continues northeast toward Windsor Terrace and Lincoln Avenue, continuing east to 7th Avenue before returning south to Rockland Avenue and continuing east to the Des Plaines River. There is an existing depressional area on Second Avenue just north of Rockland Road that collects overland flow as the Rockland Road storm sewer reaches capacity. The existing level of service and level of flood protection of this storm sewer system is less than a 10-year design storm (Exhibit 22). During storm events in excess of the 5-year design storm, roadway flooding begins along 2nd Avenue filling the depressional area, and overtopping northeast to the next depressional area on Windsor Terrace, to the depressional area on Lincoln Avenue at Wedgemere Place, continuing northeast to Meadow Lane and finally to Sunnyside Avenue. Flooding continues northeast following the historical drainage way as shown in Figure 25 which is similar to the first-hand accounts and questionnaire data received (Figure 24). The areas along Riverside Drive are susceptible to overbank flooding along the Des Plaines River.

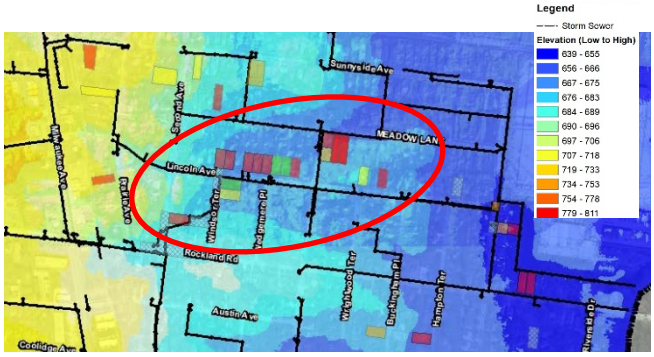



**Figure 25. Rockland Road FSA Topography and Existing Storm Sewers**


**Figure 24. USGS Hydrologic Atlas (Historic Drainageways)**

### 5.6.2 Rockland Proposed Improvements

CBBEL developed three alternatives for this area to provide a 25-year, 50-year and 100-year level of flood protection for the FSA. Open space for detention is limited in this area and overland flow paths are blocked. Large storm sewers are required to safely convey runoff during large storm events to the Des Plaines River. The proposed storm sewers outlined below increased in diameter as the level of flood protection increases. The proposed improvements have been determined using a 10-year tailwater elevation in the Des Plaines River.

The 25-year Level of Flood Protection improvements are shown Exhibit 23 and include the following:

- Construct trunk storm sewer along Rockland Road between Prairie Avenue and Des Plaines River.
- Construct a parallel outfall at Des Plaines River.

- Construct lateral storm sewers along Wrightwood Terrace and 7th Avenue.
- Upsize storm sewers along Lincoln Avenue with a new lateral connection at 4th Avenue.
- Connect the proposed Lincoln Avenue storm sewer system to the Wrightwood Avenue lateral.

The 50-year Level of Flood Protection improvements are shown Exhibit 24 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

The 100-year Level of Flood Protection improvements are shown Exhibit 25 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

Table 9 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 5-year | 25-year | 33 | 55 | 0.19 | $5,945,105 |
| | 50-year | 33 | 91 | 0.19 | $6,807,525 |
| | 100-year | 48 | 102 | 0.18 | $7,329,830 |

**Table 9. Rockland FSA Summary**

These improvements provide a level of flood protection with respect to local flooding as a result of limited storm sewer conveyance and detention capacity. Homes along Riverside Drive are susceptible to overbank flooding along the Des Plaines River. The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 22-25 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 7. Permitting and coordination for the proposed project includes the following agencies:

- Lake County DOT
- Lake County SMC
- IEPA, NPDES permit
- ACOE

## 5.7 LIBERTY BELL AND 4TH AVENUE – AREAS (15&18)

### 5.7.1 Limitations of Existing System – Cause of Flooding

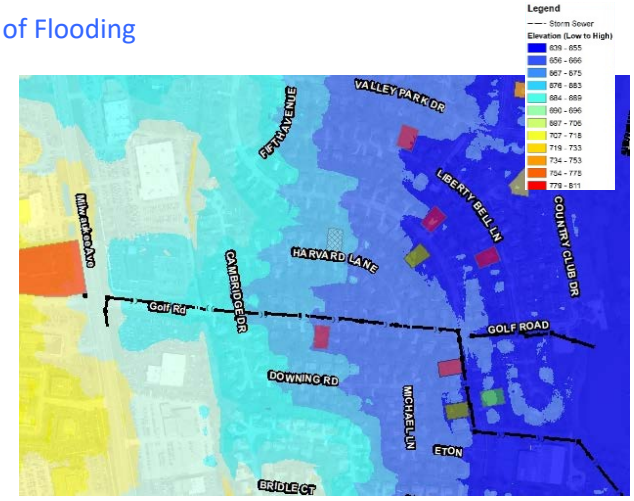



**Figure 26. Liberty Bell and 4th Lane FSA Topography and Existing Storm Sewers**

Similar to the other flood study areas east of Milwaukee Avenue and draining to the Des Plaines River, the Liberty Bell and 4th Avenue study area includes a large tributary area beginning from the west side of Milwaukee Avenue. Runoff from approximately 65 acres is collected from the Milwaukee Avenue corridor and drains east in the Golf Road storm sewer. Storm sewer laterals along 4th Avenue and Liberty Bell Lane drain south and connect into the Golf Road storm sewer. The Golf Road storm sewer continues south on 4th Avenue then east before outletting to the Des Plaines River (Figure 26). There is an additional Golf Road storm sewer outfall outletting to the existing detention basin near the Riverside Golf Course at Riverside Park on Village property. The existing outfalls both at the detention basin at Riverside Park and the Des Plaines River are deteriorated. During large storm events, the Golf Road storm sewer begins to surcharge from the upstream tributary area causing overland flow to begin east along Golf Road while preventing the 4th Avenue and Liberty Bell Lane storm sewers from draining into the system. This causes street and structure flooding both along Liberty Bell and 4th Avenue. Additionally, the rear yard drainage between Golf Road and Downing Road flows east, into the rear and side yards of the homes along the west side of 4th Avenue, south of Golf Road. The existing level of service and level of flood protection of this storm sewer system is a 10-year design storm (Exhibit 26). The system has insufficient storm sewer capacity based on current WDO. The lack of overland flows for this FSA cause structure flooding and there is no open space available for upstream detention. The areas along Country Club Drive are susceptible to overbank flooding along the Des Plaines River.

### 5.7.2 Liberty Bell and 4th Avenue Proposed Improvements

CBBEL developed two alternatives for this area to provide 50-year and 100-year level of flood protection for the FSA. Open space for detention is limited in this area and overland flow paths are blocked. Large storm sewers are required to safely convey runoff during large storm events to the Des Plaines River. The proposed storm sewers outlined below increased in diameter as the level of flood protection increases. The proposed improvements have been determined using a 10-year tailwater elevation in the Des Plaines River.

The 50-year Level of Flood Protection improvements are shown Exhibit 27 and include the following:

- Construct a new storm sewer along Liberty Bell Lane between Paul Revere Drive and Golf Road.
- Construct a new storm sewer along 4th Avenue between 942 S. 4th Avenue and Golf Road. Connect both of these proposed storm sewer systems into a new trunk storm sewer along Golf Road.
- Construct a parallel outfall at to the existing detention basin at Riverside Park.
- Restore existing overland flow paths between side and rear yards of homes west of 4th Avenue.

The 100-year Level of Flood Protection improvements are shown Exhibit 28 and include the following:

- All improvements under the previously listed project are included in this alternative with larger diameter pipe sizes.

Table 10 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 10-year | 50-year | 5 | 37 | 0.04 | $3,965,740 |
| | 100-year | 7 | 42 | 0.04 | $4,372,640 |

**Table 10. Liberty Bell and 4th Avenue FSA Summary**

These improvements provide a level of flood protection with respect to local flooding as a result of limited storm sewer conveyance and detention capacity. Homes along Riverside Drive are susceptible to overbank flooding along the Des Plaines River. The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 26-28 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 8. Permitting and coordination for the proposed project includes the following agencies:

- Lake County DOT
- Lake County SMC
- IEPA, NPDES permit
- ACOE

## 5.8 COOK AND LANGE

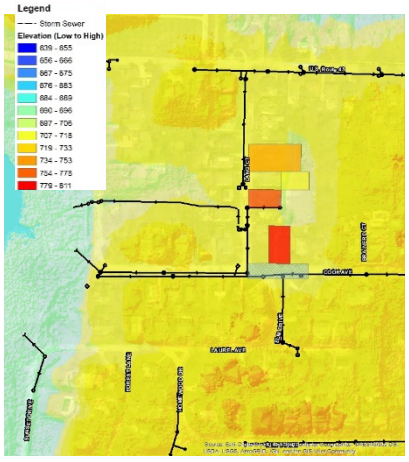



**Figure 27. Cook and Lange FSA Topography and Existing Storm Sewers**

The Cook and Lange study area includes a large depressional storage area located in the rear yards of the homes on the east side of Lange Court (Exhibit 29). Runoff from approximately 4 acres coming from the south, along Elm Drive flows north into the depressional area via between the homes on the north side of Cook Avenue causing structure street and flooding. The depressional storage area has a total tributary area of approximately 13.5 acres and is drained through a 12-inch storm sewer extending south and west before outletting to Butler Lake. The lack of overland flow paths directing runoff both into and out of the depressional storage area cause structure flooding (Figure 27). The existing level of service and level of flood protection of this storm sewer system is less than a 10-year design storm.

### 5.8.1 Cook and Lange Proposed Improvements

CBBEL developed a proposed improvement for this area to provide a 100-year level of flood protection for the FSA. The proposed improvement has been designed to collect runoff from the south and direct it west to Butler Lake prior to flooding homes on the north side of Cook Avenue. The 100-year Level of Flood Protection improvements are shown Exhibit 30 and include the following:

- Upsize the storm sewer along Cook Avenue extending to Butler Lake.
- Construct new storm sewers to connect the Elm Drive and Cook Avenue storm sewers to the upsized Cook Avenue storm sewer.
- Install high capacity inlets at Cook Avenue at Elm Drive and.

Table 11 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 10-year | 100-year | NA | NA | NA | $705,600 |

**Table 11. Cook and Lange FSA Summary**

The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 29-30 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 9. Permitting and coordination for the proposed project includes the following agencies:

- Lake County SMC
- IEPA, NPDES permit
- ACOE

## 5.9 CARRIAGE HILL

The Carriage Hill study area is located on the northeast side of the Village, east of Milwaukee Avenue and drains to the Des Plaines River (Figure 28). Runoff from approximately 33 acres west of Milwaukee Avenue drains east through this system. There is also approximately 25 acres of tributary area on the east side of Milwaukee Avenue where runoff from the rear yards along Parkview Avenue and the properties along Carriage Hill Circle collects in the existing overland flow path between Carriage Hill Circle and Parkview Avenue. The overland flow path begins just east of the intersection of Parkview

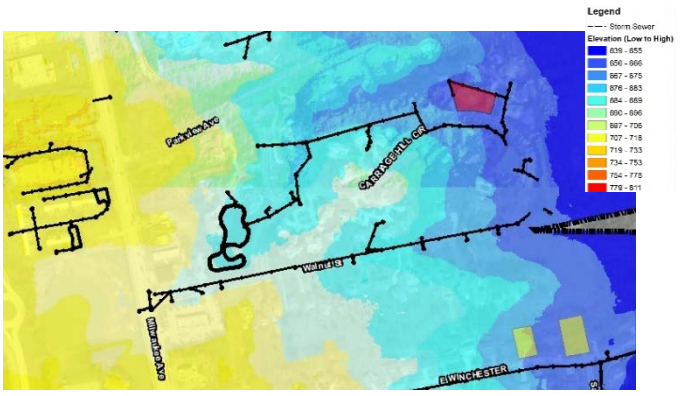



**Figure 28. Carriage Hill FSA Topography and Existing Storm Sewers**

Avenue and Carriage Avenue and continues east down steep grade through the rear yards. An existing 12-inch storm sewer drains east along the overland flow path, crossing Carriage Hill Circle south and continuing east to two equalized detention basins at the east end of Carriage Hill Circle. When the 12-inch storm sewer reaches capacity, surcharging occurs into the overflow path, and begins to flow east. As the 12-inch storm sewer heads south to cross Carriage Hill Drive, the overland flow path continues east through the homes at the east end of Carriage Hill Drive (Exhibit 31). The storm sewer draining to the detention basins is undersized to prevent overland flow from continuing east through the homes.

### 5.9.1 Carriage Hill Proposed Improvements

CBBEL developed a proposed improvement for this area to provide a 100-year level of flood protection for the FSA. The proposed improvement has been designed to collect runoff from the overland flow path south and direct it east to the existing detention basin east of Carriage Hill Circle prior to flooding homes on the north side of Carriage Hill Circle. The 100-year Level of Flood Protection improvements are shown Exhibit 32 and include the following:

- Construct a 36-inch storm sewer near the east end of the overland flow path (west of 311 Carriage Hill Circle) extending east to the existing detention basin east of Carriage Hill Circle.
- Create a settling basin with outfall protection in the existing detention basin east of Carriage Hill Circle.

Table 12 summarizes the existing and proposed level of flood protection, number of structure and properties benefited, and the cost associated with the proposed levels of flood protection in 2018 dollars.

| Existing Level of Flood Protection | Proposed Level of Flood Protection | Number of Structures Benefitted | Number of Properties Benefitted | Benefit Cost Ratio | Total Cost |
|---|---|---|---|---|---|
| 10-year | 100-year | NA | NA | NA | $914,745 |

**Table 12.Carriage Hill FSA Summary**

The recommended level of flood protection is 100-year based on discussions with Village staff. Exhibits 31-32 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 10. Permitting and coordination for the proposed project includes the following agencies:

- Lake County SMC
- ACOE

## 5.10 HARDING AND WILLOW

The Harding and Willow study area is located on the west side of the Village, west of Butterfield Road and north of IL 176. The area drains northeasterly to the Butterfield Road storm sewer system (Figure 29) that outlets to the headwaters of Butler Lake. Structure flooding in this area is caused by runoff from the 5-acre upstream tributary area where the overland flow path for this tributary area is located in the rear yards of the homes between Harding Avenue and Butterfield Road, north of Willow Avenue. During large storm events, runoff from the upstream area accesses the rear yards via an existing depressed curb along Willow Avenue (Exhibit 33). The homes along Butterfield Road have low entry points (window wells) along driveways and side yards that are vulnerable to overland flow as the elevations of the window wells are nearly at existing grade. As the overland flow continues northeast, the flow paths between homes is along the driveways is accessed (Exhibit 33).

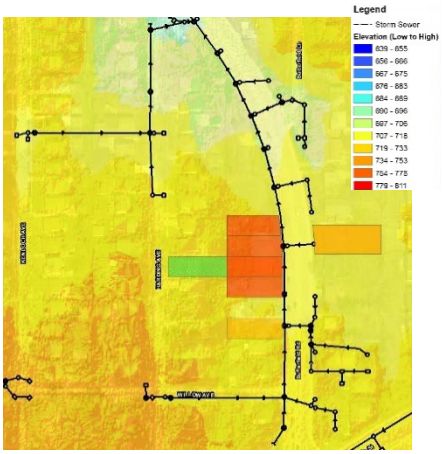



**Figure 29. Carriage Hill FSA Topography and Existing Storm Sewers**

### 5.10.1 Harding and Willow Proposed Improvements

CBBEL developed a proposed improvement for this area to provide flood protection for the FSA. The proposed improvement includes the reconstruction of the curb along Willow Avenue to prevent overland flow from continuing northeast to the rear yards (Exhibit 33). The reconstructed curb will direct overland flow east to the Butterfield Road storm sewer system, around the vulnerable structures. Additionally, it is strongly recommended that the vulnerable low entry points associated with the four homes reporting structure flooding be flood proofed. The engineers estimate of probable cost for curb reconstruction is $15,140. Exhibits 33 and the engineers estimate of probable cost for each alternative for this FSA is included in Appendix 11.

| Study Area | Potential Village Project | CBBEL Study Area Name | Limitations of Existing System - Cause of Flooding | Proposed CBBEL Project | Existing Level of Flood Protection | Proposed Level of Flood Protection | Benefit Cost Ratio | Number of Structures Benefitted | Number of Properties Benefitted (for target event) | Total Cost (2018 Dollars) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Increase storage capacity in Concord-Interlaken Subdivision retention pond. | **Winchester** | High flood flows due to large tributary area. Concord Interlaken pond overflows for approximately 95-year storm event. Insufficient storm sewer capacity based on current WDO. Overland flow routes are through residential side yards with insufficient capacity. Insufficient storage within watershed, no available open space for significant new storage. | • Revise restrictor of detention basin (Windhaven Rd) immediately south of Interlaken Ridge ponds. Install storm sewer line just east of ComEd R.O.W. to drain depressional area. Modify/correct east overflow of Loyola Pond.<br>• Install new large diameter relief storm sewer from Windhaven Rd along Winchester Road all the way to the eastern Cambridge North detention basin.<br>• Install new storm sewer to drain Wilshire Court detention basin, and route to the eastern Cambridge North detention basin. Reconstruct outfall at Cambridge North detention basin.<br>• Upsize storm sewer along Interlaken Lane and rear yards all the way to Sherborne Court. Tie two existing storm sewer systems along Sherborne Court together. Install new storm sewer to drain Sherborne Court detention basin. Tie into new sewer along Winchester Road.<br>• Upsize storm sewer into existing detention basin on Stonegate Road. Reconstruct basin overflow and outlet control on Stonegate Road basin. | 25 year | **50** | 0.16 | 7 | 49 | WIN = $4,707,550 | $5,880,250 |
| 5 | Increase storage capacity in the Interlaken Ridge retention ponds at Loyola Drive and Winchester Road. This will include evaluating if the adjacent (across the street) Sherborne Court outlet can be used for additional detention. | | | | | | | | | INT = $667,860 | |
| 6 | Increasing storage capacity in the Cambridge North (Winchester Road) and Wellington Avenue basins and conveyance capacity between these facilities and Bull Creek, including culvert underneath the railroad tracks. | | | | | | | | | | |
| 7 | Overland drainage swale between 1127 and 1133 Claridge Drive to safely convey surface flow from the adjacent ComEd right-of-way. | | | | | | | | | | |
| 10 | Evaluation of the Wilshire Court detention basin to increase storage capacity and provide a safe off-site overflow route. Pond overflow caused flooding at 955 W. Winchester Road. | | | | | | | | | STO = $504,850 | |
| 9 | Project to reduce or eliminate rear yard flooding at 811 and 815 Interlaken Lane that results in structure flooding. | **Interlaken** | Insufficient storm sewer capacity based on current WDO. Rear yards are low in comparison to street. Storm sewer surcharge first occurs in rear yard. Overland flow route out of rear yards is below home elevations. | • Install new overflow structure and modify existing restrictors at Concord-Interlaken pond.<br>• Install new large diameter relief storm sewer from Concord-Interlaken pond along Butterfield Road and Winchester Road all the way to the eastern Cambridge North detention basin.<br>• Revise restrictor of detention basin (Windhaven Rd) immediately south of Interlaken Ridge ponds. Install storm sewer line just east of ComEd R.O.W. to drain depressional area. Modify/correct east overflow of Loyola Pond.<br>• Install new storm sewer to drain Wilshire Court detention basin, and route to the eastern Cambridge North detention basin. Reconstruct outfall at Cambridge North detention basin.<br>• Upsize storm sewer along Interlaken Lane and rear yards all the way to Sherborne Court. Tie two existing storm sewer systems along Sherborne Court together. Install new storm sewer to drain Sherborne Court detention basin. Tie into new sewer along Winchester Road.<br>• Upsize storm sewer into existing detention basin on Stonegate Road. Reconstruct basin overflow and outlet control on Stonegate Road basin. | | **100** | 0.09 | 16 | 79 | WIN = $10,104,540 | $12,133,940 |
| NA | Stonegate | **Stonegate** | Detention basin and storm sewer system do not meet current WDO standards. Existing outfall of detention basin dysfunctional. Existing storage within basin not effectively accessed and drainage currently bypasses detention pond. | | | | | | | INT = $1,182,230 | |
| | | | | | | | | | | STO = $847,180 | |
| 2&17 | • Relief sewer and detention to safely convey surface runoff from existing overland flow route that causes structure flooding at 629 Wrightwood Terrace.<br>• Larger storm sewer (existing is only 10 inches) on 7th Avenue extending northward from 724 7th Avenue to the existing 48-inch sewer. Also need safe overland flood routes to direct street overflow away from depressed driveways at 724 and 718 7th Avenue. | **Copeland Manor** | Large tributary area from west side of Milwaukee. Insufficient storm sewer capacity based on current WDO. No overland flow routes. | • Install new main line storm sewer along Glendale Road from Wrightwood Terrace to the Des Plaines River.<br>• Remove and replace storm sewer along 4th Avenue west of Copeland Manor Elementary School and connect into existing storm sewer on School property.<br>• Upsize storm sewer on school property, and tie into new storm sewer along 7th Avenue between 724 7th Avenue and Glendale Road. Tie 7th Avenue storm sewer into proposed Glendale Road storm sewer.<br>• New parallel outfall at Des Plaines River | 5 year | **25** | 0.25 | 18 | 50 | $5,332,310 | |
| | | | | **• ALL STORM SEWER SIZES INCREASE**<br>• Install new main line storm sewer along Glendale Road from Wrightwood Terrace to the Des Plaines River.<br>• Remove and replace storm sewer along 4th Avenue west of Copeland Manor Elementary School and connect into existing storm sewer on School property.<br>• Upsize storm sewer on school property, and tie into new storm sewer along 7th Avenue between 724 7th Avenue and Glendale Road. Tie 7th Avenue storm sewer into proposed Glendale Road storm sewer.<br>• New parallel outfall at Des Plaines River | | **50** | 0.28 | 21 | 52 | $5,952,035 | |
| | | | | **• ALL STORM SEWER SIZES INCREASE**<br>• Install new main line storm sewer along Glendale Road from Wrightwood Terrace to the Des Plaines River.<br>• Remove and replace storm sewer along 4th Avenue west of Copeland Manor Elementary School and connect into existing storm sewer on School property.<br>• Upsize storm sewer on school property, and tie into new storm sewer along 7th Avenue between 724 7th Avenue and Glendale Road. Tie 7th Avenue storm sewer into proposed Glendale Road storm sewer.<br>• New parallel outfall at Des Plaines River | | **100** | 0.26 | 26 | 59 | $6,491,370 | |
| 3 | Relief sewer(s), detention (Nicholas Dowden North and South and Charles Brown Parks), structure flood protection, **and cleaning/regrading/restoring Charles Brown reservoir** to reduce flooding damages for the Ames/Burdick/Carter/Drake neighborhood. | **Burdick & Ames** | Insufficient storm sewer capacity based on current WDO. Water cannot get to Charles Brown Park basin and has no safe overflow route. Seavey Ditch potentially overflows back into Charles Brown Park and up into the nearby neighborhood. BFE of Seavey Ditch is high enough to flood homes in neighborhood. | Alternative 1: Install new main line storm sewer along Rockland Road and Austin Avenue to Dowden Park, and construct laterals along Drake, Carter, Burdick, and Ames Streets. Install new 48-inch storm sewer in South Dowden Park, and create **12.5 acre-foot detention basin**. | 2 year | **25** | 0.45 | 82 | 137 | $6,845,330 | |
| | | | | Alternative 1A: Install new main line storm sewer along Rockland Road and Austin Avenue to Dowden Park, and construct laterals along Drake, Carter, Burdick, and Ames Streets. Install new 48-inch storm sewer in South Dowden Park, and create **18 acre-foot detention basin**. | | **50** | 0.41 | 85 | 178 | $7,583,255 | |
| | | | | Alternative 2: Install new main line storm sewer along Rockland Road and Austin Avenue to Dowden Park, and construct laterals along Drake, Carter, Burdick, and Ames Streets. Install new 48-inch storm sewer in South Dowden Park, and create **39 acre-foot detention basin**. | | **100** | 0.16 | 119 | 247 | $21,339,515 | |
| | | | | Alternative 3: Install new main line storm sewer along Rockland Road and Austin Avenue to Dowden Park, and construct laterals along Drake, Carter, Burdick, and Ames Streets. Install new 48-inch storm sewer in South Dowden Park, and create **39 acre-foot detention basin. Construct 20 acre-foot detention** basin in North Dowden Park. | | **July** | 0.10 | 120 | 247 | $33,898,800 | |

# CHAPTER 6 SUMMARY OF PROJECTS

| Study Area | Potential Village Project | CBBEL Study Area Name | Limitations of Existing System - Cause of Flooding | Proposed CBBEL Project | Existing Level of Flood Protection | Proposed Level of Flood Protection | Benefit Cost Ratio | Number of Structures Benefitted | Number of Properties Benefitted (for target event) | Total Cost (2018 Dollars) |
|---|---|---|---|---|---|---|---|---|---|---|
| 8&14 | • Construct upstream detention basin in available W. Ellis Avenue right-of-way and downstream relief sewer segment improvements on E. Ellis Avenue to Lake Minear outfall.<br>• North side of E. Winchester Road (Parliament Court to Lake Minear). Homes located in overland flow path. Reports indicated that 6 to 7 homes suffered lower-level flooding. | **Ellis** | Insufficient storm sewer capacity based on current WDO. Overflow route is nonexistent on West Ellis and through homes on East Ellis. | • Construct new floodwater storage basin (1.5 ac-ft) at the west end of W. Ellis Avenue to drain depressional area.<br>• Install storm sewer from proposed basin to upsized East Ellis Avenue storm sewer system all the way to existing outfall pipe at the north end of Lake Minear. Upsize outfall pipe.<br>• Disconnect east system from new west system.<br>• Install new storm sewer along Sandstone, tie onto existing system going north. | 2 Year | **50** | 0.14 | 6 | 34 | $4,009,995 |
| | | | | • ALL STORM SEWER SIZES INCREASE<br>• Construct new floodwater storage basin (1.5 ac-ft) at the west end of W. Ellis Avenue to drain depressional area.<br>• Install storm sewer from proposed basin to upsized East Ellis Avenue storm sewer system all the way to existing outfall pipe at the north end of Lake Minear. Upsize outfall pipe.<br>• Disconnect east system from new west system.<br>• Install new storm sewer along Sandstone, tie onto existing system going north. | | **100** | 0.11 | 9 | 60 | $5,176,560 |
| | | | | <u>Alternative 2:</u><br>• Construct new floodwater storage basin (1.5 ac-ft) at the west end of W. Ellis Avenue to drain depressional area.<br>• Install storm sewer from proposed basin to **upsized East Ellis Avenue storm sewer system to rear yards along Sandstone**. Extend east Ellis storm sewer between 1007 and 1015 Sandstone, east to Sandstone Drive, extending south before outletting east to Lake Minear with a new outfall and water quality structure between 824 and 828 Sandstone Drive.<br>• 2-4 Easements will be required. | | **100** | 0.13 | 9 | 60 | $4,445,940 |
| 11 | Appley Avenue, 2nd Street, and Oak Spring Road intersection flooding. | **Appley** | Intersection connects to a storm sewer system that is below water elevation in ditch. Storm sewer is submerged up to 5 feet. | Install new storm sewer at the intersection of Appley Avenue, 2nd Street, and Oak Spring Road. Construct new outfall with water quality structure to lake on north side of Oak Spring Road. | <10 Year | **50** | NA | NA | NA | $625,525 |
| | | | | • **ALL STORM SEWER SIZES INCREASE**<br>Install new storm sewer at the intersection of Appley Avenue, 2nd Street, and Oak Spring Road. Construct new outfall with water quality structure to lake on north side of Oak Spring Road. | | **100** | NA | NA | NA | $792,625 |
| 12&13 | • 816 E. Rockland Road structure flooding (slab on grade home) and temporary closure of Rockland Road.<br>• Lincoln Avenue and Meadow Lane between 2nd Street and 7th Avenue. Known structure flooding at 506 E. Lincoln Avenue, 607 Meadow Lane, and 628 Meadow Lane, with significant street flooding as well (including 4th Avenue and 7th Avenue). Intersection of and Wedgemere Place and Lincoln Avenue was also flooded. 4th Avenue was impassable south of Meadow Lane. | **Rockland** | Storm sewer at 2nd Street and Rockland surcharges leaving overland flow directed toward sag on 2nd Street. Storm sewer system does not have adequate capacity per current WDO and overland flow routes through yards are insufficient. | • Install new main line storm sewer along Rockland Road between Prairie Avenue and Des Plaines River (per Civiltech Plans, with sizes increased).<br>• New parallel outfall at Des Plaines River.<br>• Install lateral storm sewers along Wrightwood Terrace and 7th Avenue, and upsize storm sewers along Lincoln Avenue with new lateral feeding in at 4th Avenue.<br>• Connect proposed Lincoln Avenue system to Wrightwood Avenue lateral. | <10 Year | **25** | 0.19 | 33 | 55 | $5,945,105 |
| | | | | • **ALL STORM SEWER SIZES INCREASE**<br>• Install new main line storm sewer along Rockland Road between Prairie Avenue and Des Plaines River (per Civiltech Plans, with sizes increased).<br>• New parallel outfall at Des Plaines River.<br>• Install lateral storm sewers along Wrightwood Terrace and 7th Avenue, and upsize storm sewers along Lincoln Avenue with new lateral feeding in at 4th Avenue.<br>• Connect proposed Lincoln Avenue system to Wrightwood Avenue lateral. | | **50** | 0.19 | 33 | 91 | $6,807,525 |
| | | | | • **ALL STORM SEWER SIZES INCREASE**<br>• Install new main line storm sewer along Rockland Road between Prairie Avenue and Des Plaines River (per Civiltech Plans, with sizes increased).<br>• New parallel outfall at Des Plaines River.<br>• Install lateral storm sewers along Wrightwood Terrace and 7th Avenue, and upsize storm sewers along Lincoln Avenue with new lateral feeding in at 4th Avenue.<br>• Connect proposed Lincoln Avenue system to Wrightwood Avenue lateral. | | **100** | 0.18 | 48 | 102 | $7,329,830 |
| 15&18 | • Water ponds in roadway sag between 941 and 954 S. 4th Avenue and floods home at 942 S. 4th Avenue.<br>• The structures at 803, 809, and 815 Liberty Bell Lane take surface runoff in the lower levels from the west. It appears that water from the roadway sag on 4th Avenue overflows towards these downstream properties. | **Liberty Bell and 4th** | Insufficient storm sewer capacity based on current WDO. Nonexistent overland flow route. Existing outfalls at Park deteriorated. | • Install new storm sewer along Liberty Bell Lane between Paul Revere Drive and Golf Road.<br>• Install new storm sewer along 4th Avenue between 942 S. 4th Avenue and Golf Road. Tie both of these proposed storm sewer systems into new trunk along Golf Road.<br>• New parallel outfall at Park.<br>• Restore existing overland flow paths between side and rear yards of homes west of 4th Avenue. | 10 Year | **50** | 0.04 | 5 | 37 | $3,965,740 |
| | | | | • **ALL STORM SEWER SIZES INCREASE**<br>• Install new storm sewer along Liberty Bell Lane between Paul Revere Drive and Golf Road.<br>• Install new storm sewer along 4th Avenue between 942 S. 4th Avenue and Golf Road. Tie both of these proposed storm sewer systems into new trunk along Golf Road.<br>• New parallel outfall at Park.<br>• Restore existing overland flow paths between side and rear yards of homes west of 4th Avenue. | | **100** | 0.04 | 7 | 42 | $4,372,640 |
| 16 | Water ponds in roadway sag at Elm Drive and W. Cook Avenue intersection and floods homes at 416 Elm Drive and 324 W. Cook Avenue. | **Lange and Cook** | Insufficient storm sewer capacity based on current WDO. Nonexistent overland flow route. | • Upsize storm sewer along Cook Avenue all the way to outfall at Butler Lake. Install new storm sewer to tie in Elm Drive and Cook Avenue system to Cook Avenue upsized sewer. High capacity inlets at Cook and Lange.<br>• NOTE: There are no high ground water concerns for this project. Previous construction issues in the are have been the result of poor soil conditions and NOT high ground water. | 10 Year | **100** | NA | NA | NA | $705,600 |
| NA | NA | **Carriage Hill** | Large tributary area from west along rear yards, insufficient storm sewer capacity to existing detention basin. No safe overland flow route. | Install new storm sewer to pick up rear yard drainage and route to existing detention basin | NA | **100** | NA | 1 | 10 | $914,745 |
| NA | NA | **Harding and Willow** | Large tributary area from southwest of Willow Ave and Harding Avenue intersection, overland flow through rear yards from depressed curb on Willow Road. Low entry (window wells along driveway) vulnerable to overland flow. | Reconstruct curb along Willow Ave, flood proof 4 homes indicating flooded structure from resident flood questionnaire. | NA | **NA** | NA | 4 | 4 | $15,140 |
| | | | | | | | | | | |
| | | | | | | | | | | |

# CHAPTER 7 FUNDING OF CAPITAL PROJECTS

The long term capital improvement projects require significant capital expenditures. The following funding sources have been used in other communities to fund infrastructure projects.

## 7.1 PAY-AS-YOU-GO CAPITAL FUNDING

The Village could dedicate a portion of the Capital Planning Budget each year to construct a portion of the selected project. The phasing and portion of the project constructed each year would depend on the budget that can be allocated to the stormwater improvements.

## 7.2 MUNICIPAL BOND

A municipal bond is a bond issued by a local government, or their agencies. The Village could issue bonds to cover all or part of the projects. This would allow a greater portion of the project to be completed in a short period of time.

## 7.3 SPECIAL SERVICE AREA (SSA)

A Special Service Area (SSA) is a taxing mechanism that can be used to fund a wide range of special or additional services and/or physical improvements in a defined geographic area within the Village. The Village could develop a SSA that places a levy on the properties within the Separate Storm Sewer area. The revenues from the SSA could be used to fund drainage projects and repay Municipal Bonds.

## 7.4 OUTSIDE FUNDING SOURCES

Federal, State and County funding of stormwater projects has been successfully used by communities. However, these outside funding sources are limited and the competition for the resources is fierce. The application process can be rigorous and take months or years to complete. Given the flooding problems and potential improvement projects, the following two outside funding sources have the highest likelihood of success.

### 7.4.1 FEMA Hazard Mitigation Grant Program (HMGP)

This program provides grants to states and local governments to implement long term hazard mitigation measures after a major disaster declaration. The program will pay for 75% of mitigation projects that meet a minimum benefit/cost ratio of 1.0, in which none of the proposed flood reduction projects would qualify. In the event that a major disaster for the State is declared in the future, it is our recommendation that the Village then apply for this grant. The funding available is only a portion of the total losses for a particular disaster, which makes this a very competitive grant with an application process that can take up to 24 months.

### 7.4.2 FEMA Pre-Disaster Mitigation Grant Program (PDM)

The goal of this program is to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters. This program awards planning and project grants and provides opportunities for raising public awareness about reducing future losses before disaster strikes. Mitigation planning is a key process used to break the cycle of disaster damage, reconstruction, and repeated damage. PDM grants are funded annually by Congressional appropriations and are awarded on a nationally competitive basis. These funds are typically allocated to repetitive loss properties and buy-outs.

### 7.4.3 Flood Mitigation Assistance (FMA)

This nationwide FEMA program provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis. Unlike the HMGP program, this is a nationwide competition that focuses on Repetitive Loss properties as defined under the National Flood Insurance Program (NFIP). The program will pay for a percentage of mitigation projects that meet a minimum benefit/cost ratio of 1.0, in which none of the proposed flood reduction projects qualify. The competition for this grant is nation-wide and is very competitive.

### 7.4.4 Lake County Watershed Management Board Grants

The primary role of the Watershed Management Board (WMB) is to oversee the allocation of SMC funding and SMC staff resource allocations for projects across the four watersheds of Lake County. The WMB cost-share grant program is available to help fund drainage improvement and flood reduction projects. Projects submitted are assessed and prioritized based on nine benefit criteria (inter-jurisdictional, flood hazard reduction, structural damage, water quality, natural resources, nuisance flood reduction, multiple use, outside funding utilization, and phosphorous public education component). The program places flood damage reduction as the highest priority and offered approximately $177,000 in assistance in 2018 with a cost share match of 50%.

### 7.4.5 Lake County Stormwater Infrastructure Repair Fund

Lake County SMC has developed a Stormwater Infrastructure Repair Fund (SIRF) to assist with inter-jurisdictional drainage and flooding problems discovered through community, flood response or flood problem inventory. The program offers $100,000 per year with a minimum 50% cost share requirement. The proposed project must have flood benefits for a 10-year design storm, enhance water quality utilizing best management practices, and alleviate flood damage types with structural flood damage given the highest priority for flood damage type.

## 7.5 STORMWATER UTILITY FEE

The concept of the stormwater utility fee is to collect from both residents and businesses within the entire Village based on the amount of impervious area on the property. The impervious area is directly related to the amount of stormwater runoff contributing to the storm sewer system. An equivalent residential unit (ERU) is the basis for the amount paid to the utility fee on a monthly basis and can be included on tax bills or water bills. Impervious areas for businesses and industries in the Village should be calculated to determine

the number of ERUs within a specific non-residential parcel. The Stormwater Utility could be used to fund drainage projects and repay Municipal Bonds. The utility fee per ERU would be set based on the cost of the project, length of time for repayment and additional reserves needed for maintenance, etc.

The Village is currently engaged in efforts to determine the method to be used to generate a stormwater utility fee to fund the proposed improvements outlined in this Master Plan. The results of this analysis are currently under review and a summary of the final determination will be provided in a separate report.

# CHAPTER 8 SEPARATE STORM SEWER SYSTEM FACTS, SPECIFICS AND REALITIES

The final chapter of this Master Plan for the Village is intended to highlight facts, answer common questions and dispel myths about the Village's storm sewer network. The following statements have been provided to help the general public understand why flooding occurs throughout the Village and understand what the Village is doing to address the issues through the proposed improvements outlined in this Master Plan.

### 8.1.1 Will my street continue to flood if the project is constructed?

A large scale capital project will reduce frequency, depth and duration of street flooding. However, given the flat topography of the Village, during the most extreme storm events there will likely still be street flooding.

### 8.1.2 What are the benefits of spending millions of dollars on a capital improvement project?

The benefits of a large scale capital improvement project include reduction in the frequency, depth and duration of flooding of streets, yards and homes. It will also reduce the likelihood of inflow and infiltration to the sanitary sewer system.

### 8.1.3 Can the Village solve the flooding problems using only green infrastructure, i.e. rain barrels and rain gardens?

While we strongly recommend the implementation of green infrastructure, it will not significantly reduce flooding by itself.

### 8.1.4 If water comes up through my floor drain during a flood event, how will these capital improvements reduce that risk? Is it valuable to install either an overhead plumbing system or a back-flow preventer?

Yes, we recommend that all residents flood proof their homes to the maximum extent practicable. Flood proofing measurements include the conversion to an overhead plumbing system, and if this is cost prohibitive, then a back-flow valve on the sanitary lateral.

### 8.1.5 What can I do on my property to help drainage?

Property owners should direct stormwater runoff away from the structure by extending downspouts and establishing positive drainage away from the structure. If the soil around the foundation of a structure is

pitched towards the structure, it's recommended that material is added or removed until the slope moves away from the house (this is known as "grading"). This material should be dense- preferably clay soil. Sump pumps with a battery back-up will also ensure footing and perimeter drains are working properly to direct runoff away from the structure foundations.

# APPENDIX 1

# RECOMMENDED FLOOD REDUCTION PROJECTS

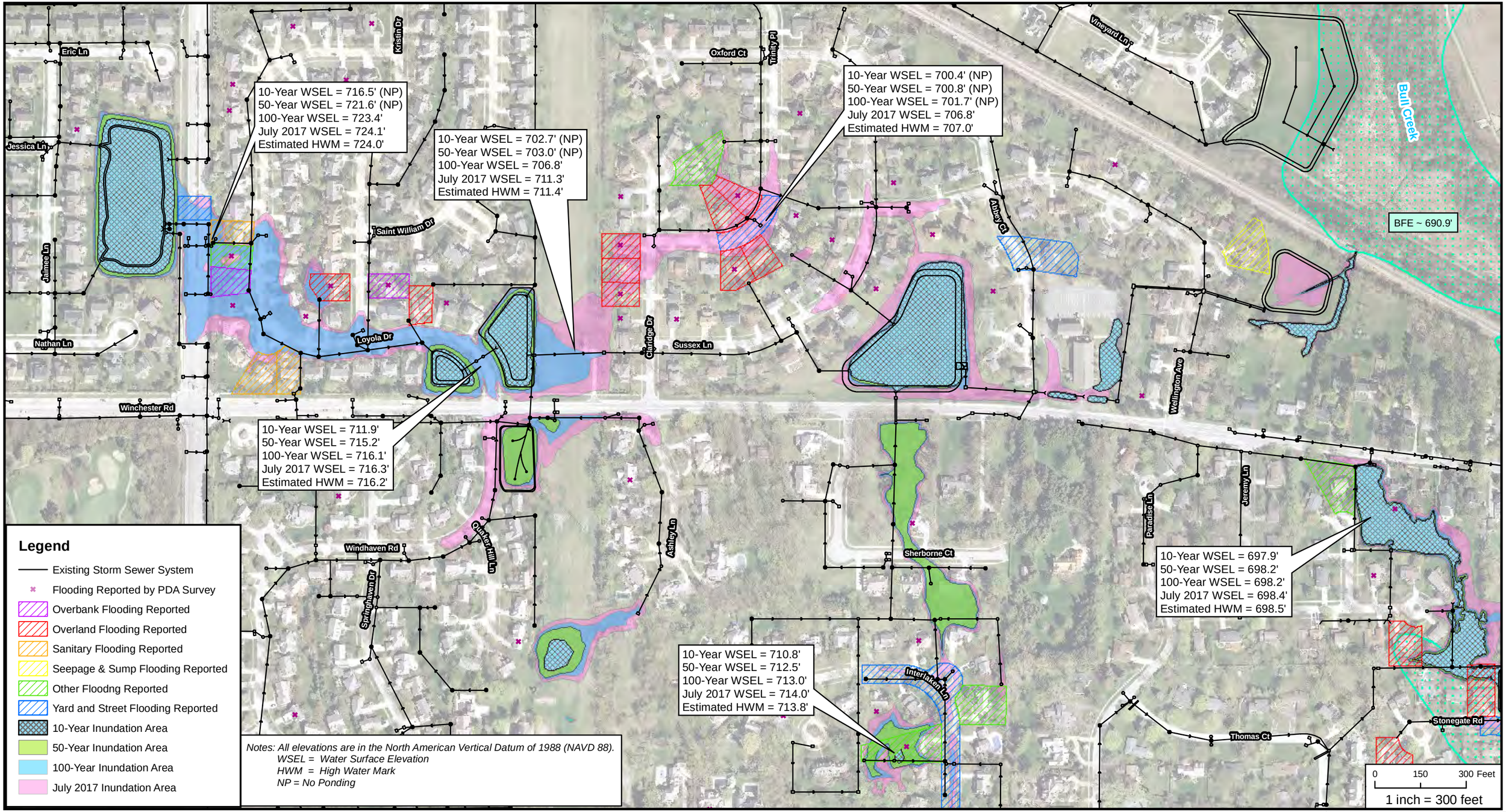
Recommended Flood Reduction Projects
**(not in order of priority)**

| Study Areas | Level of Protection | Total Project Cost |
|---|---|---|
| 1, 5, 6, 7, 9 and 10 (Winchester Road) | 100-year | $12,133,940 |
| 2 and 17 (Copeland Manor) | 100-year | $6,491,370 |
| 3 (Highlands Subdivision -1A) | 50-year***** | $7,583,255 |
| 8 and 14 (East & West Ellis Ave.) | 100-year | $5,176,560 |
| 11 (Appley/2nd Intersection) | 100-year | $792,625 |
| 12 and 13 (Rockland Road) | 100-year | $7,329,830 |
| 15 and 18 (Liberty Bell Lane) | 100-year | $4,372,640 |
| 16 (Lange & Cook) | 100-year | $705,600 |
| Carriage Hill | 100-year | $914,745 |
| Harding & Willow | N/A | $15,140 |
| **Total Project Costs:** | | **$45,515,705** |

*****It is recommended during final engineering design that this project be optimized to provide the most cost effective level of protection between the 50-year and 100-year frequency events that benefits the most number of structures. This may also involve including project alternatives 1B and 1C as bid alternates to the competitively bid recommended project 1A. Consideration will also be given to constructing the larger diameter storm sewers for alternatives 1B and/or 1C as part of project 1A so that these larger diameter storm sewers would be in place for a potential future expansion of the flood storage basin as future funding or conditions dictate.

# APPENDIX 2

# WINCHESTER / INTERLAKEN / STONEGATE – AREAS (1,5,6,7,9,10): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


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| | | | |
|---|---|---|---|
| CLIENT | Village of Libertyville | PROJECT NO. | 170001 |
| TITLE | Winchester (Areas 1, 5, 6, 7, & 10)<br>Existing Conditions Inundation Map | DATE | 7/13/18 |
| | | | EXHIBIT 1 |

0 75 150 Feet

1 inch = 150 feet

Lake County SMC Cross-Sections

10-Year WSEL = 697.9'
50-year WSEL= 698.2'
100-Year WSEL = 698.2'
July 2017 WSEL = 698.4'
Estimated HWM = 698.5'

10-Year WSEL = 695.6'
50-Year WSEL = 698.1'
100-Year WSEL = 698.7'

10-Year WSEL = 697.9'
50-year WSEL= 698.1'
100-Year WSEL = 698.2'
July 2017 WSEL = 698.4'

10-Year WSEL = 695.6'
50-Year WSEL = 698.1'
100-Year WSEL = 698.7'

10-Year WSEL = 695.6'
50-year WSEL= 695.6'
100-Year WSEL = 695.6'
July 2017 WSEL = 695.6'
Estimated HWM = 695.5'

10-Year WSEL = 695.6'
50-Year WSEL = 698.1'
100-Year WSEL = 698.7'

Winchester Rd
Wilshire Ct
Wilshire Dr
Stonegate Ct
Stonegate Rd
Lake St

## Legend

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- Yard and Street Flooding Reported
- 10-Year Inundation Area
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation*
*HWM = High Water Mark*

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

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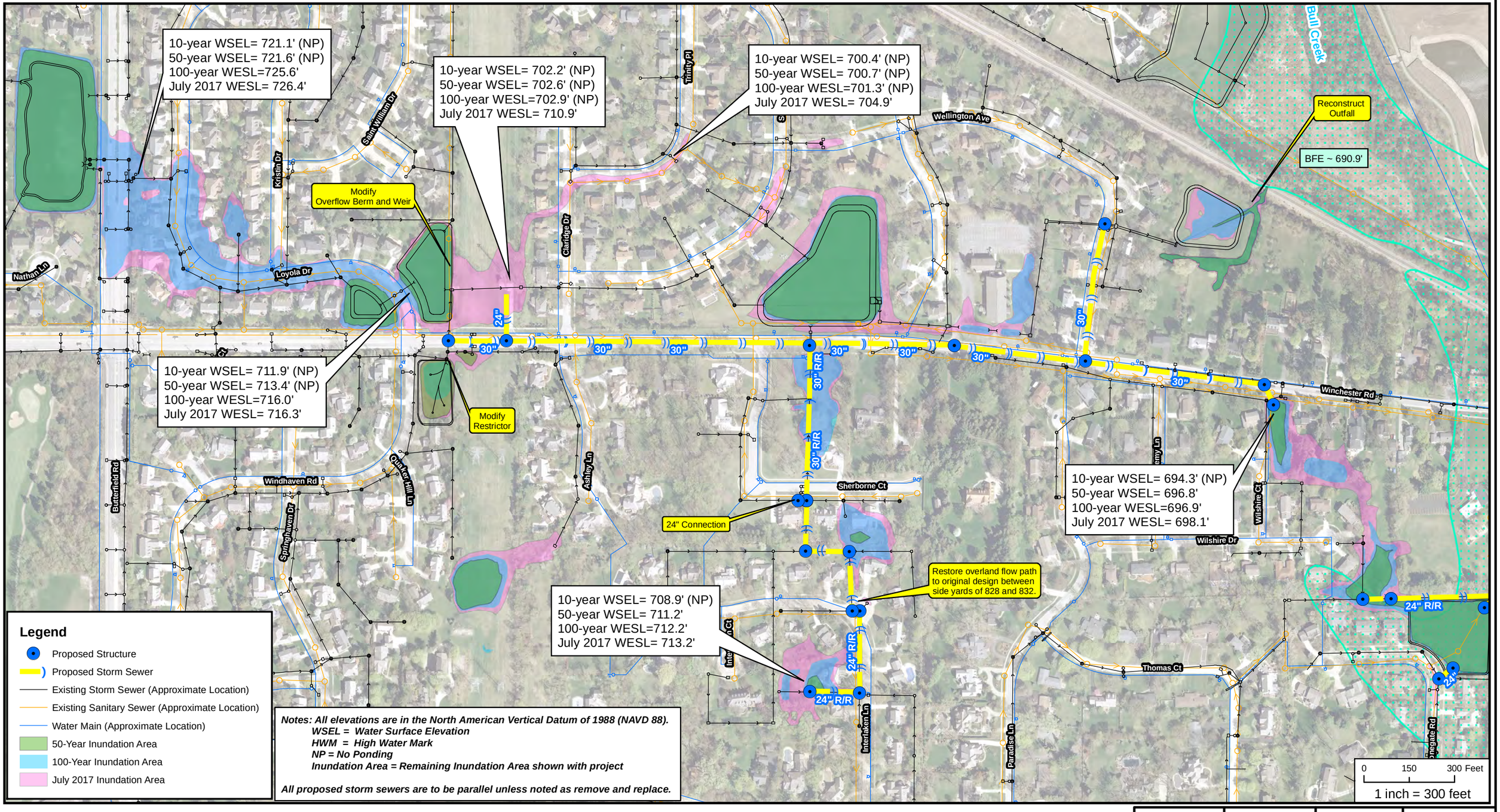
| CLIENT | PROJECT NO. |
|---|---|
| Village of Libertyville | 170001 |

TITLE
Stonegate
Existing Conditions Inundation Map

DATE
7/13/18

EXHIBIT 2




**Legend**

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


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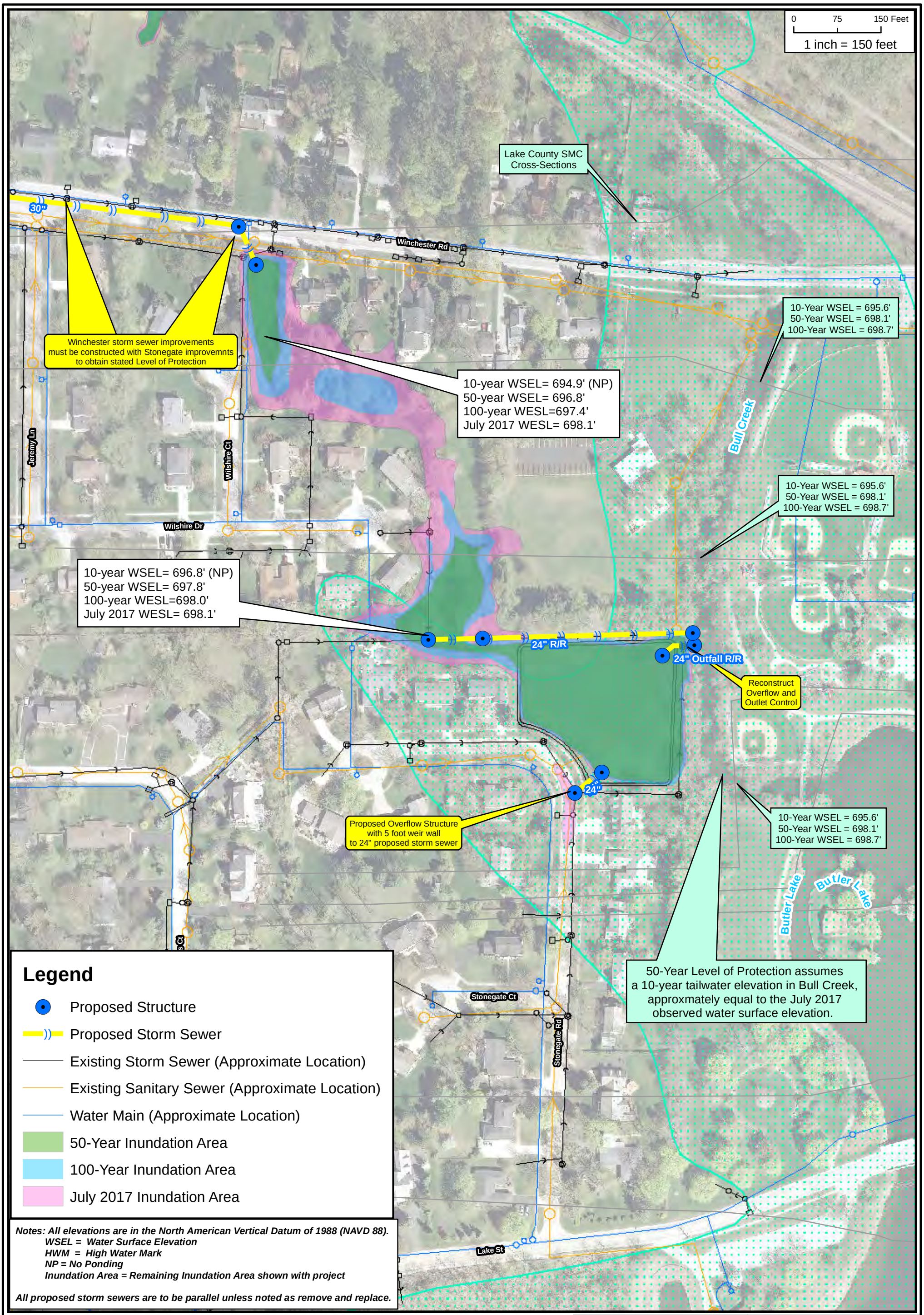
**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE** Winchester (Areas 1, 5, 6, 7, & 10)
Proposed Drainage Improvements (50-year Level of Protection)

**DATE** 04/13/18

EXHIBIT 3




*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation*
*HWM = High Water Mark*
*NP = No Ponding*
*Inundation Area = Remaining Inundation Area shown with project*

*All proposed storm sewers are to be parallel unless noted as remove and replace.*

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


| | | | |
|---|---|---|---|
| CLIENT | Village of Libertyville | PROJECT NO. | 170001 |
| TITLE | Stonegate Proposed Drainage Improvements<br>50-Year Level of Protection | DATE | 7/13/18 |
| | | | EXHIBIT 4 |

Modify Restrictors and Outfall Configuration

Install New Overflow Structure

10-year WSEL= 719.3' (NP)
50-year WSEL= 720.5' (NP)
100-year WESL=721.1' (NP)
July 2017 WESL= 722.1' (NP)

Modify Overflow Berm and Weir

10-year WSEL= 700.4' (NP)
50-year WSEL= 700.7' (NP)
100-year WESL=700.9' (NP)
July 2017 WESL= 703.5' (NP)

Reconstruct Outfall

BFE ~ 690.9'

10-year WSEL= 711.1' (NP)
50-year WSEL= 711.7' (NP)
100-year WESL=712.6' (NP)
July 2017 WESL= 715.3' (NP)

Modify Restrictor

10-year WSEL= 702.2' (NP)
50-year WSEL= 702.3' (NP)
100-year WESL=702.5' (NP)
July 2017 WESL= 703.0' (NP)

10-year WSEL= 693.5' (NP)
50-year WSEL= 694.6' (NP)
100-year WESL=695.0' (NP)
July 2017 WESL= 697.1'

24" Connection

10-year WSEL= 707.0' (NP)
50-year WSEL= 707.4' (NP)
100-year WESL=708.6' (NP)
July 2017 WESL= 711.5'

Restore overland flow path to original design between side yards of 828 and 832.

Bull Creek

Wellington Ave

Winchester Rd

Sherborne Ct

Wilshire Dr

Thomas Ct

Windhaven Rd

Pine Meadow Ct

Loyola Dr

Nathan Ln

Saint William Dr

Kristin Dr

Claridge Dr

Trinity Pl

Ashley Ln

Quaker Hill Ln

Springhaven Dr

Butterfield Rd

Interlaken Ln

Paradise Ln

Wilshire Ct

Remy Ln

Donegate Rd

42" | 54" | 24" | 58"x91" | 36" R/R | 30" R/R | 42" R/R

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

0 150 300 Feet
1 inch = 300 feet

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Winchester (Areas 1, 5, 6, 7, & 10)
Proposed Drainage Improvements (100-year Level of Protection)

**DATE** 7/13/18

EXHIBIT 5

0 70 140 Feet

1 inch = 150 feet

Lake County SMC Cross-Sections

54"

Winchester Rd

Winchester storm sewer improvements must be constructed with stonegate improvemnts to obtain stated Level of Protection

10-year WSEL= 693.7' (NP)
50-year WSEL = 694.6' (NP)
100-year WESL = 695.3' (NP)
July 2017 WESL = 697.1'

10-Year WSEL = 695.6'
50-Year WSEL = 698.1'
100-Year WSEL = 698.7'

Bull Creek

Jeremy Ln

Wilshire Ct

Wilshire Dr

10-year WSEL= 695.8' (NP)
50-year WSEL= 695.9' (NP)
100-year WESL=696.1' (NP)
July 2017 WESL= 697.0'

42" R/R

24" Outfall R/R

Reconstruct Overflow and Outlet Control

24"

Proposed Overflow Structure with 5 foot weir wall to 24" proposed storm sewer

10-Year WSEL = 695.6'
50-Year WSEL = 698.1'
100-Year WSEL = 698.7'

Butler Lake

Butler Lake

100-Year Level of Protection assumes a 10-year tailwater elevation in Bull Creek, approxmately equal to the July 2017 observed water surface elevation.

Stonegate Ct

Stonegate Rd

Lake St

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

| CLIENT | PROJECT NO. | |
|---|---|---|
| Village of Libertyville | 170001 | N W E S |
| **TITLE** | **DATE** | |
| Stonegate Proposed Drainage Improvements<br>100-Year Level of Protection | 7/13/18 | EXHIBIT 6 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: July 18, 2018

Village of Libertyville, Area 1/5/6/7/10 (Winchester)
ALTERNATE 1: 50-Year Level of Protection

| | | | | WINCHESTER | | | INTERLAKEN | | | STONEGATE | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | $5.00 | 68 | $340.00 | $850.00 | 584 | $2,920.00 | $7,300.00 | 288 | $1,440.00 | $13,600.00 | 940 | $4,700.00 | $21,750.00 |
| | SEEDING | SQ YD | $5.00 | 68 | $340.00 | | 584 | $2,920.00 | | 288 | $1,440.00 | | 940 | $4,700.00 | |
| | EROSION CONTROL BLANKET | SQ YD | $2.50 | 68 | $170.00 | | 584 | $1,460.00 | | 288 | $720.00 | | 940 | $2,350.00 | |
| | TREE REMOVAL | L. SUM | $10,000.00 | 0 | $0.00 | | 0 | $0.00 | | 1 | $10,000.00 | | 1 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 34,870 | $1,569,150.00 | $2,211,100.00 | 526 | $23,670.00 | $247,420.00 | 534 | $24,030.00 | $160,655.00 | 35,930 | $1,616,850.00 | $2,619,175.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 400 | $28,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 400 | $28,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 135 | $16,200.00 | | 850 | $102,000.00 | | 575 | $69,000.00 | | 1,560 | $187,200.00 | |
| | STORM SEWER, RCP 30" | FOOT | $150.00 | 3,420 | $513,000.00 | | 520 | $78,000.00 | | 0 | $0.00 | | 3,940 | $591,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 0 | $0.00 | | 1,350 | $33,750.00 | | 515 | $12,875.00 | | 1,865 | $46,625.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 16 | $28,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 16 | $28,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 1 | $3,750.00 | | 0 | $0.00 | | 1 | $3,750.00 | | 2 | $7,500.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 3 | $15,000.00 | | 2 | $10,000.00 | | 5 | $25,000.00 | | 10 | $50,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 5 | $35,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 5 | $35,000.00 | |
| | MODIFY OVERFLOW BERM AND WEIR | L. SUM | $1,000.00 | 1 | $1,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $1,000.00 | |
| | OVERFLOW STRUCTURE W/ 5' WEIR WALL | L. SUM | $20,000.00 | 0 | $0.00 | | 0 | $0.00 | | 1 | $20,000.00 | | 1 | $20,000.00 | |
| | MODIFY RESTRICTOR | L. SUM | $1,000.00 | 1 | $1,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $1,000.00 | |
| | MODIFY RESTRICTOR AND OUTFALL CONFIGURATION | L. SUM | $1,000.00 | 1 | $1,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $1,000.00 | |
| | 24" FLARED END SECTION W/ GRATE | EACH | $2,000.00 | 0 | $0.00 | | 0 | $0.00 | | 2 | $4,000.00 | | 2 | $4,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 0 | $0.00 | | 0 | $0.00 | | 20 | $2,000.00 | | 20 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 11,051 | $55,255.00 | $413,539.00 | 0 | $0.00 | $0.00 | 0 | $0.00 | $0.00 | 11,051 | $55,255.00 | $413,539.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 930 | $83,700.00 | | 0 | $0.00 | | 0 | $0.00 | | 930 | $83,700.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 467 | $39,695.00 | | 0 | $0.00 | | 0 | $0.00 | | 467 | $39,695.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 11,051 | $11,051.00 | | 0 | $0.00 | | 0 | $0.00 | | 11,051 | $11,051.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 583 | $14,575.00 | | 0 | $0.00 | | 0 | $0.00 | | 583 | $14,575.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 1,743 | $1,743.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,743 | $1,743.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 800 | $24,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 800 | $24,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 1,600 | $16,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,600 | $16,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 320 | $12,800.00 | | 0 | $0.00 | | 0 | $0.00 | | 320 | $12,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 1,934 | $154,720.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,934 | $154,720.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 585 | $43,875.00 | $143,875.00 | 0 | $0.00 | $26,250.00 | 0 | $0.00 | $0.00 | 585 | $43,875.00 | $170,125.00 |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 1,125 | $56,250.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,125 | $56,250.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 250 | $43,750.00 | | 150 | $26,250.00 | | 0 | $0.00 | | 400 | $70,000.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | $125,000.00 | 1 | $62,500.00 | $312,500.00 | 1 | $31,250.00 | $156,250.00 | 1 | $31,250.00 | $156,250.00 | 1 | $125,000.00 | $625,000.00 |
| | MOBILIZATION | L. SUM | $250,000.00 | 1 | $125,000.00 | | 1 | $62,500.00 | | 1 | $62,500.00 | | 1 | $250,000.00 | |
| | TRAFFIC CONTROL | L. SUM | $250,000.00 | 1 | $125,000.00 | | 1 | $62,500.00 | | 1 | $62,500.00 | | 1 | $250,000.00 | |
| | | | SUBTOTAL = | | $3,081,864.00 | | | $437,220.00 | | | $330,505.00 | | | $3,849,589.00 | |
| | | | CONTINGENCY (30%) = | | $924,559.20 | | | $131,166.00 | | | $99,151.50 | | | $1,154,876.70 | |
| | | | **CONSTRUCTION TOTAL =** | | **$4,006,423.20** | | | **$568,386.00** | | | **$429,656.50** | | | **$5,004,465.70** | |
| | | | DESIGN ENGINEERING (7.5%) = | | $300,481.74 | | | $42,628.95 | | | $32,224.24 | | | $375,334.93 | |
| | | | CONSTRUCTION ENGINEERING (7.5%) = | | $300,481.74 | | | $42,628.95 | | | $32,224.24 | | | $375,334.93 | |
| | | | PERMITTING (2.5%) = | | $100,160.58 | | | $14,209.65 | | | $10,741.41 | | | $125,111.64 | |
| | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | | **$4,707,547.26** | | | **$667,853.55** | | | **$504,846.39** | | | **$5,880,247.20** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: July 18, 2018

Village of Libertyville, Area 1/5/6/7/10 (Winchester)
ALTERNATE 2: 100-Year Level of Protection

| | | | | WINCHESTER | | | INTERLAKEN | | | STONEGATE | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | $5.00 | 637 | $3,185.00 | $7,962.50 | 733 | $3,665.00 | $9,162.50 | 376 | $1,880.00 | $14,700.00 | 1,746 | $8,730.00 | $31,825.00 |
| | SEEDING | SQ YD | $5.00 | 637 | $3,185.00 | | 733 | $3,665.00 | | 376 | $1,880.00 | | 1,746 | $8,730.00 | |
| | EROSION CONTROL BLANKET | SQ YD | $2.50 | 637 | $1,592.50 | | 733 | $1,832.50 | | 376 | $940.00 | | 1,746 | $4,365.00 | |
| | TREE REMOVAL | L. SUM | $10,000.00 | 0 | $0.00 | | 0 | $0.00 | | 1 | $10,000.00 | | 1 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 45,719 | $2,057,355.00 | $4,478,655.00 | 556 | $25,020.00 | $355,045.00 | 512 | $23,040.00 | $214,915.00 | 46,787 | $2,105,415.00 | $5,048,615.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 600 | $42,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 600 | $42,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 135 | $16,200.00 | | 20 | $2,400.00 | | 125 | $15,000.00 | | 280 | $33,600.00 | |
| | STORM SEWER, RCP 30" | FOOT | $150.00 | 0 | $0.00 | | 1,325 | $198,750.00 | | 0 | $0.00 | | 1,325 | $198,750.00 | |
| | STORM SEWER, RCP 36" | FOOT | $175.00 | 0 | $0.00 | | 200 | $35,000.00 | | 0 | $0.00 | | 200 | $35,000.00 | |
| | STORM SEWER, RCP 42" | FOOT | $200.00 | 1,980 | $396,000.00 | | 0 | $0.00 | | 450 | $90,000.00 | | 2,430 | $486,000.00 | |
| | STORM SEWER, RCP 54" | FOOT | $270.00 | 3,505 | $946,350.00 | | 0 | $0.00 | | 0 | $0.00 | | 3,505 | $946,350.00 | |
| | STORM SEWER, RCEP 91"x58" BOX | FOOT | $1,400.00 | 450 | $630,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 450 | $630,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 0 | $0.00 | | 1,525 | $38,125.00 | | 515 | $12,875.00 | | 2,040 | $51,000.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 24 | $42,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 24 | $42,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 0 | $0.00 | | 1 | $3,750.00 | | 0 | $0.00 | | 1 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 0 | $0.00 | | 2 | $10,000.00 | | 2 | $10,000.00 | | 4 | $20,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 0 | $0.00 | | 6 | $42,000.00 | | 2 | $14,000.00 | | 8 | $56,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | $12,000.00 | 8 | $96,000.00 | | 0 | $0.00 | | 2 | $24,000.00 | | 10 | $120,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | $15,750.00 | 3 | $47,250.00 | | 0 | $0.00 | | 0 | $0.00 | | 3 | $47,250.00 | |
| | MANHOLES, 9' DIAMETER | EACH | $12,500.00 | 3 | $37,500.00 | | 0 | $0.00 | | 0 | $0.00 | | 3 | $37,500.00 | |
| | MODIFY OVERFLOW BERM AND WEIR | L. SUM | $1,000.00 | 1 | $1,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $1,000.00 | |
| | OVERFLOW STRUCTURE W/ 5' WEIR WALL | L. SUM | $20,000.00 | 0 | $0.00 | | 0 | $0.00 | | 1 | $20,000.00 | | 1 | $20,000.00 | |
| | MODIFY RESTRICTOR | L. SUM | $1,000.00 | 1 | $1,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $1,000.00 | |
| | MODIFY RESTRICTOR AND OUTFALL CONFIGURATION | L. SUM | $1,000.00 | 1 | $1,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $1,000.00 | |
| | OVERFLOW STRUCTURE | L. SUM | $15,000.00 | 1 | $15,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1 | $15,000.00 | |
| | JUNCTION CHAMBER | EACH | $50,000.00 | 3 | $150,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 3 | $150,000.00 | |
| | 24" FLARED END SECTION W/ GRATE | EACH | $2,000.00 | 0 | $0.00 | | 0 | $0.00 | | 2 | $4,000.00 | | 2 | $4,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 0 | $0.00 | | 0 | $0.00 | | 20 | $2,000.00 | | 20 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 20,602 | $103,010.00 | $823,916.08 | 810 | $4,050.00 | $21,378.00 | 0 | $0.00 | $0.00 | 21,412 | $107,060.00 | $845,294.08 |
| | PAVEMENT REMOVAL | SQ YD | $15.00 | 1,150 | $17,250.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,150 | $17,250.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | $40.00 | 19 | $766.67 | | 0 | $0.00 | | 0 | $0.00 | | 19 | $766.67 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | $40.00 | 19 | $766.67 | | 0 | $0.00 | | 0 | $0.00 | | 19 | $766.67 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | $2.50 | 58 | $143.75 | | 0 | $0.00 | | 0 | $0.00 | | 58 | $143.75 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 1,862 | $167,580.00 | | 69 | $6,210.00 | | 0 | $0.00 | | 1,931 | $173,790.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 258 | $20,640.00 | | 0 | $0.00 | | 0 | $0.00 | | 258 | $20,640.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 868 | $73,780.00 | | 35 | $2,975.00 | | 0 | $0.00 | | 903 | $76,755.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | $12.00 | 1,150 | $13,800.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,150 | $13,800.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 20,602 | $20,602.00 | | 810 | $810.00 | | 0 | $0.00 | | 21,412 | $21,412.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 1,085 | $27,125.00 | | 43 | $1,075.00 | | 0 | $0.00 | | 1,128 | $28,200.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 3,332 | $3,332.00 | | 138 | $138.00 | | 0 | $0.00 | | 3,470 | $3,470.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 1,200 | $36,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 1,200 | $36,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 2,400 | $24,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 2,400 | $24,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 480 | $19,200.00 | | 0 | $0.00 | | 0 | $0.00 | | 480 | $19,200.00 | |
| | CLASS B PATCHES, 8 INCH | SQ YD | $40.00 | 0 | $0.00 | | 153 | $6,120.00 | | 0 | $0.00 | | 153 | $6,120.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 3,699 | $295,920.00 | | 0 | $0.00 | | 0 | $0.00 | | 3,699 | $295,920.00 | |
| UTILITY RELOCATIONS | WATER MAIN REMOVAL AND REPLACEMENT | FOOT | $200.00 | 450 | $90,000.00 | $654,550.00 | 0 | $0.00 | $63,375.00 | 0 | $0.00 | $0.00 | 450 | $90,000.00 | $717,925.00 |
| | NEW WATER SERVICE LINE | FOOT | $100.00 | 180 | $18,000.00 | | 0 | $0.00 | | 0 | $0.00 | | 180 | $18,000.00 | |
| | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 270 | $20,250.00 | | 225 | $16,875.00 | | 0 | $0.00 | | 495 | $37,125.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | $110.00 | 3,955 | $435,050.00 | | 0 | $0.00 | | 0 | $0.00 | | 3,955 | $435,050.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | $75.00 | 450 | $33,750.00 | | 0 | $0.00 | | 0 | $0.00 | | 450 | $33,750.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 450 | $22,500.00 | | 405 | $20,250.00 | | 0 | $0.00 | | 855 | $42,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 200 | $35,000.00 | | 150 | $26,250.00 | | 0 | $0.00 | | 350 | $61,250.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | $260,000.00 | 1 | $130,000.00 | $650,000.00 | 1 | $65,000.00 | $325,000.00 | 1 | $65,000.00 | $325,000.00 | 1 | $260,000.00 | $1,300,000.00 |
| | MOBILIZATION | L. SUM | $520,000.00 | 1 | $260,000.00 | | 1 | $130,000.00 | | 1 | $130,000.00 | | 1 | $520,000.00 | |
| | TRAFFIC CONTROL | L. SUM | $520,000.00 | 1 | $260,000.00 | | 1 | $130,000.00 | | 1 | $130,000.00 | | 1 | $520,000.00 | |
| | | | | | SUBTOTAL = | $6,615,083.58 | | | $773,960.50 | | | $554,615.00 | | | $7,943,659.08 |
| | | | | | CONTINGENCY (30%) = | $1,984,525.08 | | | $232,188.15 | | | $166,384.50 | | | $2,383,097.73 |
| | | | | | **CONSTRUCTION TOTAL =** | **$8,599,608.66** | | | **$1,006,148.65** | | | **$720,999.50** | | | **$10,326,756.81** |
| | | | | | DESIGN ENGINEERING (7.5%) = | $644,970.65 | | | $75,461.15 | | | $54,074.96 | | | $774,506.76 |
| | | | | | CONSTRUCTION ENGINEERING (7.5%) = | $644,970.65 | | | $75,461.15 | | | $54,074.96 | | | $774,506.76 |
| | | | | | PERMITTING (2.5%) = | $214,990.22 | | | $25,153.72 | | | $18,024.99 | | | $258,168.92 |
| | | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$10,104,540.17** | | | **$1,182,224.66** | | | **$847,174.41** | | | **$12,133,939.25** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 3

# COPELAND MANOR – AREAS (2&17): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).
WSEL = Water Surface Elevation; HWM = High Water Mark

0 100 200 Feet
1 inch = 200 feet

10-year WSEL = 659.3'
25-year WSEL = 659.5'
50-year WSEL = 659.6'
100-year WSEL = 659.8'
July 2017 WSEL = 659.9'
Estimated HWM = 659.6'

10-year WSEL = 656.5'
25-year WSEL = 656.8'
50-year WSEL = 656.9'
100-year WSEL = 657.0'
July 2017 WSEL = 657.1'
Estimated HWM = 657.0'

Briar Pl
4th Ave
Wrightwood Ter
Buckingham Pl
Hampton Ter
Kenwood Ave
Riverside Dr
Glendale Rd
Des Plaines River
7th Ave
Ardmore Ter
Valley Park Dr
5th Ave
Liberty Bell Ln
Paul Revere Dr

**Legend**

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- Yard and Street Flooding Reported
- 10-Year Inundation Area
- 25-Year Inundation Area
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

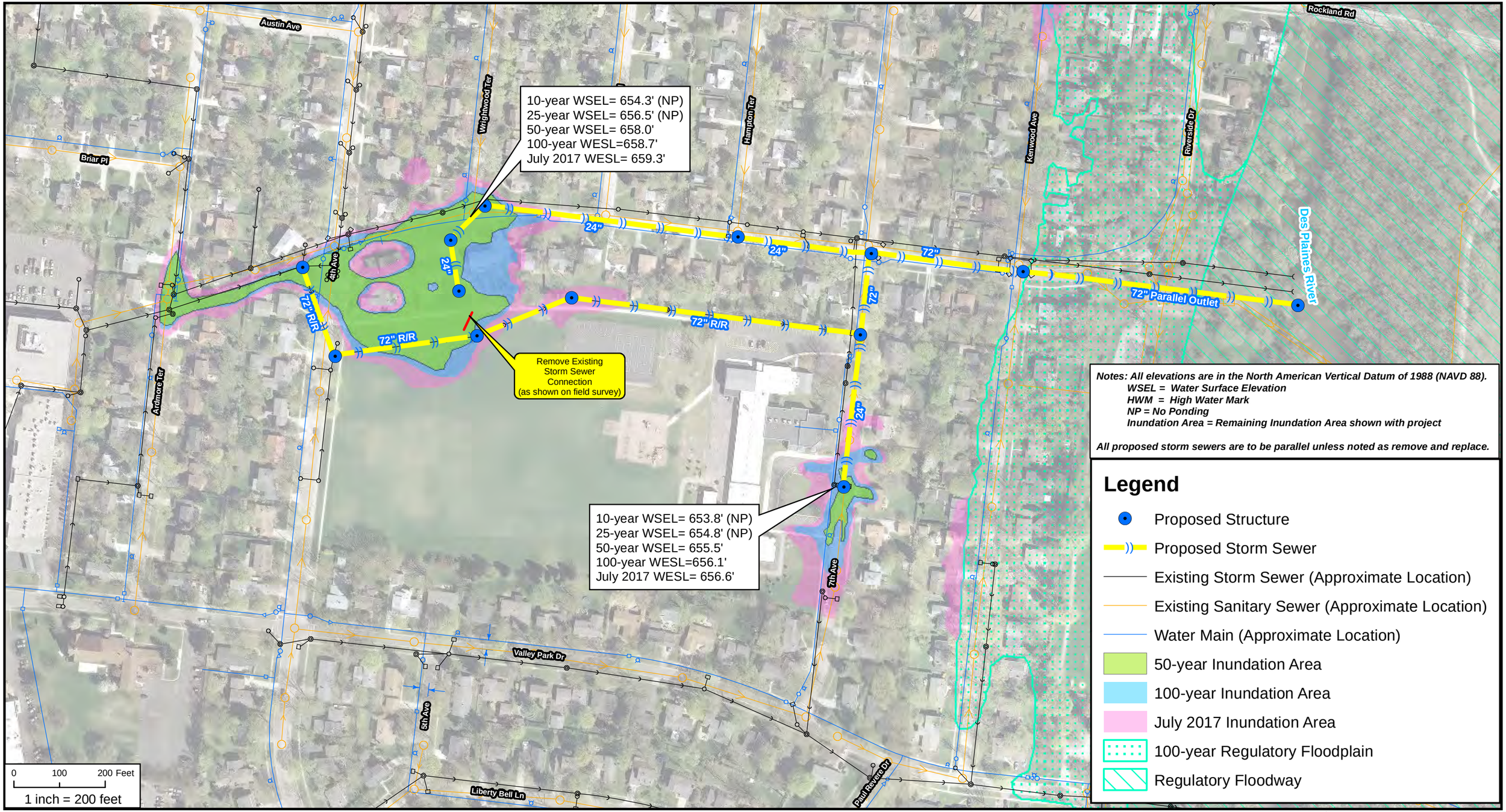
**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE** Copeland Manor (Areas 2 & 17) Existing Conditions Inundation Map

**DATE** 7/13/18

EXHIBIT 7




***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-year Inundation Area
- 100-year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

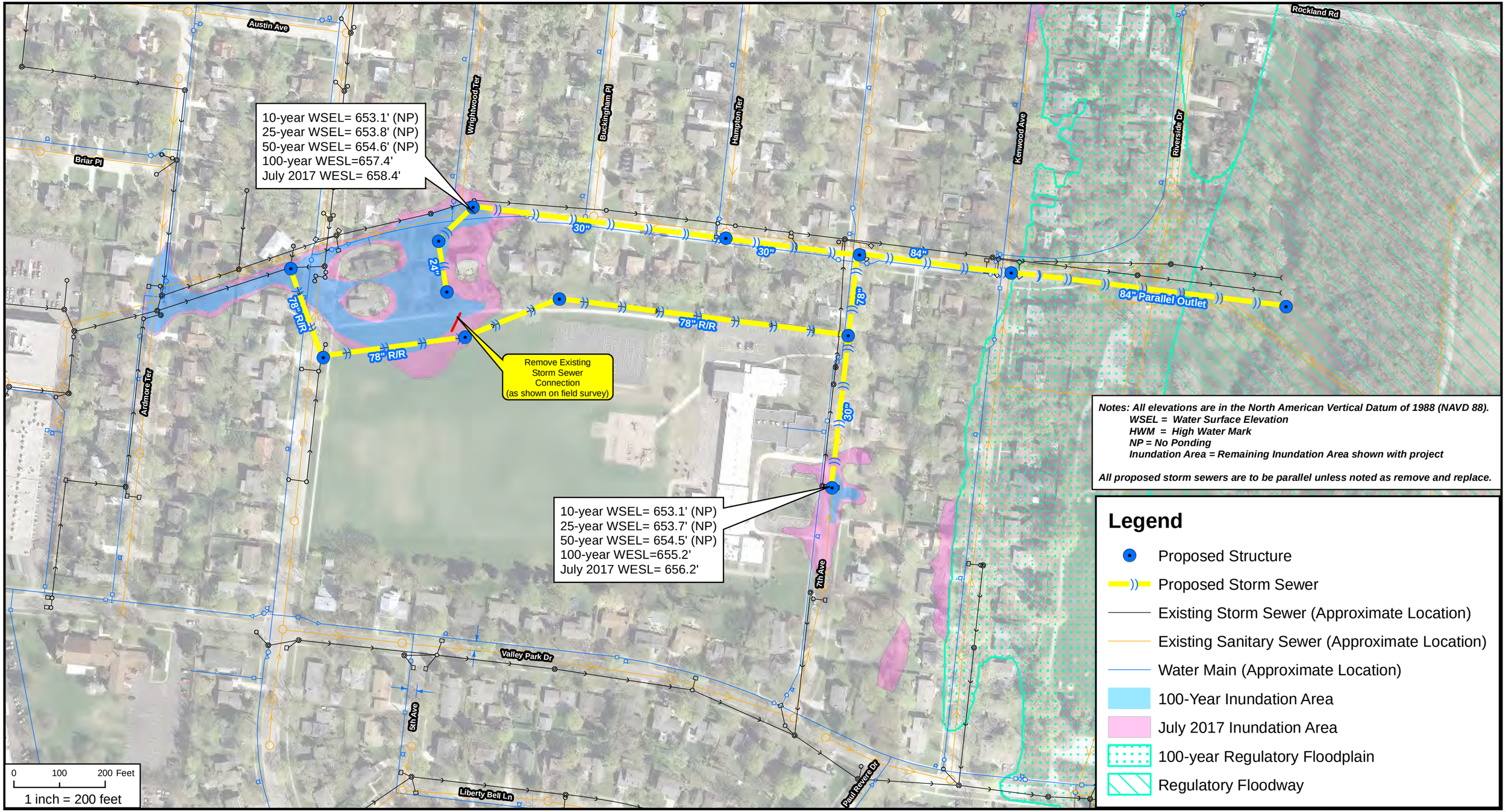
**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Copeland Manor (Areas 2 & 17)
Proposed Drainage Improvements (25-year Level of Protection)

**DATE** 7/13/18

EXHIBIT 8




*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation*
*HWM = High Water Mark*
*NP = No Ponding*
*Inundation Area = Remaining Inundation Area shown with project*

*All proposed storm sewers are to be parallel unless noted as remove and replace.*

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

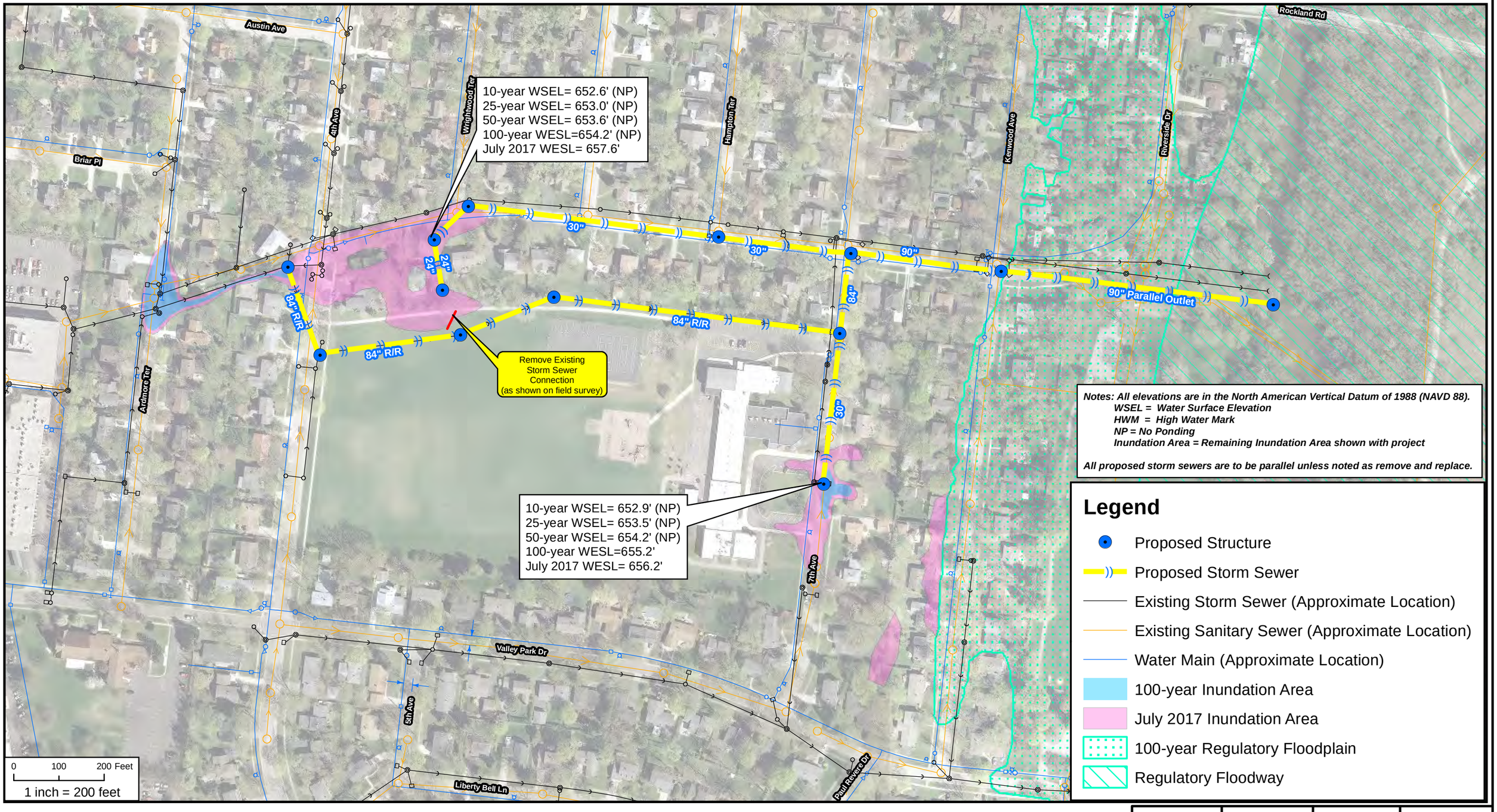
**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Copeland Manor (Areas 2 & 17)
Proposed Drainage Improvements (50-year Level of Protection)

**DATE** 7/13/18

EXHIBIT 9




***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Copeland Manor (Areas 2 & 17)
Proposed Drainage Improvements (100-year Level of Protection)

**DATE** 7/13/18

EXHIBIT 10

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 2/17 (Copeland Manor)
ALTERNATE 1: 25-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 2,239 | $5.00 | $11,195.00 | $27,987.50 |
| | SEEDING | SQ YD | 2,239 | $5.00 | $11,195.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 2,239 | $2.50 | $5,597.50 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 13,350 | $45.00 | $600,750.00 | $2,162,175.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 500 | $70.00 | $35,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | 1,490 | $120.00 | $178,800.00 | |
| | STORM SEWER, RCP 72" | FOOT | 2,540 | $450.00 | $1,143,000.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,395 | $25.00 | $34,875.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 20 | $1,750.00 | $35,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 6 | $3,750.00 | $22,500.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 5 | $15,750.00 | $78,750.00 | |
| | MANHOLES, 9' DIAMETER | EACH | 2 | $12,500.00 | $25,000.00 | |
| | 72" FLARED END SECTION W/ GRATE | EACH | 1 | $7,500.00 | $7,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 3,325 | $5.00 | $16,625.00 | $304,308.71 |
| | PAVEMENT REMOVAL | SQ YD | 2,275 | $15.00 | $34,125.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 38 | $40.00 | $1,516.67 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 38 | $40.00 | $1,516.67 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 114 | $2.50 | $284.38 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 536 | $90.00 | $48,240.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 511 | $80.00 | $40,880.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 141 | $85.00 | $11,985.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 2,275 | $12.00 | $27,300.00 | |
| | PREPARATION OF BASE | SQ YD | 3,325 | $1.00 | $3,325.00 | |
| | AGGREGATE BASE REPAIR | TON | 175 | $25.00 | $4,375.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 536 | $1.00 | $536.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,000 | $30.00 | $30,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 2,000 | $10.00 | $20,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 400 | $40.00 | $16,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 595 | $80.00 | $47,600.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 990 | $75.00 | $74,250.00 | $516,400.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 2,540 | $110.00 | $279,400.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 450 | $75.00 | $33,750.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 1,530 | $50.00 | $76,500.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $120,000.00 | $120,000.00 | $480,000.00 |
| | MOBILIZATION | L. SUM | 1 | $240,000.00 | $240,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $120,000.00 | $120,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $3,490,871.21 |
| CONTINGENCY (30%) = | $1,047,261.36 |
| **CONSTRUCTION TOTAL =** | **$4,538,132.57** |
| DESIGN ENGINEERING (7.5%) = | $340,359.94 |
| CONSTRUCTION ENGINEERING (7.5%) = | $340,359.94 |
| PERMITTING (2.5%) = | $113,453.31 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$5,332,305.77** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 2/17 (Copeland Manor)
ALTERNATE 2: 50-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 2,124 | $5.00 | $10,620.00 | $26,550.00 |
| | SEEDING | SQ YD | 2,124 | $5.00 | $10,620.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 2,124 | $2.50 | $5,310.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 13,568 | $45.00 | $610,560.00 | $2,522,935.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 500 | $70.00 | $35,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | 300 | $120.00 | $36,000.00 | |
| | STORM SEWER, RCP 30" | FOOT | 1,190 | $150.00 | $178,500.00 | |
| | STORM SEWER, RCP 78" | FOOT | 1,565 | $500.00 | $782,500.00 | |
| | STORM SEWER, RCP 84" | FOOT | 975 | $550.00 | $536,250.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,395 | $25.00 | $34,875.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 20 | $1,750.00 | $35,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 1 | $3,750.00 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 3 | $5,000.00 | $15,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 1 | $7,000.00 | $7,000.00 | |
| | MANHOLES, 9' DIAMETER | EACH | 3 | $12,500.00 | $37,500.00 | |
| | JUNCTION CHAMBER | EACH | 4 | $50,000.00 | $200,000.00 | |
| | 84" FLARED END SECTION W/ GRATE | EACH | 1 | $10,000.00 | $10,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 3,325 | $5.00 | $16,625.00 | $310,699.71 |
| | PAVEMENT REMOVAL | SQ YD | 2,275 | $15.00 | $34,125.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 38 | $40.00 | $1,516.67 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 38 | $40.00 | $1,516.67 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 114 | $2.50 | $284.38 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 536 | $90.00 | $48,240.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 511 | $80.00 | $40,880.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 141 | $85.00 | $11,985.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 2,275 | $12.00 | $27,300.00 | |
| | PREPARATION OF BASE | SQ YD | 3,325 | $1.00 | $3,325.00 | |
| | AGGREGATE BASE REPAIR | TON | 175 | $25.00 | $4,375.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 607 | $1.00 | $607.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,000 | $30.00 | $30,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 2,000 | $10.00 | $20,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 400 | $40.00 | $16,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 674 | $80.00 | $53,920.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 990 | $75.00 | $74,250.00 | $516,400.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 2,540 | $110.00 | $279,400.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 450 | $75.00 | $33,750.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 1,530 | $50.00 | $76,500.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $130,000.00 | $130,000.00 | $520,000.00 |
| | MOBILIZATION | L. SUM | 1 | $260,000.00 | $260,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $130,000.00 | $130,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $3,896,584.71 |
| CONTINGENCY (30%) = | $1,168,975.41 |
| **CONSTRUCTION TOTAL =** | **$5,065,560.12** |
| DESIGN ENGINEERING (7.5%) = | $379,917.01 |
| CONSTRUCTION ENGINEERING (7.5%) = | $379,917.01 |
| PERMITTING (2.5%) = | $126,639.00 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$5,952,033.14** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISITION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 2/17 (Copeland Manor)
ALTERNATE 3: 100-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 2,239 | $5.00 | $11,195.00 | $27,987.50 |
| | SEEDING | SQ YD | 2,239 | $5.00 | $11,195.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 2,239 | $2.50 | $5,597.50 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 13,574 | $45.00 | $610,830.00 | $2,814,580.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 500 | $70.00 | $35,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | 300 | $120.00 | $36,000.00 | |
| | STORM SEWER, RCP 30" | FOOT | 1,190 | $150.00 | $178,500.00 | |
| | STORM SEWER, RCP 84" | FOOT | 1,565 | $550.00 | $860,750.00 | |
| | STORM SEWER, RCP 90" | FOOT | 975 | $875.00 | $853,125.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,395 | $25.00 | $34,875.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 20 | $1,750.00 | $35,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 1 | $5,000.00 | $5,000.00 | |
| | MANHOLES, 10' DIAMETER | EACH | 2 | $1,250.00 | $2,500.00 | |
| | JUNCTION CHAMBER | EACH | 3 | $50,000.00 | $150,000.00 | |
| | 90" FLARED END SECTION W/ GRATE | EACH | 1 | $12,000.00 | $12,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 3,325 | $5.00 | $16,625.00 | $310,699.71 |
| | PAVEMENT REMOVAL | SQ YD | 2,275 | $15.00 | $34,125.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 38 | $40.00 | $1,516.67 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 38 | $40.00 | $1,516.67 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 114 | $2.50 | $284.38 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 536 | $90.00 | $48,240.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 511 | $80.00 | $40,880.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 141 | $85.00 | $11,985.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 2,275 | $12.00 | $27,300.00 | |
| | PREPARATION OF BASE | SQ YD | 3,325 | $1.00 | $3,325.00 | |
| | AGGREGATE BASE REPAIR | TON | 175 | $25.00 | $4,375.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 607 | $1.00 | $607.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,000 | $30.00 | $30,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 2,000 | $10.00 | $20,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 400 | $40.00 | $16,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 674 | $80.00 | $53,920.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 990 | $75.00 | $74,250.00 | $516,400.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 2,540 | $110.00 | $279,400.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 450 | $75.00 | $33,750.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 1,530 | $50.00 | $76,500.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $145,000.00 | $145,000.00 | $580,000.00 |
| | MOBILIZATION | L. SUM | 1 | $290,000.00 | $290,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $145,000.00 | $145,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $4,249,667.21 |
| CONTINGENCY (30%) = | $1,274,900.16 |
| **CONSTRUCTION TOTAL =** | **$5,524,567.37** |
| DESIGN ENGINEERING (7.5%) = | $414,342.55 |
| CONSTRUCTION ENGINEERING (7.5%) = | $414,342.55 |
| PERMITTING (2.5%) = | $138,114.18 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$6,491,366.66** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 4

# BURDICK & AMES – AREA (3): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

## Legend

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- Yard and Street Flooding Reported
- 10-Year Inundation Area
- 25-Year Inundation Area
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 205 410 Feet
1 inch = 400 feet

Butler Lake

10-year WSEL = 697.8'
25-year WSEL = 698.3'
50-year WSEL = 698.8'
100-year WSEL = 699.3'
July 2017 WSEL = 700.1'

10-year WSEL = 699.2'
25-year WSEL = 699.8'
50-year WSEL = 700.4'
100-year WSEL = 700.8'
July 2017 WSEL = 701.4'
Estimated HWM = 701.3'

10-year WSEL = 699.6'
25-year WSEL = 700.1'
50-year WSEL = 700.5'
100-year WSEL = 700.9'
July 2017 WSEL = 701.4'
Estimated HWM = 701.3'

10-year WSEL = 720.5'
25-year WSEL = 720.5'
50-year WSEL = 720.6'
100-year WSEL = 720.6'
July 2017 WSEL = 720.9'
Estimated HWM = 720.8'

10-year WSEL = 699.5'
25-year WSEL = 700.0'
50-year WSEL = 700.4'
100-year WSEL = 700.8'
July 2017 WSEL = 701.4'
Estimated HWM = 701.3'

10-year WSEL = 700.3'
25-year WSEL = 700.3'
50-year WSEL = 700.7'
100-year WSEL = 701.3'
July 2017 WSEL = 701.9'
Estimated HWM = 701.3'

Nicholas Dowden Park

Elm Ct, Forest Ln, Sunset Dr, Linden Ln, Arbor Ct, Homewood Ave, Brainerd Ave, Mckinley Ave, Lincoln Ave, Rockland Rd, Austin Ave, Ash St, Ames St, Carter St, Burdick St, Crane Blvd, Dawes St, Drake St, Burridge St, Gracewood Dr, Dymond Rd, Pinetree Ln, Havenwood Ct, Havenwood Ln, Harms Ave, Shari Ln, Nordic Ct, Crestfield Ave, Fairlawn Ave, Butterfield Rd, Regency Ln, Bedford Ln, Golf Rd, Wexford Ct, Pembrooke Rd, Hayes Ave, Arthur Ave, Roosevelt Dr, Garfield Ave, Saxon Ln

*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation*
*HWM = High Water Mark*

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Libertyville

PROJECT NO.: 170001

TITLE: Burdick & Ames (Area 3)
Existing Conditions Inundation Map

DATE: 7/13/18

EXHIBIT 11

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 200 400 Feet

1 inch = 400 feet

Butler Lake

10-year WSEL = 696.4' (NP)
25-year WSEL = 697.2' (NP)
50-year WSEL = 698.1' (NP)
100-year WSEL = 698.8'
July 2017 WSEL = 700.0'

10-year WSEL = 696.9' (NP)
25-year WSEL = 698.2' (NP)
50-year WSEL = 699.3'
100-year WSEL = 700.1'
July 2017 WSEL = 701.0'

Proposed Conveyance Swale

Nicholas Dowden Park

10-year WSEL = 711.7' (NP)
25-year WSEL = 711.9' (NP)
50-year WSEL = 712.0' (NP)
100-year WSEL = 712.2' (NP)
July 2017 WSEL = 720.3'

10-year WSEL = 696.7' (NP)
25-year WSEL = 698.3' (NP)
50-year WSEL = 699.4'
100-year WSEL = 700.2'
July 2017 WSEL = 701.0'

10-year WSEL = 699.2' (NP)
25-year WSEL = 700.3' (NP)
50-year WSEL = 700.4'
100-year WSEL = 700.4'
July 2017 WSEL = 701.8'

Proposed Storage Basin
Additional 12.5 ac-ft

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

| CLIENT | PROJECT NO. |
|---|---|
| Village of Libertyville | 170001 |

TITLE: Burdick & Ames (Area 3)
Proposed Drainage Improvements: Alternative 1
(25-Year Level of Protection)

DATE: 7/13/18

EXHIBIT 12

## Legend

- Proposed Structure
- BAalt1A
- BAalt1(rr)
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Iundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 200 400 Feet

1 inch = 400 feet

Butler Lake

10-year WSEL = 696.3' (NP)
25-year WSEL = 697.0' (NP)
50-year WSEL = 698.0' (NP)
100-year WSEL = 698.7' (NP)
July 2017 WSEL = 699.9'

10-year WSEL = 696.8' (NP)
25-year WSEL = 697.8' (NP)
50-year WSEL = 699.0' (NP)
100-year WSEL = 699.8'
July 2017 WSEL = 700.9'

Proposed Conveyance Swale

Nicholas Dowden Park

10-year WSEL = 711.7' (NP)
25-year WSEL = 711.9' (NP)
50-year WSEL = 712.0' (NP)
100-year WSEL = 712.2' (NP)
July 2017 WSEL = 720.3'

10-year WSEL = 696.2' (NP)
25-year WSEL = 697.6' (NP)
50-year WSEL = 699.0' (NP)
100-year WSEL = 700.0'
July 2017 WSEL = 700.9'

10-year WSEL = 699.2' (NP)
25-year WSEL = 700.3' (NP)
50-year WSEL = 700.3' (NP)
100-year WSEL = 700.4'
July 2017 WSEL = 701.8'

Proposed Storage Basin
Additional 18 ac-ft

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***

***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Libertyville

PROJECT NO.: 170001

TITLE: Burdick & Ames (Area 3)
Proposed Drainage Improvements: Alternative 1A
(50-Year Level of Protection)

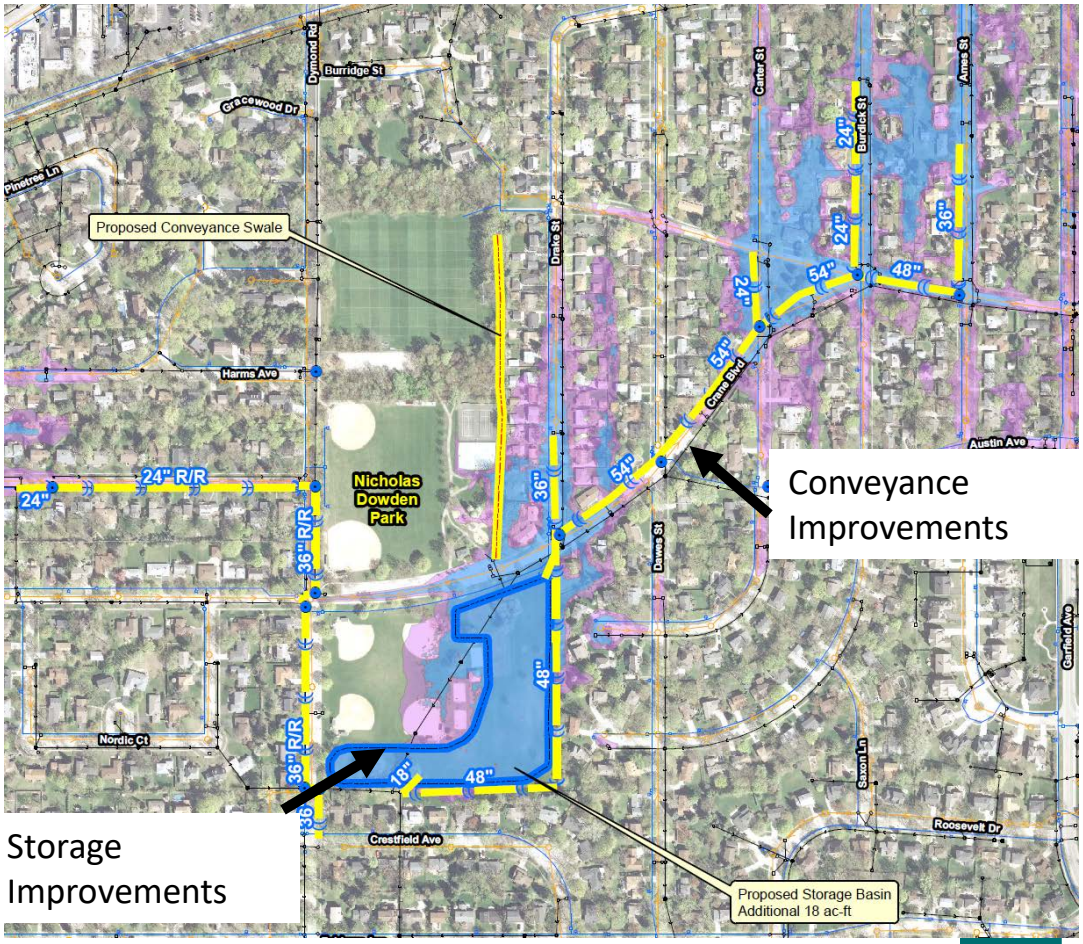
DATE: 7/13/18

EXHIBIT 13

# Drainage Improvements – Storage and Conveyance

- Conveyance Improvements
  - Need to transport water away from flooded homes
  - Overland conveyance is not an option
  - Need adequately sized storm sewers
    - Current Alternative 1A has 54-inch diameter storm sewers
- Storage Improvements
  - Safely store water release slowly to storm sewer system
  - Typically requires open spaces
  - Excavation needed to provide storage at correct elevation
    - Current Alternative 1A has 18 acre-ft of storage
    - Excavation depth = 5 feet
    - Avoids impacts to softball fields and shelters
    - Bottom of storage is sloped turf grass open space with underdrains
    - Tree impacts required

Alternative 1A Drainage Improvements



# Revised Alternatives

Increase in Flood Storage at Dowden Park and Inflow Storm Sewers


Alternative 1B Drainage Improvements
27 acre-ft stormwater storage
1 softball field impacted


Alternative 1C Drainage Improvements
34 acre-ft stormwater storage
2 softball fields impacted

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation
- July 2017 Inundation
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 200 400 Feet
1 inch = 400 feet

Butler Lake

10-year WSEL = 696.3' (NP)
25-year WSEL = 696.7' (NP)
50-year WSEL = 697.1' (NP)
100-year WSEL = 698.2' (NP)
July 2017 WSEL = 699.8'

10-year WSEL = 696.7' (NP)
25-year WSEL = 697.2' (NP)
50-year WSEL = 697.7' (NP)
100-year WSEL = 698.9'
July 2017 WSEL = 700.4'

Proposed Conveyance Swale

10-year WSEL = 695.7' (NP)
25-year WSEL = 696.3' (NP)
50-year WSEL = 697.2' (NP)
100-year WSEL = 698.5'
July 2017 WSEL = 700.3'

10-year WSEL = 711.7' (NP)
25-year WSEL = 711.9' (NP)
50-year WSEL = 712.0' (NP)
100-year WSEL = 712.2' (NP)
July 2017 WSEL = 720.3'

10-year WSEL = 695.3' (NP)
25-year WSEL = 696.3' (NP)
50-year WSEL = 697.2' (NP)
100-year WSEL = 698.5'
July 2017 WSEL = 700.0'

10-year WSEL = 696.1' (NP)
25-year WSEL = 696.6' (NP)
50-year WSEL = 697.4' (NP)
100-year WSEL = 698.8' (NP)
July 2017 WSEL = 700.6'

Proposed Storage Basin
Approximately 39 ac-ft

Nicholas Dowden Park

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Libertyville

PROJECT NO.: 170001

TITLE: Burdick & Ames (Area 3)
Proposed Drainage Improvements: Alternative 2
(100-Year Level of Protection)

DATE: 7/13/18

EXHIBIT 14

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- July 2017 Inundation
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 200 400 Feet
1 inch = 400 feet

Butler Lake

10-year WSEL = 696.3' (NP)
25-year WSEL = 696.6' (NP)
50-year WSEL = 697.0' (NP)
100-year WSEL = 697.5' (NP)
July 2017 WSEL = 699.8'

10-year WSEL = 696.7' (NP)
25-year WSEL = 697.2' (NP)
50-year WSEL = 697.5' (NP)
100-year WSEL = 698.0' (NP)
July 2017 WSEL = 699.6'

10-year WSEL = 694.8' (NP)
25-year WSEL = 695.3' (NP)
50-year WSEL = 695.9' (NP)
100-year WSEL = 696.9' (NP)
July 2017 WSEL = 699.4'

Proposed Conveyance Swale

Proposed Storage Basin
Approximately 20 ac-ft

Nicholas Dowden Park

10-year WSEL = 711.7' (NP)
25-year WSEL = 711.9' (NP)
50-year WSEL = 712.0' (NP)
100-year WSEL = 712.2' (NP)
July 2017 WSEL = 720.3'

10-year WSEL = 694.6' (NP)
25-year WSEL = 695.2' (NP)
50-year WSEL = 695.9' (NP)
100-year WSEL = 696.9' (NP)
July 2017 WSEL = 698.7'

10-year WSEL = 696.1' (NP)
25-year WSEL = 696.3' (NP)
50-year WSEL = 696.6' (NP)
100-year WSEL = 697.3' (NP)
July 2017 WSEL = 700.5'

Proposed Storage Basin
Approximately 39 ac-ft

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Libertyville

PROJECT NO.: 170001

TITLE: Burdick & Ames (Area 3)
Proposed Drainage Improvements: Alternative 3
(100-Year + Level of Protection)

DATE: 7/13/18

EXHIBIT 15

# Summary of Investigated Drainage Improvements

| Alternative | Level of Flood Protection | Dowden Park Storage Provided (acre-ft) | 100-Year Water Depth in Street (ft) | Structures Protected in 100-Year Event | Construction Cost |
|---|---|---|---|---|---|
| Existing Conditions | 2-year | 0 | 3.1 | 0 of 121 | N/A |
| 1 | 25-year | 12.5 | 2.4 | 82 of 121 | $6.8M |
| 1A | 50-Year | 18 | 2.2 | 85 of 121 | $7.6M |
| 1B | >50-Year | 27 | 1.6 | 106 of 121 | $14.6M |
| 1C | >50-Year | 34 | 1.2 | 115 of 121 | $17.1M |
| 2 | 100-Year | 40 | 0.7 | 119 of 121 | $21.3M |
| 3 | July 2017 | 59 | 0.0 | 120 of 121 | $31.9 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 3 (Burdick & Ames)
ALTERNATE 1: 25-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | 20,167 | $30.00 | $605,000.00 | $921,622.50 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 23,294 | $5.00 | $116,469.00 | |
| | SEEDING | SQ YD | 23,294 | $5.00 | $116,469.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 23,294 | $2.50 | $58,234.50 | |
| | DITCH REGRADING | FOOT | 1,030 | $15.00 | $15,450.00 | |
| | TREE REMOVAL | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 7,810 | $45.00 | $351,450.00 | $1,656,075.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 900 | $70.00 | $63,000.00 | |
| | STORM SEWER, RCP 18" | FOOT | 80 | $85.00 | $6,800.00 | |
| | STORM SEWER, RCP 24" | FOOT | 2,080 | $120.00 | $249,600.00 | |
| | STORM SEWER, RCP 36" | FOOT | 1,905 | $175.00 | $333,375.00 | |
| | STORM SEWER, RCP 48" | FOOT | 410 | $220.00 | $90,200.00 | |
| | STORM SEWER, RCP 54" | FOOT | 1,220 | $270.00 | $329,400.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,910 | $25.00 | $47,750.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 36 | $1,750.00 | $63,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 5 | $3,750.00 | $18,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 6 | $5,000.00 | $30,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 2 | $7,000.00 | $14,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 3 | $12,000.00 | $36,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 1 | $15,750.00 | $15,750.00 | |
| | 18" FLARED END SECTION W/ GRATE | EACH | 1 | $1,500.00 | $1,500.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | 1 | $3,500.00 | $3,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 20 | $100.00 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 15,808 | $5.00 | $79,040.00 | $694,521.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 1,334 | $90.00 | $120,060.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 0 | $80.00 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 669 | $85.00 | $56,865.00 | |
| | PREPARATION OF BASE | SQ YD | 15,808 | $1.00 | $15,808.00 | |
| | AGGREGATE BASE REPAIR | TON | 835 | $25.00 | $20,875.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 3,153 | $1.00 | $3,153.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,800 | $30.00 | $54,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 3,600 | $10.00 | $36,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 720 | $40.00 | $28,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 3,499 | $80.00 | $279,920.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 2,115 | $75.00 | $158,625.00 | $604,175.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 1,630 | $110.00 | $179,300.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 360 | $75.00 | $27,000.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 3,735 | $50.00 | $186,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | 1 | $5,000.00 | $5,000.00 | $605,000.00 |
| | CONSTRUCTION LAYOUT | L. SUM | 1 | $150,000.00 | $150,000.00 | |
| | MOBILIZATION | L. SUM | 1 | $300,000.00 | $300,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $150,000.00 | $150,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $4,481,393.50 |
| CONTINGENCY (30%) = | $1,344,418.05 |
| **CONSTRUCTION TOTAL =** | **$5,825,811.55** |
| DESIGN ENGINEERING (7.5%) = | $436,935.87 |
| CONSTRUCTION ENGINEERING (7.5%) = | $436,935.87 |
| PERMITTING (2.5%) = | $145,645.29 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$6,845,328.57** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY COSTS FOR REPLACING THE EXISTING BASEBALL FIELDS, TENNIS COURTS, OR HOCKEY RINKS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 3 (Burdick & Ames)
ALTERNATE 1A: 50-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | 29,040 | $30.00 | $871,200.00 | $1,302,820.83 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 32,494 | $5.00 | $162,468.33 | |
| | SEEDING | SQ YD | 32,494 | $5.00 | $162,468.33 | |
| | EROSION CONTROL BLANKET | SQ YD | 32,494 | $2.50 | $81,234.17 | |
| | DITCH REGRADING | FOOT | 1,030 | $15.00 | $15,450.00 | |
| | TREE REMOVAL | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 7,832 | $45.00 | $352,440.00 | $1,674,815.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 900 | $70.00 | $63,000.00 | |
| | STORM SEWER, RCP 18" | FOOT | 80 | $85.00 | $6,800.00 | |
| | STORM SEWER, RCP 24" | FOOT | 1,780 | $120.00 | $213,600.00 | |
| | STORM SEWER, RCP 36" | FOOT | 2,205 | $175.00 | $385,875.00 | |
| | STORM SEWER, RCP 48" | FOOT | 410 | $220.00 | $90,200.00 | |
| | STORM SEWER, RCP 54" | FOOT | 1,220 | $270.00 | $329,400.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,910 | $25.00 | $47,750.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 36 | $1,750.00 | $63,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 4 | $3,750.00 | $15,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 7 | $5,000.00 | $35,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 2 | $7,000.00 | $14,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 3 | $12,000.00 | $36,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 1 | $15,750.00 | $15,750.00 | |
| | 18" FLARED END SECTION W/ GRATE | EACH | 1 | $1,500.00 | $1,500.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | 1 | $3,500.00 | $3,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 20 | $100.00 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 15,808 | $5.00 | $79,040.00 | $697,677.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 1,334 | $90.00 | $120,060.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 0 | $80.00 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 669 | $85.00 | $56,865.00 | |
| | PREPARATION OF BASE | SQ YD | 15,808 | $1.00 | $15,808.00 | |
| | AGGREGATE BASE REPAIR | TON | 835 | $25.00 | $20,875.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 3,189 | $1.00 | $3,189.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,800 | $30.00 | $54,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 3,600 | $10.00 | $36,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 720 | $40.00 | $28,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 3,538 | $80.00 | $283,040.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 2,115 | $75.00 | $158,625.00 | $604,175.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 1,630 | $110.00 | $179,300.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 360 | $75.00 | $27,000.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 3,735 | $50.00 | $186,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | 1 | $5,000.00 | $5,000.00 | $685,000.00 |
| | CONSTRUCTION LAYOUT | L. SUM | 1 | $170,000.00 | $170,000.00 | |
| | MOBILIZATION | L. SUM | 1 | $340,000.00 | $340,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $170,000.00 | $170,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $4,964,487.83 |
| CONTINGENCY (30%) = | $1,489,346.35 |
| **CONSTRUCTION TOTAL =** | **$6,453,834.18** |
| DESIGN ENGINEERING (7.5%) = | $484,037.56 |
| CONSTRUCTION ENGINEERING (7.5%) = | $484,037.56 |
| PERMITTING (2.5%) = | $161,345.85 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$7,583,255.17** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY COSTS FOR REPLACING THE EXISTING BASEBALL FIELDS, TENNIS COURTS, OR HOCKEY RINKS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: May 10, 2019

Village of Libertyville, Area 3 (Burdick & Ames)
ALTERNATE 1B: 50-Year Level of Protection (1 Ball Field)

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | 75,000 | $30.00 | $2,250,000.00 | $2,837,950.00 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 45,000 | $5.00 | $225,000.00 | |
| | SEEDING | SQ YD | 45,000 | $5.00 | $225,000.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 45,000 | $2.50 | $112,500.00 | |
| | DITCH REGRADING | FOOT | 1,030 | $15.00 | $15,450.00 | |
| | TREE REMOVAL | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 9,500 | $45.00 | $427,500.00 | $3,508,800.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 900 | $70.00 | $63,000.00 | |
| | STORM SEWER, RCP 18" | FOOT | 80 | $85.00 | $6,800.00 | |
| | STORM SEWER, RCP 24" | FOOT | 1,780 | $120.00 | $213,600.00 | |
| | STORM SEWER, RCP 36" | FOOT | 2,500 | $175.00 | $437,500.00 | |
| | STORM SEWER, RCEP 49"x32" | FOOT | 490 | $410.00 | $200,900.00 | |
| | STORM SEWER, RCP 48" | FOOT | 1,200 | $220.00 | $264,000.00 | |
| | STORM SEWER, RCEP 76"x48" | FOOT | 1,615 | $950.00 | $1,534,250.00 | |
| | STORM SEWER REMOVAL | FOOT | 3,690 | $25.00 | $92,250.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 36 | $1,750.00 | $63,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 3 | $3,750.00 | $11,250.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 10 | $5,000.00 | $50,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 5 | $7,000.00 | $35,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 2 | $12,000.00 | $24,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 5 | $15,750.00 | $78,750.00 | |
| | 18" FLARED END SECTION W/ GRATE | EACH | 1 | $1,500.00 | $1,500.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | 1 | $3,500.00 | $3,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 20 | $100.00 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 16,500 | $5.00 | $82,500.00 | $1,027,300.00 |
| | PAVEMENT REMOVAL | SQ YD | 5,500 | $15.00 | $82,500.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 100 | $40.00 | $4,000.00 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 100 | $40.00 | $4,000.00 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 300 | $2.50 | $750.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 2,250 | $90.00 | $202,500.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 1,250 | $80.00 | $100,000.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 750 | $85.00 | $63,750.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 5,500 | $12.00 | $66,000.00 | |
| | PREPARATION OF BASE | SQ YD | 16,500 | $1.00 | $16,500.00 | |
| | AGGREGATE BASE REPAIR | TON | 900 | $25.00 | $22,500.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 3,500 | $1.00 | $3,500.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,800 | $30.00 | $54,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 3,600 | $10.00 | $36,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 720 | $40.00 | $28,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 3,250 | $80.00 | $260,000.00 | |
| UTILITY RELOCATIONS | WATER MAIN REMOVAL AND REPLACEMENT | FOOT | 500 | $200.00 | $100,000.00 | $844,525.00 |
| | NEW WATER SERVICE LINE | FOOT | 540 | $100.00 | $54,000.00 | |
| | ADJUSTING WATER SERVICE LINE | FOOT | 2,115 | $75.00 | $158,625.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 2,415 | $110.00 | $265,650.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 360 | $75.00 | $27,000.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 3,735 | $50.00 | $186,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | 1 | $5,000.00 | $5,000.00 | $1,312,500.00 |
| | DEMOLITION OF BUILDINGS | EACH | 1 | $7,500.00 | $7,500.00 | |
| | CONSTRUCTION LAYOUT | L. SUM | 1 | $325,000.00 | $325,000.00 | |
| | MOBILIZATION | L. SUM | 1 | $650,000.00 | $650,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $325,000.00 | $325,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $9,531,075.00 |
| CONTINGENCY (30%) = | $2,859,322.50 |
| **CONSTRUCTION TOTAL =** | **$12,390,397.50** |
| DESIGN ENGINEERING (7.5%) = | $929,279.81 |
| CONSTRUCTION ENGINEERING (7.5%) = | $929,279.81 |
| PERMITTING (2.5%) = | $309,759.94 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$14,558,717.06** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY COSTS FOR REPLACING THE EXISTING BASEBALL FIELDS, TENNIS COURTS, OR HOCKEY RINKS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: May 10, 2019

Village of Libertyville, Area 3 (Burdick & Ames)
ALTERNATE 1C: 50-Year Level of Protection (2 Ball Fields)

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | 110,000 | $30.00 | $3,300,000.00 | $4,200,450.00 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 70,000 | $5.00 | $350,000.00 | |
| | SEEDING | SQ YD | 70,000 | $5.00 | $350,000.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 70,000 | $2.50 | $175,000.00 | |
| | DITCH REGRADING | FOOT | 1,030 | $15.00 | $15,450.00 | |
| | TREE REMOVAL | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 9,500 | $45.00 | $427,500.00 | $3,508,800.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 900 | $70.00 | $63,000.00 | |
| | STORM SEWER, RCP 18" | FOOT | 80 | $85.00 | $6,800.00 | |
| | STORM SEWER, RCP 24" | FOOT | 1,780 | $120.00 | $213,600.00 | |
| | STORM SEWER, RCP 36" | FOOT | 2,500 | $175.00 | $437,500.00 | |
| | STORM SEWER, RCEP 49"x32" | FOOT | 490 | $410.00 | $200,900.00 | |
| | STORM SEWER, RCP 48" | FOOT | 1,200 | $220.00 | $264,000.00 | |
| | STORM SEWER, RCEP 76"x48" | FOOT | 1,615 | $950.00 | $1,534,250.00 | |
| | STORM SEWER REMOVAL | FOOT | 3,690 | $25.00 | $92,250.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 36 | $1,750.00 | $63,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 3 | $3,750.00 | $11,250.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 10 | $5,000.00 | $50,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 5 | $7,000.00 | $35,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 2 | $12,000.00 | $24,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 5 | $15,750.00 | $78,750.00 | |
| | 18" FLARED END SECTION W/ GRATE | EACH | 1 | $1,500.00 | $1,500.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | 1 | $3,500.00 | $3,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 20 | $100.00 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 16,500 | $5.00 | $82,500.00 | $1,027,300.00 |
| | PAVEMENT REMOVAL | SQ YD | 5,500 | $15.00 | $82,500.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 100 | $40.00 | $4,000.00 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 100 | $40.00 | $4,000.00 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 300 | $2.50 | $750.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 2,250 | $90.00 | $202,500.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 1,250 | $80.00 | $100,000.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 750 | $85.00 | $63,750.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 5,500 | $12.00 | $66,000.00 | |
| | PREPARATION OF BASE | SQ YD | 16,500 | $1.00 | $16,500.00 | |
| | AGGREGATE BASE REPAIR | TON | 900 | $25.00 | $22,500.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 3,500 | $1.00 | $3,500.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 1,800 | $30.00 | $54,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 3,600 | $10.00 | $36,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 720 | $40.00 | $28,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 3,250 | $80.00 | $260,000.00 | |
| UTILITY RELOCATIONS | WATER MAIN REMOVAL AND REPLACEMENT | FOOT | 500 | $200.00 | $100,000.00 | $844,525.00 |
| | NEW WATER SERVICE LINE | FOOT | 540 | $100.00 | $54,000.00 | |
| | ADJUSTING WATER SERVICE LINE | FOOT | 2,115 | $75.00 | $158,625.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 2,415 | $110.00 | $265,650.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 360 | $75.00 | $27,000.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 3,735 | $50.00 | $186,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 300 | $175.00 | $52,500.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | 1 | $5,000.00 | $5,000.00 | $1,612,500.00 |
| | DEMOLITION OF BUILDINGS | EACH | 1 | $7,500.00 | $7,500.00 | |
| | CONSTRUCTION LAYOUT | L. SUM | 1 | $400,000.00 | $400,000.00 | |
| | MOBILIZATION | L. SUM | 1 | $800,000.00 | $800,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $400,000.00 | $400,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $11,193,575.00 |
| CONTINGENCY (30%) = | $3,358,072.50 |
| **CONSTRUCTION TOTAL =** | **$14,551,647.50** |
| DESIGN ENGINEERING (7.5%) = | $1,091,373.56 |
| CONSTRUCTION ENGINEERING (7.5%) = | $1,091,373.56 |
| PERMITTING (2.5%) = | $363,791.19 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$17,098,185.81** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY COSTS FOR REPLACING THE EXISTING BASEBALL FIELDS, TENNIS COURTS, OR HOCKEY RINKS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 3 (Burdick & Ames)
ALTERNATE 2

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | 158,371 | $30.00 | $4,751,144.44 | $5,477,064.44 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 56,050 | $5.00 | $280,248.00 | |
| | SEEDING | SQ YD | 56,050 | $5.00 | $280,248.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 56,050 | $2.50 | $140,124.00 | |
| | DITCH REGRADING | FOOT | 1,020 | $15.00 | $15,300.00 | |
| | TREE REMOVAL | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 12,287 | $45.00 | $552,915.00 | $4,122,790.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 1,400 | $70.00 | $98,000.00 | |
| | STORM SEWER, RCP 18" | FOOT | 100 | $85.00 | $8,500.00 | |
| | STORM SEWER, RCP 24" | FOOT | 2,040 | $120.00 | $244,800.00 | |
| | STORM SEWER, RCP 30" | FOOT | 1,020 | $150.00 | $153,000.00 | |
| | STORM SEWER, RCP 36" | FOOT | 2,105 | $175.00 | $368,375.00 | |
| | STORM SEWER, RCP 48" | FOOT | 330 | $220.00 | $72,600.00 | |
| | STORM SEWER, RCEP 45"x29" | FOOT | 600 | $340.00 | $204,000.00 | |
| | STORM SEWER, RCEP 49"x32" | FOOT | 460 | $410.00 | $188,600.00 | |
| | STORM SEWER, RCEP 53"x34" | FOOT | 240 | $475.00 | $114,000.00 | |
| | STORM SEWER, RCEP 83"x53" | FOOT | 1,320 | $1,200.00 | $1,584,000.00 | |
| | STORM SEWER REMOVAL | FOOT | 3,690 | $25.00 | $92,250.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 56 | $1,750.00 | $98,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 7 | $3,750.00 | $26,250.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 9 | $5,000.00 | $45,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 2 | $7,000.00 | $14,000.00 | |
| | JUNCTION CHAMBER | EACH | 5 | $50,000.00 | $250,000.00 | |
| | 18" FLARED END SECTION W/ GRATE | EACH | 1 | $1,500.00 | $1,500.00 | |
| | 83"x53" FLARED END SECTION W/ GRATE | EACH | 1 | $5,000.00 | $5,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 20 | $100.00 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 17,992 | $5.00 | $89,960.00 | $1,048,618.08 |
| | PAVEMENT REMOVAL | SQ YD | 3,718 | $15.00 | $55,770.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 62 | $40.00 | $2,478.67 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 62 | $40.00 | $2,478.67 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 186 | $2.50 | $464.75 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 1,936 | $90.00 | $174,240.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 834 | $80.00 | $66,720.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 761 | $85.00 | $64,685.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 3,718 | $12.00 | $44,616.00 | |
| | PREPARATION OF BASE | SQ YD | 17,992 | $1.00 | $17,992.00 | |
| | AGGREGATE BASE REPAIR | TON | 952 | $25.00 | $23,800.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 3,573 | $1.00 | $3,573.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 2,800 | $30.00 | $84,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 5,600 | $10.00 | $56,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 1,120 | $40.00 | $44,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 3,963 | $80.00 | $317,040.00 | |
| UTILITY RELOCATIONS | WATER MAIN REMOVAL AND REPLACEMENT | FOOT | 2,620 | $200.00 | $524,000.00 | $1,429,250.00 |
| | NEW WATER SERVICE LINE | FOOT | 990 | $100.00 | $99,000.00 | |
| | ADJUSTING WATER SERVICE LINE | FOOT | 1,800 | $75.00 | $135,000.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 2,350 | $110.00 | $258,500.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 720 | $75.00 | $54,000.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 4,725 | $50.00 | $236,250.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 700 | $175.00 | $122,500.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | 1 | $5,000.00 | $5,000.00 | $1,892,500.00 |
| | DEMOLITION OF BUILDINGS | EACH | 1 | $7,500.00 | $7,500.00 | |
| | CONSTRUCTION LAYOUT | L. SUM | 1 | $470,000.00 | $470,000.00 | |
| | MOBILIZATION | L. SUM | 1 | $940,000.00 | $940,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $470,000.00 | $470,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $13,970,222.53 |
| CONTINGENCY (30%) = | $4,191,066.76 |
| **CONSTRUCTION TOTAL =** | **$18,161,289.29** |
| DESIGN ENGINEERING (7.5%) = | $1,362,096.70 |
| CONSTRUCTION ENGINEERING (7.5%) = | $1,362,096.70 |
| PERMITTING (2.5%) = | $454,032.23 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$21,339,514.91** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY COSTS FOR REPLACING THE EXISTING BASEBALL FIELDS, TENNIS COURTS, OR HOCKEY RINKS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 3 (Burdick & Ames)
ALTERNATE 3

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | 284,505 | $30.00 | $8,535,144.44 | $9,640,566.94 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 86,722 | $5.00 | $433,609.00 | |
| | SEEDING | SQ YD | 86,722 | $5.00 | $433,609.00 | |
| | EROSION CONTROL BLANKET | SQ UD | 86,722 | $2.50 | $216,804.50 | |
| | DITCH REGRADING | FOOT | 760 | $15.00 | $11,400.00 | |
| | TREE REMOVAL | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 13,017 | $45.00 | $585,765.00 | $6,556,940.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 1,400 | $70.00 | $98,000.00 | |
| | STORM SEWER, RCP 18" | FOOT | 100 | $85.00 | $8,500.00 | |
| | STORM SEWER, RCP 24" | FOOT | 2,040 | $120.00 | $244,800.00 | |
| | STORM SEWER, RCP 30" | FOOT | 1,020 | $150.00 | $153,000.00 | |
| | STORM SEWER, RCP 36" | FOOT | 1,805 | $175.00 | $315,875.00 | |
| | STORM SEWER, RCP 48" | FOOT | 300 | $220.00 | $66,000.00 | |
| | STORM SEWER, RCEP 68"x43" | FOOT | 240 | $775.00 | $186,000.00 | |
| | STORM SEWER, RCEP 76"x48" | FOOT | 1,070 | $950.00 | $1,016,500.00 | |
| | STORM SEWER, RCEP 83"x53" | FOOT | 320 | $1,200.00 | $384,000.00 | |
| | STORM SEWER, RCEP 144"x48" BOX | FOOT | 1,550 | $1,850.00 | $2,867,500.00 | |
| | STORM SEWER REMOVAL | FOOT | 3,690 | $25.00 | $92,250.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 56 | $1,750.00 | $98,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 6 | $3,750.00 | $22,500.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 8 | $5,000.00 | $40,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 1 | $7,000.00 | $7,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 3 | $15,750.00 | $47,250.00 | |
| | MANHOLES, 9' DIAMETER | EACH | 1 | $12,500.00 | $12,500.00 | |
| | JUNCTION CHAMBER | EACH | 6 | $50,000.00 | $300,000.00 | |
| | 18" FLARED END SECTION W/ GRATE | EACH | 1 | $1,500.00 | $1,500.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | 2 | $3,500.00 | $7,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 30 | $100.00 | $3,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 13,464 | $5.00 | $67,320.00 | $1,181,784.08 |
| | PAVEMENT REMOVAL | SQ YD | 9,262 | $15.00 | $138,930.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 154 | $40.00 | $6,174.67 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 154 | $40.00 | $6,174.67 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 463 | $2.50 | $1,157.75 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 2,177 | $90.00 | $195,930.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 2,079 | $80.00 | $166,320.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 569 | $85.00 | $48,365.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 9,262 | $12.00 | $111,144.00 | |
| | PREPARATION OF BASE | SQ YD | 13,464 | $1.00 | $13,464.00 | |
| | AGGREGATE BASE REPAIR | TON | 713 | $25.00 | $17,825.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 2,499 | $1.00 | $2,499.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 2,800 | $30.00 | $84,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 5,600 | $10.00 | $56,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 1,120 | $40.00 | $44,800.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 2,771 | $80.00 | $221,680.00 | |
| UTILITY RELOCATIONS | WATER MAIN REMOVAL AND REPLACEMENT | FOOT | 3,180 | $200.00 | $636,000.00 | $1,688,050.00 |
| | NEW WATER SERVICE LINE | FOOT | 1,260 | $100.00 | $126,000.00 | |
| | ADJUSTING WATER SERVICE LINE | FOOT | 1,530 | $75.00 | $114,750.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 3,480 | $110.00 | $382,800.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | 1,260 | $75.00 | $94,500.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 4,230 | $50.00 | $211,500.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 700 | $175.00 | $122,500.00 | |
| MISC. | DEMOLITION OF BUILDINGS | EACH | 2 | $7,500.00 | $15,000.00 | $3,125,000.00 |
| | STABILIZED CONSTRUCTION ENTRANCE | EACH | 2 | $5,000.00 | $10,000.00 | |
| | PARK EQUIPMENT REMOVAL AND REINSTALLATION | L. SUM | 1 | $100,000.00 | $100,000.00 | |
| | CONSTRUCTION LAYOUT | L. SUM | 1 | $750,000.00 | $750,000.00 | |
| | MOBILIZATION | L. SUM | 1 | $1,500,000.00 | $1,500,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $750,000.00 | $750,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $22,192,341.03 |
| CONTINGENCY (30%) = | $6,657,702.31 |
| **CONSTRUCTION TOTAL =** | **$28,850,043.34** |
| DESIGN ENGINEERING (7.5%) = | $2,163,753.25 |
| CONSTRUCTION ENGINEERING (7.5%) = | $2,163,753.25 |
| PERMITTING (2.5%) = | $721,251.08 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$33,898,800.92** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY COSTS FOR REPLACING THE EXISTING BASEBALL FIELDS, TENNIS COURTS, OR HOCKEY RINKS.

# APPENDIX 5

# ELLIS EAST AND WEST AVENUE – AREAS (8&14): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

## Legend

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- 10-Year Inundation Area
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation*
*HWM = High Water Mark*

0 100 200 Feet
1 inch = 200 feet

10-year WSEL = 655.7'
50-year WSEL = 655.9'
100-year WSEL = 656.4'
July 2017 WSEL = 656.9'
Estimated HWM = 657.0'

10-year WSEL = 680.6'
50-year WSEL = 684.6'
100-year WSEL = 685.4'
July 2017 WSEL = 685.8'

10-year WSEL = 690.6'
50-year WSEL = 696.3'
100-year WSEL = 696.5'
July 2017 WSEL = 696.5'

10-year WSEL = 663.5'
50-year WSEL = 665.6'
100-year WSEL = 665.7'
July 2017 WSEL = 665.8'
Estimated HWM = 665.8'

10-year WSEL = 696.4'
50-year WSEL = 697.0'
100-year WSEL = 697.4'
July 2017 WSEL = 698.1'
Estimated HWM = 698.0'

Note: Review of flooding questionnaire determined type of flooding to be seepage.

10-year WSEL = 661.0'
50-year WSEL = 661.3'
100-year WSEL = 661.4'
July 2017 WSEL = 661.4'
Estimated HWM = 661.4'

Lake Minear
BFE ~ 690.7'

Parliament Ct
IL Route 21
Milwaukee Ave
Hyatt Dr
Avalon Ln
Minear Dr
Sandstone Dr
Ellis Ave
Winchester Rd
Wheeler Ct
Merrill Ct

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|---|---|---|---|

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Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

| CLIENT | PROJECT NO. | |
|---|---|---|
| Village of Libertyville | 170001 | N W E S |
| **TITLE** Ellis (Areas 8 & 14) Existing Conditions Inundation Map | | **DATE** 7/13/18 |
| | | EXHIBIT 16 |

## Legend

- Proposed Structure
- Proposed Sotorm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

Rear Yard Swale Grading

Upsize Existing Outfall Pipe and FES

60" R/R

Connect to Existing Storm Sewer System

10-year WSEL= 655.1' (NP)
50-year WSEL= 655.8' (NP)
100-year WESL=656.3'
July 2017 WESL= 656.8'

10-year WSEL= 690.5' (NP)
50-year WSEL= 692.9' (NP)
100-year WESL=694.0' (NP)
July 2017 WESL= 694.4' (NP)

10-year WSEL= 680.6' (NP)
50-year WSEL= 683.4' (NP)
100-year WESL=684.7'
July 2017 WESL= 685.3'

10-year WSEL= 693.1' (NP)
50-year WSEL= 695.0'
100-year WESL=695.7'
July 2017 WESL= 697.3'

10-year WSEL= 658.9' (NP)
50-year WSEL= 660.1' (NP)
100-year WESL=665.3'
July 2017 WESL= 665.7'

10-year WSEL= 657.4' (NP)
50-year WSEL= 659.6' (NP)
100-year WESL=661.2'
July 2017 WESL= 661.4'

Proposed Storage Basin Approximately 1.5 ac-ft

Remove and Replace Existing Storm Sewers with Upsized Sewers

Remove Existing Storm Sewer Connection

Remove and Replace Existing Storm Sewers with Upsized Sewers

30" R/R

24" R/R

30"

Parliament Ct

Avalon Ln

Hyatt Dr

Sandstone Dr

Minear Dr

Ellis Ave

Manor Cir

Bartlett Ter

Winchester Rd

Wheeler Ct

Merrill Ct

IL Route 21

Lake Minear

0 100 200 Feet
1 inch = 200 feet

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|---|---|---|---|

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9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE** Ellis (Areas 8 & 14)
Proposed Drainage Improvements (50-year Level of Protection)

**DATE** 7/13/18

EXHIBIT 17

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

Rear Yard Swale Grading

Upsize Existing Outfall Pipe and FES

66" R/R

Connect to Existing Storm Sewer System

48"

10-year WSEL= 655.7' (NP)
50-year WSEL= 655.7' (NP)
100-year WESL=656.2'(NP)
July 2017 WESL= 656.6'(NP)

10-year WSEL= 689.6' (NP)
50-year WSEL= 690.6' (NP)
100-year WESL=691.3'(NP)
July 2017 WESL= 692.4'(NP)

10-year WSEL= 680.6' (NP)
50-year WSEL= 682.6' (NP)
100-year WESL=684.6'(NP)
July 2017 WESL= 685.3'(NP)

10-year WSEL= 658.9' (NP)
50-year WSEL= 659.8' (NP)
100-year WESL=662.2'(NP)
July 2017 WESL= 664.3'(NP)

10-year WSEL= 691.9'
50-year WSEL= 692.9'
100-year WESL=693.7'
July 2017 WESL= 695.1'

10-year WSEL= 657.2' (NP)
10-year WSEL= 659.1' (NP)
100-year WESL=660.9'
July 2017 WESL= 661.3'

Proposed Storage Basin Approximately 1.5 ac-ft

Remove and Replace Existing Storm Sewers with Upsized Sewers

Remove Existing Storm Sewer Connection

Remove and Replace Existing Storm Sewers with Upsized Sewers

42" R/R

48" R/R

30" R/R

N. Route 21

Winchester Rd

Ellis Ave

Hyatt Dr

Minear Dr

Parliament

Sandstone Dr

Wheeler Ct

Merrill Ct

Manor Cir

Bartlett Ter

Lake Minear

0 100 200 Feet
1 inch = 200 feet

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|---|---|---|---|

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(847) 823-0500 / FAX (847) 823-0520

**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Ellis (Areas 8 & 14)
Proposed Drainage Improvements (100-Year Level of Protection)

**DATE** 7/13/18

EXHIBIT 18

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

Rear Yard Swale Grading

Upsize Existing Outfall Pipe and FES

54" R/R

10-year WSEL= 690.6' (NP)
50-year WSEL= 696.3'
100-year WESL=696.5'
July 2017 WESL= 696.5'

10-year WSEL= 655.5' (NP)
50-year WSEL= 655.8' (NP)
100-year WESL=656.2'(NP)
July 2017 WESL= 656.8'(NP)

10-year WSEL= 660.8' (NP)
50-year WSEL=662.0' (NP)
100-year WESL=662.9'(NP)
July 2017 WESL= 665.5'

10-year WSEL= 680.6' (NP)
50-year WSEL= 684.6' (NP)
100-year WESL=685.4'
July 2017 WESL= 685.8'

Lake Minear

Proposed Storage Basin Approximately 1.5 ac-ft

Remove and Replace Existing Storm Sewers with Upsized Sewers

36" R/R

Ellis Ave

Remove and Replace Existing Storm Sewers with Upsized Sewers

Easements will be Required from 2-4 Properties

10-year WSEL= 655.8' (NP)
50-year WSEL= 657.1' (NP)
100-year WESL=658.6' (NP)
July 2017 WESL= 660.5' (NP)

Water Quality Structure and Energy Dissipation Structure

10-year WSEL= 691.9'
50-year WSEL= 693.0'
100-year WESL=693.7'
July 2017 WESL= 695.1'

Walnut St
Ellis Ave
Milwaukee Ave
Parliament Ct
Hyatt Dr
Sandstone Dr
Minear Dr
Manor Cir
Orchard Cir
Merrill Ct
Wheeler Ct
Johnson Ave
Bartlett Ter

0 125 250 Feet
1 inch = 250 feet

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|---|---|---|---|

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(847) 823-0500 / FAX (847) 823-0520

| CLIENT | PROJECT NO. | |
|---|---|---|
| Village of Libertyville | 170001 | N W E S |
| **TITLE** Ellis (Areas 8 & 14)<br>Proposed Drainage Improvements (100-Year Level of Protection)<br>Alternative 2 | | **DATE** 8/30/18<br>EXHIBIT 19 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 8/14 (Ellis)
ALTERNATE 1: 50-Year Level of Protection

| | | | | OPTION A: OPEN CUT | | | OPTION B: TUNNEL | | |
|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| GRADING | EARTH EXCAVATION | CU YD | $30.00 | 2,423 | $72,700.00 | $148,007.50 | 2,423 | $72,700.00 | $148,007.50 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | $5.00 | 4,385 | $21,923.00 | | 4,385 | $21,923.00 | |
| | SEEDING | SQ YD | $5.00 | 4,385 | $21,923.00 | | 4,385 | $21,923.00 | |
| | EROSION CONTROL BLANKET | SQ YD | $2.50 | 4,385 | $10,961.50 | | 4,385 | $10,961.50 | |
| | DITCH REGRADING | FOOT | $15.00 | 700 | $10,500.00 | | 700 | $10,500.00 | |
| | TREE REMOVAL | L. SUM | $10,000.00 | 1 | $10,000.00 | | 1 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 7,244 | $325,980.00 | $1,304,855.00 | 7,284 | $327,780.00 | $1,572,905.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 800 | $56,000.00 | | 800 | $56,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 750 | $90,000.00 | | 750 | $90,000.00 | |
| | STORM SEWER, RCP 30" | FOOT | $150.00 | 3,355 | $503,250.00 | | 3,205 | $480,750.00 | |
| | STORM SEWER, RCP 30" (AUGERED) | FOOT | $1,925.00 | 0 | $0.00 | | 150 | $288,750.00 | |
| | STORM SEWER, RCP 60" | FOOT | $350.00 | 320 | $112,000.00 | | 320 | $112,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 1,635 | $40,875.00 | | 1,635 | $40,875.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 32 | $56,000.00 | | 32 | $56,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 1 | $3,750.00 | | 1 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 10 | $50,000.00 | | 10 | $50,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 6 | $42,000.00 | | 6 | $42,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | $15,750.00 | 1 | $15,750.00 | | 1 | $15,750.00 | |
| | 30" FLARED END SECTION W/ GRATE | EACH | $2,250.00 | 1 | $2,250.00 | | 1 | $2,250.00 | |
| | 60" FLARED END SECTION W/ GRATE | EACH | $5,000.00 | 1 | $5,000.00 | | 1 | $5,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 20 | $2,000.00 | | 20 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 13,211 | $66,055.00 | $531,205.00 | 13,211 | $66,055.00 | $532,405.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 1,114 | $100,260.00 | | 1,114 | $100,260.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 0 | $0.00 | | 0 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 559 | $47,515.00 | | 559 | $47,515.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 13,211 | $13,211.00 | | 13,211 | $13,211.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 697 | $17,425.00 | | 697 | $17,425.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 2,019 | $2,019.00 | | 2,019 | $2,019.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 1,600 | $48,000.00 | | 1,600 | $48,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 3,200 | $32,000.00 | | 3,200 | $32,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 640 | $25,600.00 | | 640 | $25,600.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 2,239 | $179,120.00 | | 2,254 | $180,320.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 945 | $70,875.00 | $274,825.00 | 945 | $70,875.00 | $266,075.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | $110.00 | 320 | $35,200.00 | | 320 | $35,200.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 1,800 | $90,000.00 | | 1,800 | $90,000.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 450 | $78,750.00 | | 400 | $70,000.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | $5,000.00 | 1 | $5,000.00 | $365,000.00 | 1 | $5,000.00 | $405,000.00 |
| | CONSTRUCTION LAYOUT | L. SUM | $90,000.00 | 1 | $90,000.00 | | 1 | $100,000.00 | |
| | MOBILIZATION | L. SUM | $180,000.00 | 1 | $180,000.00 | | 1 | $200,000.00 | |
| | TRAFFIC CONTROL | L. SUM | $90,000.00 | 1 | $90,000.00 | | 1 | $100,000.00 | |
| | | | | SUBTOTAL = | $2,623,892.50 | | | $2,924,392.50 | |
| | | | | CONTINGENCY (30%) = | $787,167.75 | | | $877,317.75 | |
| | | | | **CONSTRUCTION TOTAL =** | **$3,411,060.25** | | | **$3,801,710.25** | |
| | | | | DESIGN ENGINEERING (7.5%) = | $255,829.52 | | | $285,128.27 | |
| | | | | CONSTRUCTION ENGINEERING (7.5%) = | $255,829.52 | | | $285,128.27 | |
| | | | | PERMITTING (2.5%) = | $85,276.51 | | | $95,042.76 | |
| | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$4,007,995.79** | | | **$4,467,009.54** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 8/14 (Ellis)
ALTERNATE 2: 100-Year Level of Protection

| | | | | OPTION A: OPEN CUT | | | OPTION B: TUNNEL | | |
|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| GRADING | EARTH EXCAVATION | CU YD | $30.00 | 2,423 | $72,700.00 | | 2,423 | $72,700.00 | |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | $5.00 | 4,414 | $22,068.00 | | 4,414 | $22,068.00 | |
| | SEEDING | SQ YD | $5.00 | 4,414 | $22,068.00 | | 4,414 | $22,068.00 | |
| | EROSION CONTROL BLANKET | SQ YD | $2.50 | 4,414 | $11,034.00 | | 4,414 | $11,034.00 | |
| | DITCH REGRADING | FOOT | $15.00 | 700 | $10,500.00 | $148,370.00 | 700 | $10,500.00 | $148,370.00 |
| | TREE REMOVAL | L. SUM | $10,000.00 | 1 | $10,000.00 | | 1 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 7,676 | $345,420.00 | | 7,676 | $345,420.00 | |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 800 | $56,000.00 | | 800 | $56,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 750 | $90,000.00 | | 750 | $90,000.00 | |
| | STORM SEWER, RCP 42" | FOOT | $200.00 | 910 | $182,000.00 | | 760 | $152,000.00 | |
| | STORM SEWER, RCP 42" (AUGERED) | FOOT | $2,700.00 | 0 | $0.00 | | 150 | $405,000.00 | |
| | STORM SEWER, RCP 48" | FOOT | $220.00 | 2,445 | $537,900.00 | | 2,445 | $537,900.00 | |
| | STORM SEWER, RCP 66" | FOOT | $400.00 | 320 | $128,000.00 | | 320 | $128,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 1,635 | $40,875.00 | | 1,635 | $40,875.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 32 | $56,000.00 | | 32 | $56,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 1 | $3,750.00 | | 1 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 1 | $5,000.00 | $1,633,945.00 | 1 | $5,000.00 | $2,008,945.00 |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 3 | $21,000.00 | | 3 | $21,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | $12,000.00 | 9 | $108,000.00 | | 9 | $108,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | $15,750.00 | 3 | $47,250.00 | | 3 | $47,250.00 | |
| | MANHOLES, 10' DIAMETER | EACH | $1,250.00 | 1 | $1,250.00 | | 1 | $1,250.00 | |
| | 42" FLARED END SECTION W/ GRATE | EACH | $3,000.00 | 1 | $3,000.00 | | 1 | $3,000.00 | |
| | 66" FLARED END SECTION W/ GRATE | EACH | $6,500.00 | 1 | $6,500.00 | | 1 | $6,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 20 | $2,000.00 | | 20 | $2,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 13,211 | $66,055.00 | | 13,211 | $66,055.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 1,114 | $100,260.00 | | 1,114 | $100,260.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 0 | $0.00 | | 0 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 559 | $47,515.00 | | 559 | $47,515.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 13,211 | $13,211.00 | | 13,211 | $13,211.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 697 | $17,425.00 | $578,695.00 | 697 | $17,425.00 | $578,295.00 |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 2,549 | $2,549.00 | | 2,549 | $2,549.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 1,600 | $48,000.00 | | 1,600 | $48,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 3,200 | $32,000.00 | | 3,200 | $32,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 640 | $25,600.00 | | 640 | $25,600.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 2,826 | $226,080.00 | | 2,821 | $225,680.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 945 | $70,875.00 | | 945 | $70,875.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | $110.00 | 2,765 | $304,150.00 | | 2,765 | $304,150.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | $75.00 | 585 | $43,875.00 | $562,900.00 | 585 | $43,875.00 | $554,150.00 |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 1,305 | $65,250.00 | | 1,305 | $65,250.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 450 | $78,750.00 | | 400 | $70,000.00 | |
| MISC. | STABILIZED CONSTRUCTION ENTRANCE | EACH | $5,000.00 | 1 | $5,000.00 | | 1 | $5,000.00 | |
| | CONSTRUCTION LAYOUT | L. SUM | $115,000.00 | 1 | $115,000.00 | | 1 | $130,000.00 | |
| | MOBILIZATION | L. SUM | $230,000.00 | 1 | $230,000.00 | $465,000.00 | 1 | $260,000.00 | $525,000.00 |
| | TRAFFIC CONTROL | L. SUM | $115,000.00 | 1 | $115,000.00 | | 1 | $130,000.00 | |
| | | | SUBTOTAL = | | $3,388,910.00 | | | $3,814,760.00 | |
| | | | CONTINGENCY (30%) = | | $1,016,673.00 | | | $1,144,428.00 | |
| | | | **CONSTRUCTION TOTAL =** | | **$4,405,583.00** | | | **$4,959,188.00** | |
| | | | DESIGN ENGINEERING (7.5%) = | | $330,418.73 | | | $371,939.10 | |
| | | | CONSTRUCTION ENGINEERING (7.5%) = | | $330,418.73 | | | $371,939.10 | |
| | | | PERMITTING (2.5%) = | | $110,139.58 | | | $123,979.70 | |
| | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | | **$5,176,560.03** | | | **$5,827,045.90** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018
**Revised: August 31, 2018**

Village of Libertyville, Area 8/14 (Ellis - Alternate Route)
ALTERNATE 2A: 100-Year Level of Protection

| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | EARTH EXCAVATION | CU YD | $30.00 | 2,500 | $75,000.00 | $235,500.00 |
| | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | $5.00 | 10,000 | $50,000.00 | |
| | SEEDING | SQ YD | $5.00 | 10,000 | $50,000.00 | |
| | EROSION CONTROL BLANKET | SQ YD | $2.50 | 10,000 | $25,000.00 | |
| | DITCH REGRADING | FOOT | $15.00 | 700 | $10,500.00 | |
| | TREE REMOVAL | L. SUM | $25,000.00 | 1 | $25,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 9,200 | $414,000.00 | $1,569,000.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 500 | $35,000.00 | |
| | STORM SEWER, RCP 36" | FOOT | $175.00 | 2,800 | $490,000.00 | |
| | STORM SEWER, RCP 48" | FOOT | $220.00 | 950 | $209,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 3,300 | $82,500.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 20 | $35,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $10,000.00 | 8 | $80,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | $12,000.00 | 5 | $60,000.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | $4,000.00 | 1 | $4,000.00 | |
| | 54" FLARED END SECTION W/ GRATE | EACH | $4,500.00 | 1 | $4,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 50 | $5,000.00 | |
| | WATER QUALITY STRUCTURE | EACH | $150,000.00 | 1 | $150,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 8,500 | $42,500.00 | $589,850.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 720 | $64,800.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 360 | $30,600.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 8,500 | $8,500.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 450 | $11,250.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 7,700 | $7,700.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 3,900 | $117,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 11,750 | $117,500.00 | |
| | DRIVEWAY REMOVAL AND REPLACEMENT | SQ YD | $60.00 | 500 | $30,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 400 | $16,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 1,800 | $144,000.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 900 | $67,500.00 | $191,250.00 |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 900 | $45,000.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 450 | $78,750.00 | |
| MISC. | MAILBOX RELOCATION AND REINSTALLATION | EACH | $250.00 | 20 | $5,000.00 | $325,000.00 |
| | CONSTRUCTION LAYOUT | L. SUM | $80,000.00 | 1 | $80,000.00 | |
| | MOBILIZATION | L. SUM | $160,000.00 | 1 | $160,000.00 | |
| | TRAFFIC CONTROL | L. SUM | $80,000.00 | 1 | $80,000.00 | |
| | | | | SUBTOTAL = | $2,910,600.00 | |
| | | | | CONTINGENCY (30%) = | $873,180.00 | |
| | | | | **CONSTRUCTION TOTAL =** | **$3,783,780.00** | |
| | | | | DESIGN ENGINEERING (7.5%) = | $283,783.50 | |
| | | | | CONSTRUCTION ENGINEERING (7.5%) = | $283,783.50 | |
| | | | | PERMITTING (2.5%) = | $94,594.50 | |
| | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$4,445,941.50** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 6

# APPLEY – AREA (11): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation; HWM = High Water Mark*

Estimated HWM = 661.5'

Appley Ave

2nd St

Metra Metropolitan Rail

Oak Spring Rd

Lake Minear

BFE ~ 658'

**Legend**

- Existing Storm Sewer System
- 10-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- Regulatory Floodway
- 100-year Regulatory Floodplain
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Yard & Street Flooding Reported
- Other Flooding Reported

0 25 50 Feet

1 inch = 50 feet

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| DSGN. | AMP | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE** Appley (Area 11) Existing Conditions Inundation Map

**DATE** 04/13/18

EXHIBIT 20

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

Multiple high capaity inlets and lateral sewers

10-year WSEL= 656.9' (NP)
100-year WESL=660.2'
July 2017 WESL= 661.0'

Decreaseing proposed storm sewer size to 30" provides 50-year level of protection.

Water Quality Structure

Inundation in ditch not shown

Lake Minear

BFE ~ 658'

Appley Ave

Metra Metra

2nd St

Oak Spring Rd

42" CMP

48"

48"

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area

0 25 50 Feet
1 inch = 50 feet

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Appley (Area 11)
Proposed Drainage Improvements (100-Year Level of Protection)

**DATE** 04/13/18

EXHIBIT 21

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 11 (Appley)
ALTERNATE 1: 50-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 34 | $5.00 | $170.00 | $425.00 |
| | SEEDING | SQ YD | 34 | $5.00 | $170.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 34 | $2.50 | $85.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 505 | $45.00 | $22,725.00 | $284,575.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 400 | $70.00 | $28,000.00 | |
| | STORM SEWER, RCP 30" | FOOT | 322 | $150.00 | $48,300.00 | |
| | STORM SEWER REMOVAL | FOOT | 62 | $25.00 | $1,550.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 16 | $1,750.00 | $28,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | 1 | $3,750.00 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 1 | $5,000.00 | $5,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 2 | $7,000.00 | $14,000.00 | |
| | WATER QUALITY STRUCTURE | EACH | 1 | $130,000.00 | $130,000.00 | |
| | 30" FLARED END SECTION W/ GRATE | EACH | 1 | $2,250.00 | $2,250.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 1,160 | $5.00 | $5,800.00 | $47,007.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 99 | $90.00 | $8,910.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 0 | $80.00 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 50 | $85.00 | $4,250.00 | |
| | PREPARATION OF BASE | SQ YD | 1,160 | $1.00 | $1,160.00 | |
| | AGGREGATE BASE REPAIR | TON | 62 | $25.00 | $1,550.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 137 | $1.00 | $137.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 200 | $30.00 | $6,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 400 | $10.00 | $4,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 80 | $40.00 | $3,200.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 150 | $80.00 | $12,000.00 | |
| U.R. | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 100 | $175.00 | $17,500.00 | $17,500.00 |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $15,000.00 | $15,000.00 | $60,000.00 |
| | MOBILIZATION | L. SUM | 1 | $30,000.00 | $30,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $15,000.00 | $15,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $409,507.00 |
| CONTINGENCY (30%) = | $122,852.10 |
| **CONSTRUCTION TOTAL =** | **$532,359.10** |
| DESIGN ENGINEERING (7.5%) = | $39,926.93 |
| CONSTRUCTION ENGINEERING (7.5%) = | $39,926.93 |
| PERMITTING (2.5%) = | $13,308.98 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$625,521.94** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 11 (Appley)
ALTERNATE 2: 100-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 46 | $5.00 | $230.00 | $575.00 |
| | SEEDING | SQ YD | 46 | $5.00 | $230.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 46 | $2.50 | $115.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 530 | $45.00 | $23,850.00 | $341,500.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 400 | $70.00 | $28,000.00 | |
| | STORM SEWER, RCP 42" | FOOT | 62 | $200.00 | $12,400.00 | |
| | STORM SEWER, RCP 48" | FOOT | 260 | $220.00 | $57,200.00 | |
| | STORM SEWER REMOVAL | FOOT | 62 | $25.00 | $1,550.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 16 | $1,750.00 | $28,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 1 | $5,000.00 | $5,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 1 | $7,000.00 | $7,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 2 | $12,000.00 | $24,000.00 | |
| | WATER QUALITY STRUCTURE | EACH | 1 | $150,000.00 | $150,000.00 | |
| | 48" FLARED END SECTION W/ GRATE | EACH | 1 | $3,500.00 | $3,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 1,160 | $5.00 | $5,800.00 | $50,728.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 99 | $90.00 | $8,910.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 0 | $80.00 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 50 | $85.00 | $4,250.00 | |
| | PREPARATION OF BASE | SQ YD | 1,160 | $1.00 | $1,160.00 | |
| | AGGREGATE BASE REPAIR | TON | 62 | $25.00 | $1,550.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 178 | $1.00 | $178.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 200 | $30.00 | $6,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 400 | $10.00 | $4,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 80 | $40.00 | $3,200.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 196 | $80.00 | $15,680.00 | |
| U.R. | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 260 | $110.00 | $28,600.00 | $46,100.00 |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 100 | $175.00 | $17,500.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $20,000.00 | $20,000.00 | $80,000.00 |
| | MOBILIZATION | L. SUM | 1 | $40,000.00 | $40,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $20,000.00 | $20,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $518,903.00 |
| CONTINGENCY (30%) = | $155,670.90 |
| **CONSTRUCTION TOTAL =** | **$674,573.90** |
| DESIGN ENGINEERING (7.5%) = | $50,593.04 |
| CONSTRUCTION ENGINEERING (7.5%) = | $50,593.04 |
| PERMITTING (2.5%) = | $16,864.35 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$792,624.33** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 7

# ROCKLAND – AREAS (12&13): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation; HWM = High Water Mark*

10-Year WSEL = 662.5'
50-Year WSEL = 666.6'
100-Year WSEL = 667.0'
July 2017 WSEL = 667.5'
Estimated HWM = 667.4'

10-Year WSEL = 685.8'
50-Year WSEL = 686.8'
100-Year WSEL = 687.0'
July 2017 WSEL = 687.2'
Estimated HWM = 687.5'

10-Year WSEL = 655.2'
50-Year WSEL = 655.6'
100-Year WSEL = 655.8'
July 2017 WSEL = 656.1'

10-Year WSEL = 670.1'
50-Year WSEL = 671.8'
100-Year WSEL = 672.0'
July 2017 WSEL = 672.2'
Estimated HWM = 671.9'

## Legend

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- Yard and Street Flooding Reported
- 10-Year Inundation Area
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 150 300 Feet
1 inch = 300 feet

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

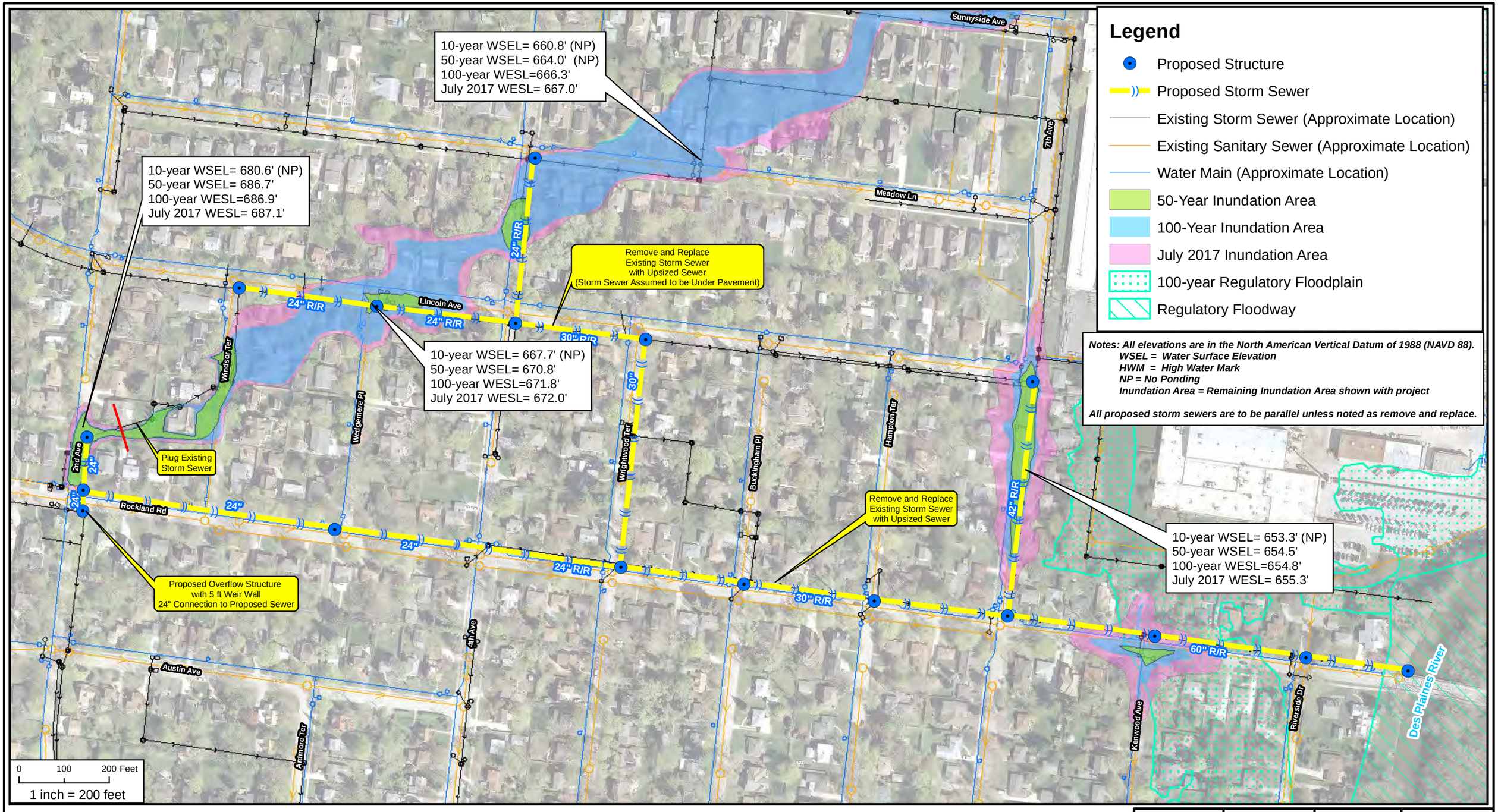
**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE** Rockland (Areas 12 & 13) Existing Conditions Inundation Map

**DATE** 7/13/18

EXHIBIT 22




## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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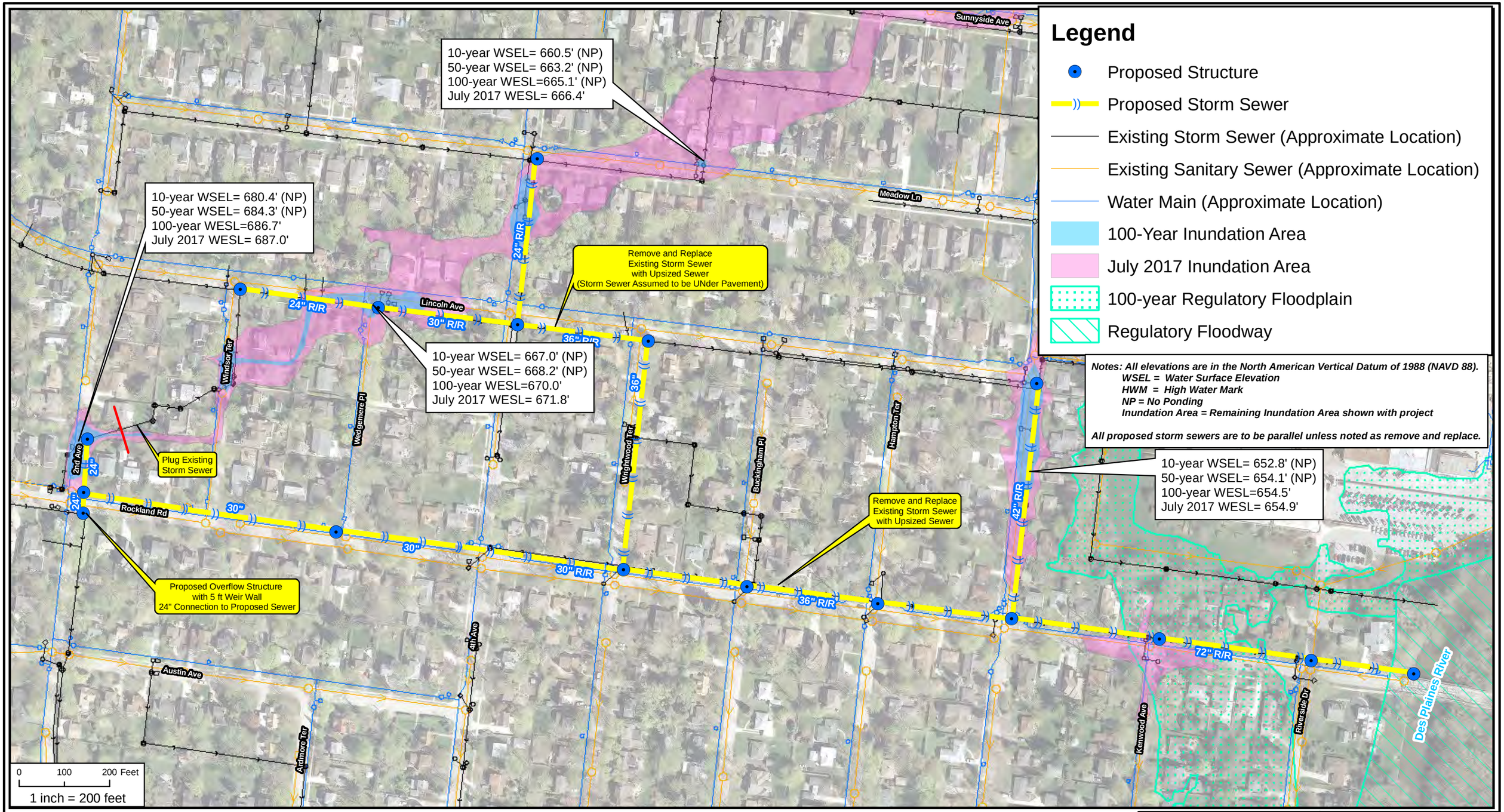
| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

| | |
|---|---|
| **CLIENT** | Village of Libertyville |
| **PROJECT NO.** | 170001 |
| **TITLE** | Rockland (Areas 12 & 13)<br>Proposed Drainage Improvements (25-Year Level of Protection) |
| **DATE** | 7/13/18 |
| | EXHIBIT 23 |




## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

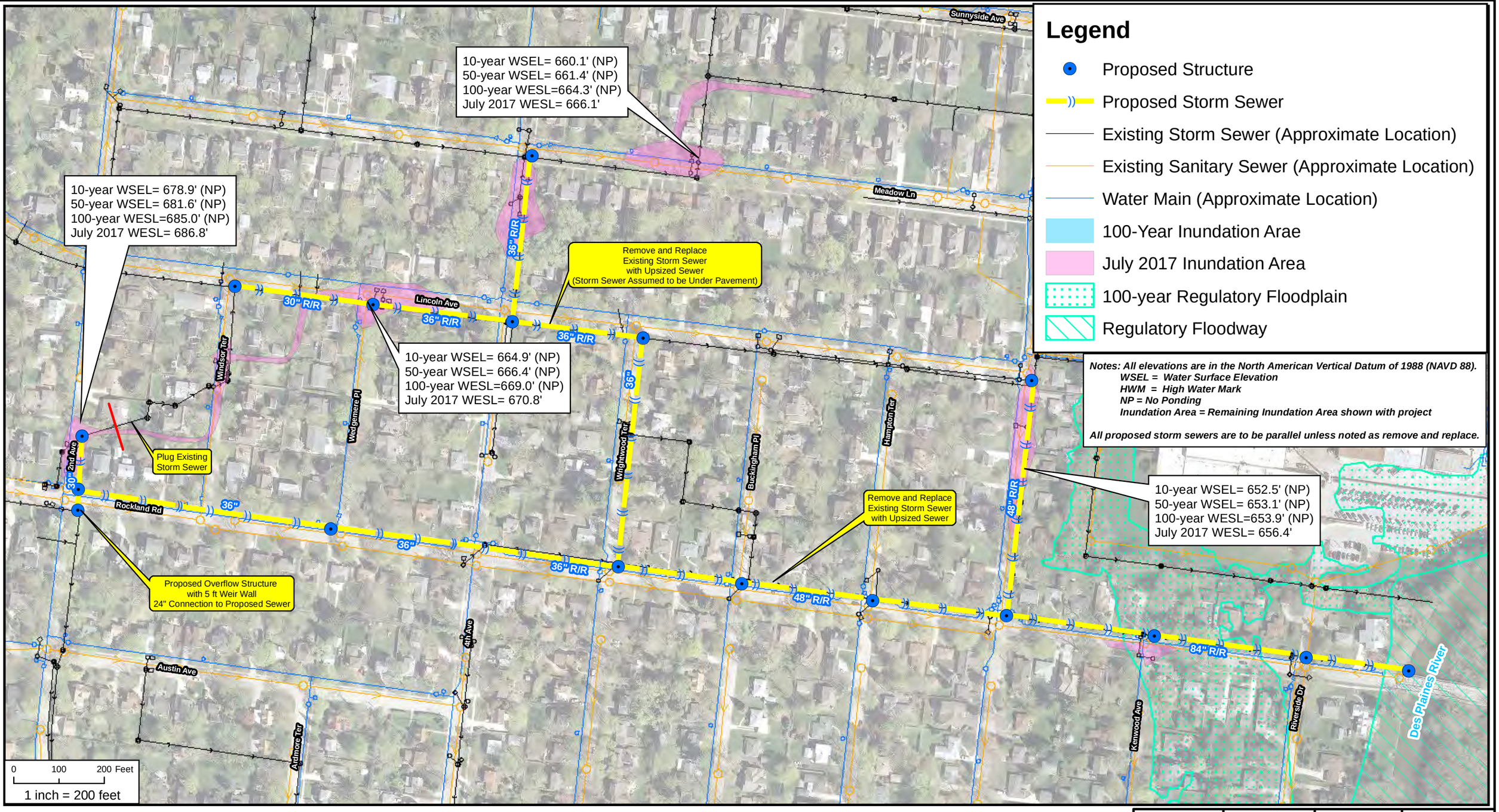
**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE**
Rockland (Areas 12 & 13)
Proposed Drainage Improvements (50-Year Level of Protection)

**DATE** 7/13/18

EXHIBIT 24




## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Arae
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


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Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


| | | | |
|---|---|---|---|
| **CLIENT** | Village of Libertyville | **PROJECT NO.** | 170001 |
| **TITLE** | Rockland (Areas 12 & 13)<br>Proposed Drainage Improvements (100-Year Level of Protection) | **DATE** | 7/13/18 |
| | | | EXHIBIT 25 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 12/13 (Rockland)
ALTERNATE 1: 25-Year Level of Protection

| | | | | OPTION A: OPEN CUT | | | OPTION B: TUNNEL | | |
|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 11,463 | $515,835.00 | | 9,063 | $407,835.00 | |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 1,500 | $105,000.00 | | 1,500 | $105,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 2,015 | $241,800.00 | | 1,115 | $133,800.00 | |
| | STORM SEWER, RCP 24" (AUGERED) | FOOT | $1,525.00 | 0 | $0.00 | | 900 | $1,372,500.00 | |
| | STORM SEWER, RCP 30" | FOOT | $150.00 | 1,660 | $249,000.00 | | 1,160 | $174,000.00 | |
| | STORM SEWER, RCP 30" (AUGERED) | FOOT | $1,925.00 | 0 | $0.00 | | 500 | $962,500.00 | |
| | STORM SEWER, RCP 42" | FOOT | $200.00 | 510 | $102,000.00 | | 510 | $102,000.00 | |
| | STORM SEWER, RCP 60" | FOOT | $350.00 | 900 | $315,000.00 | | 900 | $315,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 3,515 | $87,875.00 | | 3,515 | $87,875.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 60 | $105,000.00 | | 60 | $105,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 7 | $26,250.00 | | 7 | $26,250.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 5 | $25,000.00 | | 5 | $25,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 1 | $7,000.00 | | 1 | $7,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | $15,750.00 | 3 | $47,250.00 | | 3 | $47,250.00 | |
| | OVERFLOW STRUCTURE W/ WEIR WALL | EACH | $75,000.00 | 1 | $75,000.00 | | 1 | $75,000.00 | |
| | 60" FLARED END SECTION W/ GRATE | EACH | $5,000.00 | 1 | $5,000.00 | | 1 | $5,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 10 | $1,000.00 | **$1,908,010.00** | 10 | $1,000.00 | **$3,952,010.00** |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 12,779 | $63,895.00 | | 12,779 | $63,895.00 | |
| | PAVEMENT REMOVAL | SQ YD | $15.00 | 3,000 | $45,000.00 | | 3,000 | $45,000.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | $40.00 | 50 | $2,000.00 | | 50 | $2,000.00 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | $40.00 | 50 | $2,000.00 | | 50 | $2,000.00 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | $2.50 | 150 | $375.00 | | 150 | $375.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 1,413 | $127,170.00 | | 1,413 | $127,170.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 672 | $53,760.00 | | 672 | $53,760.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 540 | $45,900.00 | | 540 | $45,900.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | $12.00 | 3,000 | $36,000.00 | | 3,000 | $36,000.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 12,779 | $12,779.00 | | 12,779 | $12,779.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 677 | $16,925.00 | | 677 | $16,925.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 2,075 | $2,075.00 | | 2,075 | $2,075.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 3,000 | $90,000.00 | | 3,000 | $90,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 6,000 | $60,000.00 | | 6,000 | $60,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 1,200 | $48,000.00 | | 1,200 | $48,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 2,302 | $184,160.00 | **$790,039.00** | 1,552 | $124,160.00 | **$730,039.00** |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 2,610 | $195,750.00 | | 2,115 | $158,625.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | $110.00 | 900 | $99,000.00 | | 900 | $99,000.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | $75.00 | 450 | $33,750.00 | | 450 | $33,750.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 4,635 | $231,750.00 | | 4,140 | $207,000.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 650 | $113,750.00 | **$674,000.00** | 550 | $96,250.00 | **$594,625.00** |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | $130,000.00 | 1 | $130,000.00 | | 1 | $205,000.00 | |
| | MOBILIZATION | L. SUM | $260,000.00 | 1 | $260,000.00 | | 1 | $410,000.00 | |
| | TRAFFIC CONTROL | L. SUM | $130,000.00 | 1 | $130,000.00 | **$520,000.00** | 1 | $205,000.00 | **$820,000.00** |
| | | | | | SUBTOTAL = | $3,892,049.00 | | $6,096,674.00 | |
| | | | | | CONTINGENCY (30%) = | $1,167,614.70 | | $1,829,002.20 | |
| | | | | | **CONSTRUCTION TOTAL =** | **$5,059,663.70** | | **$7,925,676.20** | |
| | | | | | DESIGN ENGINEERING (7.5%) = | $379,474.78 | | $594,425.72 | |
| | | | | | CONSTRUCTION ENGINEERING (7.5%) = | $379,474.78 | | $594,425.72 | |
| | | | | | PERMITTING (2.5%) = | $126,491.59 | | $198,141.91 | |
| | | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$5,945,104.85** | | **$9,312,669.54** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 12/13 (Rockland)
ALTERNATE 2: 50-Year Level of Protection

| | | | | OPTION A: OPEN CUT | | | OPTION B: TUNNEL | | |
|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 12,287 | $552,915.00 | | 9,887 | $444,915.00 | |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 1,500 | $105,000.00 | | 1,500 | $105,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 870 | $104,400.00 | | 870 | $104,400.00 | |
| | STORM SEWER, RCP 30" | FOOT | $150.00 | 1,475 | $221,250.00 | | 575 | $86,250.00 | |
| | STORM SEWER, RCP 30" (AUGERED) | FOOT | $1,925.00 | 0 | $0.00 | | 900 | $1,732,500.00 | |
| | STORM SEWER, RCP 36" | FOOT | $175.00 | 1,660 | $290,500.00 | | 1,160 | $203,000.00 | |
| | STORM SEWER, RCP 36" (AUGERED) | FOOT | $2,275.00 | 0 | $0.00 | | 500 | $1,137,500.00 | |
| | STORM SEWER, RCP 42" | FOOT | $200.00 | 510 | $102,000.00 | | 510 | $102,000.00 | |
| | STORM SEWER, RCP 72" | FOOT | $450.00 | 900 | $405,000.00 | | 900 | $405,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 3,845 | $96,125.00 | $2,316,440.00 | 3,845 | $96,125.00 | $4,855,940.00 |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 60 | $105,000.00 | | 60 | $105,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 1 | $3,750.00 | | 1 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 4 | $20,000.00 | | 4 | $20,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 5 | $35,000.00 | | 5 | $35,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | $12,000.00 | 4 | $48,000.00 | | 4 | $48,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | $15,750.00 | 2 | $31,500.00 | | 2 | $31,500.00 | |
| | MANHOLES, 9' DIAMETER | EACH | $12,500.00 | 9 | $112,500.00 | | 9 | $112,500.00 | |
| | OVERFLOW STRUCTURE W/ WEIR WALL | EACH | $75,000.00 | 1 | $75,000.00 | | 1 | $75,000.00 | |
| | 72" FLARED END SECTION W/ GRATE | EACH | $7,500.00 | 1 | $7,500.00 | | 1 | $7,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 10 | $1,000.00 | | 10 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 13,696 | $68,480.00 | | 13,696 | $68,480.00 | |
| | PAVEMENT REMOVAL | SQ YD | $15.00 | 3,000 | $45,000.00 | | 3,000 | $45,000.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | $40.00 | 50 | $2,000.00 | | 50 | $2,000.00 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | $40.00 | 50 | $2,000.00 | | 50 | $2,000.00 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | $2.50 | 150 | $375.00 | | 150 | $375.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 1,491 | $134,190.00 | | 1,491 | $134,190.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 672 | $53,760.00 | | 672 | $53,760.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 579 | $49,215.00 | $836,955.00 | 579 | $49,215.00 | $776,955.00 |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | $12.00 | 3,000 | $36,000.00 | | 3,000 | $36,000.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 13,696 | $13,696.00 | | 13,696 | $13,696.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 726 | $18,150.00 | | 726 | $18,150.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 2,409 | $2,409.00 | | 2,409 | $2,409.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 3,000 | $90,000.00 | | 3,000 | $90,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 6,000 | $60,000.00 | | 6,000 | $60,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 1,200 | $48,000.00 | | 1,200 | $48,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 2,671 | $213,680.00 | | 1,921 | $153,680.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 2,790 | $209,250.00 | | 2,295 | $172,125.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | $110.00 | 900 | $99,000.00 | | 900 | $99,000.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | $75.00 | 450 | $33,750.00 | $703,250.00 | 450 | $33,750.00 | $623,875.00 |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 4,950 | $247,500.00 | | 4,455 | $222,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 650 | $113,750.00 | | 550 | $96,250.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | $150,000.00 | 1 | $150,000.00 | | 1 | $245,000.00 | |
| | MOBILIZATION | L. SUM | $300,000.00 | 1 | $300,000.00 | $600,000.00 | 1 | $490,000.00 | $980,000.00 |
| | TRAFFIC CONTROL | L. SUM | $150,000.00 | 1 | $150,000.00 | | 1 | $245,000.00 | |
| | | | | SUBTOTAL = | $4,456,645.00 | | | $7,236,770.00 | |
| | | | | CONTINGENCY (30%) = | $1,336,993.50 | | | $2,171,031.00 | |
| | | | | **CONSTRUCTION TOTAL =** | **$5,793,638.50** | | | **$9,407,801.00** | |
| | | | | DESIGN ENGINEERING (7.5%) = | $434,522.89 | | | $705,585.08 | |
| | | | | CONSTRUCTION ENGINEERING (7.5%) = | $434,522.89 | | | $705,585.08 | |
| | | | | PERMITTING (2.5%) = | $144,840.96 | | | $235,195.03 | |
| | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$6,807,525.24** | | | **$11,054,166.18** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 12/13 (Rockland)
ALTERNATE 3: 100-Year Level of Protection

| | | | | OPTION A: OPEN CUT | | | OPTION B: TUNNEL | | |
|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 12,512 | $563,040.00 | | 10,012 | $450,540.00 | |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 1,500 | $105,000.00 | | 1,500 | $105,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 50 | $6,000.00 | | 50 | $6,000.00 | |
| | STORM SEWER, RCP 30" | FOOT | $150.00 | 450 | $67,500.00 | | 450 | $67,500.00 | |
| | STORM SEWER, RCP 36" | FOOT | $175.00 | 2,635 | $461,125.00 | | 1,235 | $216,125.00 | |
| | STORM SEWER, RCP 36" (AUGERED) | FOOT | $2,275.00 | 0 | $0.00 | | 1,400 | $3,185,000.00 | |
| | STORM SEWER, RCP 48" | FOOT | $220.00 | 1,380 | $303,600.00 | | 1,380 | $303,600.00 | |
| | STORM SEWER, RCP 84" | FOOT | $550.00 | 900 | $495,000.00 | | 900 | $495,000.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 3,845 | $96,125.00 | $2,417,140.00 | 3,845 | $96,125.00 | $5,244,640.00 |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 60 | $105,000.00 | | 60 | $105,000.00 | |
| | MANHOLES, 4' DIAMETER | EACH | $3,750.00 | 1 | $3,750.00 | | 1 | $3,750.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 2 | $10,000.00 | | 2 | $10,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | $7,000.00 | 4 | $28,000.00 | | 4 | $28,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | $12,000.00 | 3 | $36,000.00 | | 3 | $36,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | $15,750.00 | 3 | $47,250.00 | | 3 | $47,250.00 | |
| | MANHOLES, 10' DIAMETER | EACH | $1,250.00 | 3 | $3,750.00 | | 3 | $3,750.00 | |
| | OVERFLOW STRUCTURE W/ WEIR WALL | EACH | $75,000.00 | 1 | $75,000.00 | | 1 | $75,000.00 | |
| | 84" FLARED END SECTION W/ GRATE | EACH | $10,000.00 | 1 | $10,000.00 | | 1 | $10,000.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | $100.00 | 10 | $1,000.00 | | 10 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 13,696 | $68,480.00 | | 13,696 | $68,480.00 | |
| | PAVEMENT REMOVAL | SQ YD | $15.00 | 3,000 | $45,000.00 | | 3,000 | $45,000.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | $40.00 | 50 | $2,000.00 | | 50 | $2,000.00 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | $40.00 | 50 | $2,000.00 | | 50 | $2,000.00 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | $2.50 | 150 | $375.00 | | 150 | $375.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 1,491 | $134,190.00 | | 1,491 | $134,190.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 672 | $53,760.00 | | 672 | $53,760.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 579 | $49,215.00 | $862,763.00 | 579 | $49,215.00 | $802,763.00 |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | $12.00 | 3,000 | $36,000.00 | | 3,000 | $36,000.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 13,696 | $13,696.00 | | 13,696 | $13,696.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 726 | $18,150.00 | | 726 | $18,150.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 2,697 | $2,697.00 | | 2,697 | $2,697.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 3,000 | $90,000.00 | | 3,000 | $90,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 6,000 | $60,000.00 | | 6,000 | $60,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 1,200 | $48,000.00 | | 1,200 | $48,000.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 2,990 | $239,200.00 | | 2,240 | $179,200.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 2,790 | $209,250.00 | | 2,790 | $209,250.00 | |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | $110.00 | 2,280 | $250,800.00 | | 2,280 | $250,800.00 | |
| | NEW SANITARY SERVICE LINE | FOOT | $75.00 | 1,305 | $97,875.00 | $878,675.00 | 1,305 | $97,875.00 | $861,175.00 |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 4,140 | $207,000.00 | | 4,140 | $207,000.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 650 | $113,750.00 | | 550 | $96,250.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | $160,000.00 | 1 | $160,000.00 | | 1 | $270,000.00 | |
| | MOBILIZATION | L. SUM | $320,000.00 | 1 | $320,000.00 | $640,000.00 | 1 | $540,000.00 | $1,080,000.00 |
| | TRAFFIC CONTROL | L. SUM | $160,000.00 | 1 | $160,000.00 | | 1 | $270,000.00 | |
| | | | | SUBTOTAL = | $4,798,578.00 | | | $7,988,578.00 | |
| | | | | CONTINGENCY (30%) = | $1,439,573.40 | | | $2,396,573.40 | |
| | | | | **CONSTRUCTION TOTAL =** | **$6,238,151.40** | | | **$10,385,151.40** | |
| | | | | DESIGN ENGINEERING (7.5%) = | $467,861.36 | | | $778,886.36 | |
| | | | | CONSTRUCTION ENGINEERING (7.5%) = | $467,861.36 | | | $778,886.36 | |
| | | | | PERMITTING (2.5%) = | $155,953.79 | | | $259,628.79 | |
| | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$7,329,827.90** | | | **$12,202,552.90** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 8

# LIBERTY BELL AND 4TH AVENUE – AREAS (15&18): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).
WSEL = Water Surface Elevation; HWM = High Water Mark

10-Year WSEL = 654.0'
50-Year WSEL = 654.8'
100-Year WSEL = 654.9'
July 2017 WSEL = 655.1'

Paul Revere Dr
Liberty Bell Ct
Harvard Ln
Country Club Dr
Liberty Bell Ln
Golf Rd
Cambridge Dr
Downing Rd
4th Ave
Michaels Ln
Paddock Ln
Furlong Dr
Eton Ct

0 100 200 Feet
1 inch = 200 feet

## Legend

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- Yard and Street Flooding Reported
- 10-Year Inundation Area
- 50-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Libertyville

PROJECT NO.: 170001

TITLE: Liberty Bell & 4th (Areas 15 & 18) Existing Conditions Inundation Map

DATE: 7/13/18

EXHIBIT 26

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

Remove and Replace Existing Storm Sewer with Upsized Sewer

10-year WSEL= 652.6' (NP)
50-year WSEL= 653.6' (NP)
100-year WESL=653.8'
July 2017 WESL= 654.6'

Remove Existing Storm Sewer Connection to 36" on Golf Rd.

Multiple High Capacity Inlets

Existing Overland Flow Path to be Restored for Positive Drainage

30" RJR

66"

66" Parallel Outfall

5th Ave
Paul Revere Dr
Liberty Bell Ct
Harvard Ln
Country Club Dr
Des Plaines River
Cambridge Dr
Downing Rd
Liberty Bell
4th Ave
Michaels Ln
Paddock Ln
Furlong Dr
Eton Ct

0 100 200 Feet
1 inch = 200 feet

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

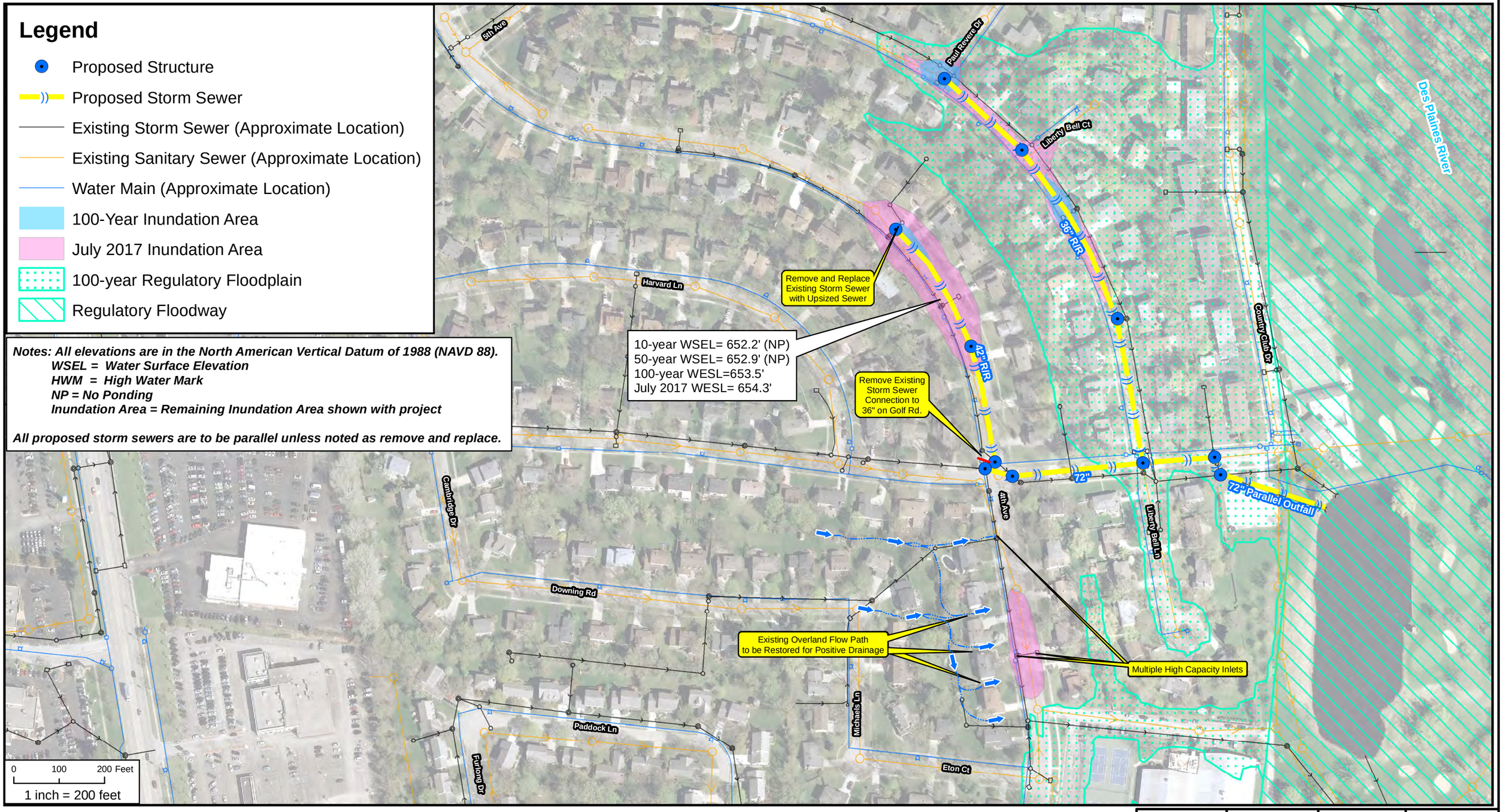
| | |
|---|---|
| CLIENT | Village of Libertyville |
| PROJECT NO. | 170001 |
| TITLE | Liberty Bell & 4th (Areas 15 & 18)<br>Proposed Drainage Improvements (50-Year Level of Protection) |
| DATE | 7/13/18 |
| | EXHIBIT 27 |

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


| | |
|---|---|
| CLIENT | Village of Libertyville |
| PROJECT NO. | 170001 |
| TITLE | Liberty Bell & 4th (Areas 15 & 18)<br>Proposed Drainage Improvements (100-Year Level of Protection) |
| DATE | 7/13/18 |
| | EXHIBIT 28 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 15/18 (Liberty Bell & 4th Avenue)
ALTERNATE 1: 50-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 268 | $5.00 | $1,340.00 | $3,350.00 |
| | SEEDING | SQ YD | 268 | $5.00 | $1,340.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 268 | $2.50 | $670.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 19,464 | $45.00 | $875,880.00 | $1,738,630.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 300 | $70.00 | $21,000.00 | |
| | STORM SEWER, RCP 30" | FOOT | 1,350 | $150.00 | $202,500.00 | |
| | STORM SEWER, RCP 66" | FOOT | 790 | $400.00 | $316,000.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,350 | $25.00 | $33,750.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 12 | $1,750.00 | $21,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 6 | $5,000.00 | $30,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 2 | $7,000.00 | $14,000.00 | |
| | MANHOLES, 8' DIAMETER | EACH | 1 | $15,750.00 | $15,750.00 | |
| | MANHOLES, 10' DIAMETER | EACH | 1 | $1,250.00 | $1,250.00 | |
| | JUNCTION CHAMBER | EACH | 4 | $50,000.00 | $200,000.00 | |
| | 66" FLARED END SECTION W/ GRATE | EACH | 1 | $6,500.00 | $6,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 3,968 | $5.00 | $19,840.00 | $248,594.67 |
| | PAVEMENT REMOVAL | SQ YD | 1,304 | $15.00 | $19,560.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 22 | $40.00 | $869.33 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 22 | $40.00 | $869.33 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 65 | $2.50 | $163.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 482 | $90.00 | $43,380.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 293 | $80.00 | $23,440.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 168 | $85.00 | $14,280.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 1,304 | $12.00 | $15,648.00 | |
| | PREPARATION OF BASE | SQ YD | 3,968 | $1.00 | $3,968.00 | |
| | AGGREGATE BASE REPAIR | TON | 210 | $25.00 | $5,250.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 687 | $1.00 | $687.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 600 | $30.00 | $18,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 1,200 | $10.00 | $12,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 240 | $40.00 | $9,600.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 763 | $80.00 | $61,040.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 720 | $75.00 | $54,000.00 | $245,650.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 790 | $110.00 | $86,900.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 1,395 | $50.00 | $69,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 200 | $175.00 | $35,000.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $90,000.00 | $90,000.00 | $360,000.00 |
| | MOBILIZATION | L. SUM | 1 | $180,000.00 | $180,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $90,000.00 | $90,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $2,596,224.67 |
| CONTINGENCY (30%) = | $778,867.40 |
| **CONSTRUCTION TOTAL =** | **$3,375,092.07** |
| DESIGN ENGINEERING (7.5%) = | $253,131.91 |
| CONSTRUCTION ENGINEERING (7.5%) = | $253,131.91 |
| PERMITTING (2.5%) = | $84,377.30 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$3,965,733.18** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 15/18 (Liberty Bell & 4th Avenue)
ALTERNATE 2: 100-Year Level of Protection

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 286 | $5.00 | $1,430.00 | $3,575.00 |
| | SEEDING | SQ YD | 286 | $5.00 | $1,430.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 286 | $2.50 | $715.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 22,469 | $45.00 | $1,011,105.00 | $1,955,730.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 300 | $70.00 | $21,000.00 | |
| | STORM SEWER, RCP 36" | FOOT | 975 | $175.00 | $170,625.00 | |
| | STORM SEWER, RCP 42" | FOOT | 375 | $200.00 | $75,000.00 | |
| | STORM SEWER, RCP 72" | FOOT | 790 | $450.00 | $355,500.00 | |
| | STORM SEWER REMOVAL | FOOT | 1,350 | $25.00 | $33,750.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 12 | $1,750.00 | $21,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 4 | $5,000.00 | $20,000.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 2 | $7,000.00 | $14,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 2 | $12,000.00 | $24,000.00 | |
| | MANHOLES, 10' DIAMETER | EACH | 1 | $1,250.00 | $1,250.00 | |
| | JUNCTION CHAMBER | EACH | 4 | $50,000.00 | $200,000.00 | |
| | 72" FLARED END SECTION W/ GRATE | EACH | 1 | $7,500.00 | $7,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 3,968 | $5.00 | $19,840.00 | $257,655.67 |
| | PAVEMENT REMOVAL | SQ YD | 1,304 | $15.00 | $19,560.00 | |
| | AGGREGATE SUBGRADE IMPROVEMENT | CU YD | 22 | $40.00 | $869.33 | |
| | REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL | CU YD | 22 | $40.00 | $869.33 | |
| | GEOTECHNICAL FABRIC FOR GROUND STABILIZATION | SQ YD | 65 | $2.50 | $163.00 | |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 482 | $90.00 | $43,380.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 293 | $80.00 | $23,440.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 168 | $85.00 | $14,280.00 | |
| | AGGREGATE BASE COURSE, TYPE B, 12" | SQ YD | 1,304 | $12.00 | $15,648.00 | |
| | PREPARATION OF BASE | SQ YD | 3,968 | $1.00 | $3,968.00 | |
| | AGGREGATE BASE REPAIR | TON | 210 | $25.00 | $5,250.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 788 | $1.00 | $788.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 600 | $30.00 | $18,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 1,200 | $10.00 | $12,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 240 | $40.00 | $9,600.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 875 | $80.00 | $70,000.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | 720 | $75.00 | $54,000.00 | $245,650.00 |
| | NEW PARALLEL SANITARY SEWER MAIN | FOOT | 790 | $110.00 | $86,900.00 | |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | 1,395 | $50.00 | $69,750.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 200 | $175.00 | $35,000.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $100,000.00 | $100,000.00 | $400,000.00 |
| | MOBILIZATION | L. SUM | 1 | $200,000.00 | $200,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $100,000.00 | $100,000.00 | |

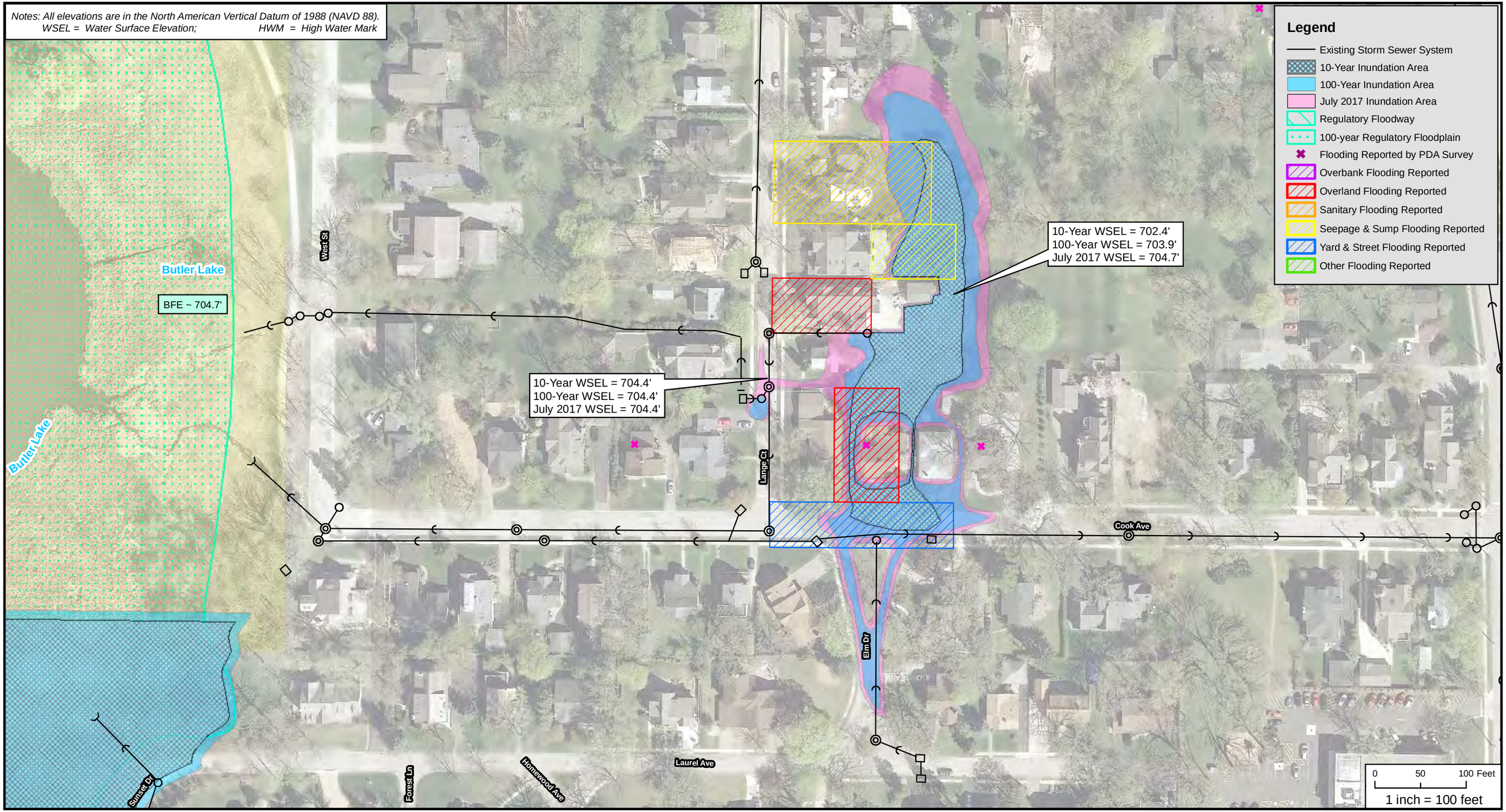
| | |
|---|---|
| SUBTOTAL = | $2,862,610.67 |
| CONTINGENCY (30%) = | $858,783.20 |
| **CONSTRUCTION TOTAL =** | **$3,721,393.87** |
| DESIGN ENGINEERING (7.5%) = | $279,104.54 |
| CONSTRUCTION ENGINEERING (7.5%) = | $279,104.54 |
| PERMITTING (2.5%) = | $93,034.85 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$4,372,637.79** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 9

# LANGE AND COOK – AREA (16): EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

*Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).*
*WSEL = Water Surface Elevation; HWM = High Water Mark*




**Legend**

- Existing Storm Sewer System
- 10-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- Regulatory Floodway
- 100-year Regulatory Floodplain
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Yard & Street Flooding Reported
- Other Flooding Reported

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| DSGN. | AMP | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

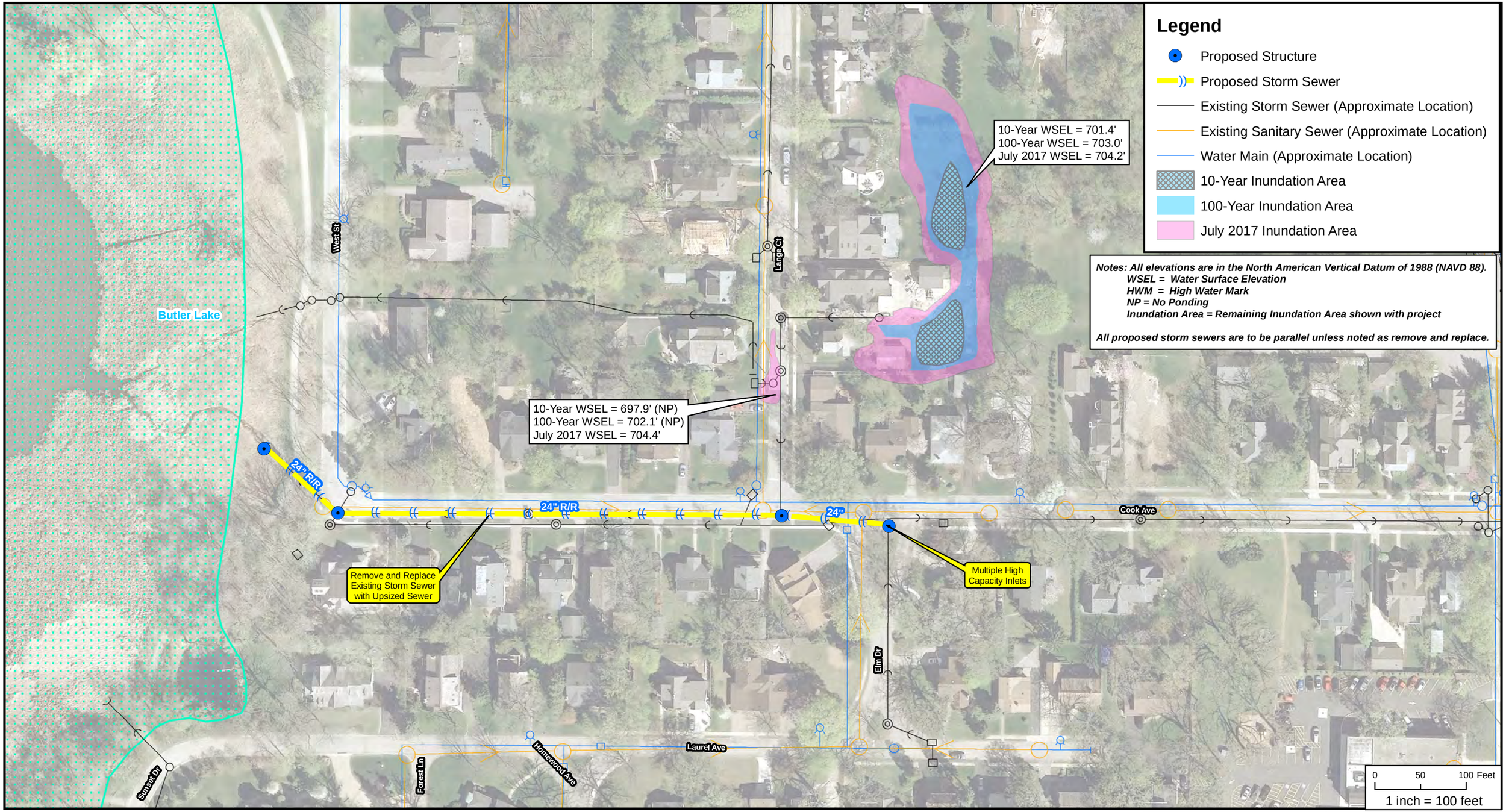

**CLIENT** Village of Libertyville

**PROJECT NO.** 170001

**TITLE** Lange & Cook (Area 16) Existing Conditions Inundation Map

**DATE** 04/13/18

EXHIBIT 29

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| DSGN. | AMP | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


| | | | |
|---|---|---|---|
| CLIENT: Village of Libertyville | | PROJECT NO.: 170001 | N |
| TITLE: Lange & Cook (Area 16)<br>Proposed Drainage Improvements (100-Year Level of Protection) | | | DATE: 04/13/18<br>EXHIBIT 30 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area 16 (Lange & Cook)
ALTERNATE 1: 100-Year Level of Protection

| | | | | OPTION A: OPEN CUT | | | OPTION B: TUNNEL | | |
|---|---|---|---|---|---|---|---|---|---|
| | ITEMS | UNIT | UNIT PRICE | QUANTITY | TOTAL COST | SUBTOTALS | QUANTITY | TOTAL COST | SUBTOTALS |
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | $5.00 | 40 | $200.00 | $500.00 | 100 | $500.00 | $1,250.00 |
| | SEEDING | SQ YD | $5.00 | 40 | $200.00 | | 100 | $500.00 | |
| | EROSION CONTROL BLANKET | SQ YD | $2.50 | 40 | $100.00 | | 100 | $250.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | $45.00 | 1,627 | $73,215.00 | $226,665.00 | 900 | $40,500.00 | $1,142,125.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | $70.00 | 300 | $21,000.00 | | 300 | $21,000.00 | |
| | STORM SEWER, RCP 24" | FOOT | $120.00 | 685 | $82,200.00 | | 0 | $0.00 | |
| | STORM SEWER, RCP 24" (AUGERED) | FOOT | $1,525.00 | 0 | $0.00 | | 685 | $1,044,625.00 | |
| | STORM SEWER REMOVAL | FOOT | $25.00 | 570 | $14,250.00 | | 0 | $0.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | $1,750.00 | 12 | $21,000.00 | | 12 | $21,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | $5,000.00 | 3 | $15,000.00 | | 3 | $15,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | $5.00 | 1,790 | $8,950.00 | $97,389.00 | 1,790 | $8,950.00 | $89,149.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | $90.00 | 151 | $13,590.00 | | 151 | $13,590.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | $80.00 | 0 | $0.00 | | 0 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | $85.00 | 77 | $6,545.00 | | 77 | $6,545.00 | |
| | PREPARATION OF BASE | SQ YD | $1.00 | 1,790 | $1,790.00 | | 1,790 | $1,790.00 | |
| | AGGREGATE BASE REPAIR | TON | $25.00 | 96 | $2,400.00 | | 96 | $2,400.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | $1.00 | 274 | $274.00 | | 274 | $274.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | $30.00 | 600 | $18,000.00 | | 600 | $18,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | $10.00 | 1,200 | $12,000.00 | | 1,200 | $12,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | $40.00 | 240 | $9,600.00 | | 240 | $9,600.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | $80.00 | 303 | $24,240.00 | | 200 | $16,000.00 | |
| UTILITY RELOCATIONS | ADJUSTING WATER SERVICE LINE | FOOT | $75.00 | 405 | $30,375.00 | $77,375.00 | 0 | $0.00 | $0.00 |
| | ADJUSTING SANITARY SERVICE LINE | FOOT | $50.00 | 765 | $38,250.00 | | 0 | $0.00 | |
| | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | $175.00 | 50 | $8,750.00 | | 0 | $0.00 | |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | $15,000.00 | 1 | $15,000.00 | $60,000.00 | 1 | $50,000.00 | $200,000.00 |
| | MOBILIZATION | L. SUM | $30,000.00 | 1 | $30,000.00 | | 1 | $100,000.00 | |
| | TRAFFIC CONTROL | L. SUM | $15,000.00 | 1 | $15,000.00 | | 1 | $50,000.00 | |
| | | | | SUBTOTAL = | $461,929.00 | | | $1,432,524.00 | |
| | | | | CONTINGENCY (30%) = | $138,578.70 | | | $429,757.20 | |
| | | | | **CONSTRUCTION TOTAL =** | **$600,507.70** | | | **$1,862,281.20** | |
| | | | | DESIGN ENGINEERING (7.5%) = | $45,038.08 | | | $139,671.09 | |
| | | | | CONSTRUCTION ENGINEERING (7.5%) = | $45,038.08 | | | $139,671.09 | |
| | | | | PERMITTING (2.5%) = | $15,012.69 | | | $46,557.03 | |
| | | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$705,596.55** | | | **$2,188,180.41** | |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 10

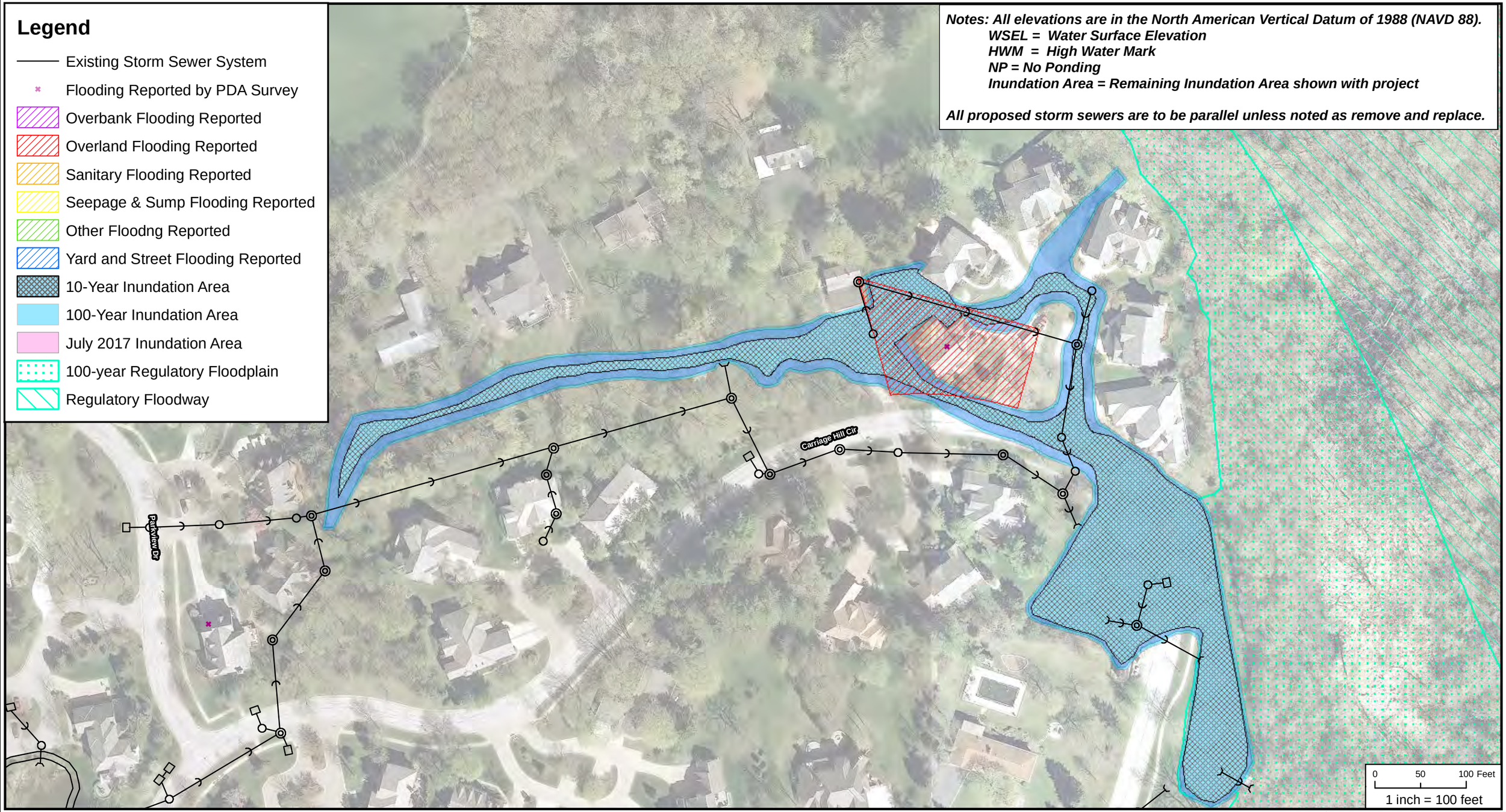
# CARRIAGE HILL: EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

## Legend

- Existing Storm Sewer System
- Flooding Reported by PDA Survey
- Overbank Flooding Reported
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Other Floodng Reported
- Yard and Street Flooding Reported
- 10-Year Inundation Area
- 100-Year Inundation Area
- July 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


| | |
|---|---|
| CLIENT | Village of Libertyville |
| PROJECT NO. | 170001 |
| TITLE | Carraige Hill<br>Existing Conditions Inundation Map |
| DATE | 7/13/18 |
| | EXHIBIT 31 |

***Notes: All elevations are in the North American Vertical Datum of 1988 (NAVD 88).***
***WSEL = Water Surface Elevation***
***HWM = High Water Mark***
***NP = No Ponding***
***Inundation Area = Remaining Inundation Area shown with project***

***All proposed storm sewers are to be parallel unless noted as remove and replace.***

High capacity inlet structure

Carriage Hill Cir

36"

36"

36"

36"

36"

Settling Basin

## Legend

- Proposed Structure
- Proposed Storm Sewer
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)
- 100-Year Inundation Area
- 2017 Inundation Area
- 100-year Regulatory Floodplain
- Regulatory Floodway

0 25 50 Feet
1 inch = 50 feet

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

| | |
|---|---|
| CLIENT | Village of Libertyville |
| PROJECT NO. | 170001 |
| TITLE | Carraige Hill<br>Proposed Drainage Improvements |
| DATE | 04/13/18 |
| | EXHIBIT 32 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: June 25, 2018

Village of Libertyville, Area Carriage Hill
Proposed Drainage Improvements

| | ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST | SUBTOTALS |
|---|---|---|---|---|---|---|
| GRADING | TOPSOIL, FURNISH AND PLACE, 6" | SQ YD | 89 | $5.00 | $445.00 | $11,112.50 |
| | SEEDING | SQ YD | 89 | $5.00 | $445.00 | |
| | EROSION CONTROL BLANKET | SQ YD | 89 | $2.50 | $222.50 | |
| | STILLING BASIN | L. SUM | 1 | $10,000.00 | $10,000.00 | |
| STORM SEWER | TRENCH BACKFILL, SPECIAL | CU YD | 1,701 | $45.00 | $76,545.00 | $357,445.00 |
| | STORM SEWER, RCP 12" (LATERALS) | FOOT | 100 | $70.00 | $7,000.00 | |
| | STORM SEWER, RCP 36" | FOOT | 1,308 | $175.00 | $228,900.00 | |
| | INLETS, TYPE A, HIGH CAPACITY FRAME AND GRATE | EACH | 4 | $1,750.00 | $7,000.00 | |
| | MANHOLES, 5' DIAMETER | EACH | 2 | $5,000.00 | $10,000.00 | |
| | MANHOLES, 5' DIAMETER, HIGH CAPACITY FRAME AND GRATE | EACH | 1 | $5,500.00 | $5,500.00 | |
| | MANHOLES, 6' DIAMETER | EACH | 1 | $7,000.00 | $7,000.00 | |
| | MANHOLES, 7' DIAMETER | EACH | 1 | $12,000.00 | $12,000.00 | |
| | 36" FLARED END SECTION W/ GRATE | EACH | 1 | $2,500.00 | $2,500.00 | |
| | RIPRAP WITH FILTER FABRIC | SQ YD | 10 | $100.00 | $1,000.00 | |
| PAVEMENT | HOT-MIX ASPHALT SURFACE REMOVAL | SQ YD | 3,245 | $5.00 | $16,225.00 | $132,793.00 |
| | HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50 | TON | 274 | $90.00 | $24,660.00 | |
| | HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50 | TON | 0 | $80.00 | $0.00 | |
| | HOT-MIX ASPHALT LEVELING BINDER (MACHINE METHOD), N50 | TON | 137 | $85.00 | $11,645.00 | |
| | PREPARATION OF BASE | SQ YD | 3,245 | $1.00 | $3,245.00 | |
| | AGGREGATE BASE REPAIR | TON | 171 | $25.00 | $4,275.00 | |
| | BITUMINOUS MATERIALS (PRIME COAT) | POUND | 663 | $1.00 | $663.00 | |
| | CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 200 | $30.00 | $6,000.00 | |
| | CONCRETE SIDEWALK REMOVAL AND REPLACEMENT | SQ FT | 400 | $10.00 | $4,000.00 | |
| | DETECTABLE WARNINGS | SQ FT | 80 | $40.00 | $3,200.00 | |
| | CLASS D PATCHES, 6 INCH | SQ YD | 736 | $80.00 | $58,880.00 | |
| U.R. | WATER MAIN ADJUSTMENT FOR PERPENDICULAR CROSSINGS | FOOT | 100 | $175.00 | $17,500.00 | $17,500.00 |
| MISC. | CONSTRUCTION LAYOUT | L. SUM | 1 | $20,000.00 | $20,000.00 | $80,000.00 |
| | MOBILIZATION | L. SUM | 1 | $40,000.00 | $40,000.00 | |
| | TRAFFIC CONTROL | L. SUM | 1 | $20,000.00 | $20,000.00 | |

| | |
|---|---|
| SUBTOTAL = | $598,850.50 |
| CONTINGENCY (30%) = | $179,655.15 |
| **CONSTRUCTION TOTAL =** | **$778,505.65** |
| DESIGN ENGINEERING (7.5%) = | $58,387.92 |
| CONSTRUCTION ENGINEERING (7.5%) = | $58,387.92 |
| PERMITTING (2.5%) = | $19,462.64 |
| **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$914,744.14** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 11

# HARDING AND WILLOW: EXHIBITS AND ENGINEER'S ESTIMATE OF PROBABLE COSTS

## Legend

- Flooding Reported by PDA Survey
- Overland Flooding Reported
- Sanitary Flooding Reported
- Seepage & Sump Flooding Reported
- Yard & Street Flooding Reported
- Existing Storm Sewer (Approximate Location)
- Existing Sanitary Sewer (Approximate Location)
- Water Main (Approximate Location)

Flood proof 4 structures

Existing Overland Flow Route

Reconstruct 40 feet of curb along Willow Avenue
to direct overland flow east toward Butterfield Road system



0 50 100 Feet
1 inch = 100 feet

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| DSGN. | DRB | CHKD. | DTO |
|---|---|---|---|


Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520


| | | | |
|---|---|---|---|
| CLIENT | Village of Libertyville | PROJECT NO. | 170001 |
| TITLE | Harding and Willow<br>Proposed Drainage Improvements | DATE | 07/13/18 |
| | | | EXHIBIT 33 |

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
Project Number: 17-0001
Date: JuLy 16, 2018

Village of Libertyville, Area Harding & Willow
PROPOSED DRAINAGE IMPROVEMENTS

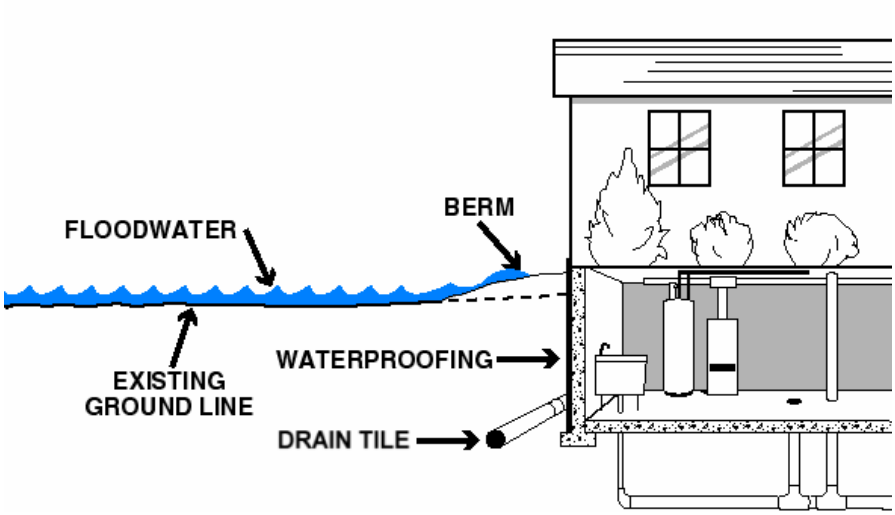
| ITEMS | UNIT | QUANTITY | UNIT PRICE | TOTAL COST |
|---|---|---|---|---|
| CONCRETE CURB REMOVAL AND REPLACEMENT | FOOT | 40 | $50.00 | $2,000.00 |
| DRIVEWAY REMOVAL AND REPLACEMENT | SQ YD | 20 | $50.00 | $1,000.00 |
| CLASS D PATCHES, 6 INCH | SQ YD | 10 | $80.00 | $800.00 |
| CONSTRUCTION LAYOUT | L. SUM | 1 | $1,000.00 | $1,000.00 |
| MOBILIZATION | L. SUM | 1 | $2,000.00 | $2,000.00 |
| TRAFFIC CONTROL | L. SUM | 1 | $1,000.00 | $1,000.00 |
| | | | SUBTOTAL = | $7,800.00 |
| | | | CONTINGENCY (30%) = | $2,340.00 |
| | | | **CONSTRUCTION TOTAL =** | **$10,140.00** |
| | | | DESIGN ENGINEERING = | $2,500.00 |
| | | | CONSTRUCTION ENGINEERING = | $2,500.00 |
| | | | **TOTAL PROJECT COST INCLUDING ENGINEERING =** | **$15,140.00** |

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW OR PROPERTY ACQUISTION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING PRIVATE UTILITIES.
2. THIS ESTIMATE ASSUMES 2018 CONSTRUCTION DOLLARS.
3. THIS ESTIMATES ASSUMES ALL MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.

# APPENDIX 12

# ILLINOIS ASSOCIATION FOR FLOODPLAIN AND STORMWATER MANAGEMENT – GUIDE TO FLOOD PROTECTION IN NORTHEASTERN ILLINOIS

# Guide To
# Flood Protection
# In Northeastern Illinois




March 2006

The Illinois Association for
Floodplain and
Stormwater Management

# Important Numbers

Police and fire emergencies: **911** Gas hazards: 1-888/642-6748 (1-888/NICOR4U)

Ambulance: **911** Electrical hazards: 1-800/334-7661 (1-800/EDISON-1)

Family meeting place after a flood: _____

Insurance agent: _____

Homeowner's insurance: Company: _____ Policy No. _____

Flood insurance: Company: _____ Policy No. _____

Neighbors: _____

_____

# How to use this Guide

**What's your situation now?**

- ✓ Has a **flood watch or warning** just been issued or do you see flooding start? If so, go to Section 5, "During a Flood" on page 17. Later on, read section 6 on "After A Flood" to prepare for when you go back to your flooded property.

- ✓ Have you **just been flooded?** If so, start with section 6 "After A Flood" on page 20. Then look through the rest of this *Guide*.

- ✓ If you're not in a rush and want to know **how to protect yourself from the next flood**, start on page 2.

If you would like more information on flood protection, visit the following websites:

- www.floods.org
- www.IllinoisFloods.org
- www.louisianafloods.org (although in Louisiana, it has many useful links)

# Contents




This guide was prepared with funding support from the Kane County Division of Environmental Management and the Illinois Emergency Management Agency and is being distributed by the Illinois Association for Floodplain and Stormwater Management.


## Disclaimer

This guide is designed to give the reader an overview of steps that can be taken to protect a property from damage from the type of surface water flooding and sewer backup that faces most of northeastern Illinois. The information provided is based on careful research and input from experienced professionals.

The reader must assume responsibility for adapting this information to fit his or her conditions. This guide is not intended to replace the advice and guidance of an experienced professional who is able to examine a building and assess the needs of the particular situation.

## 1. Flooding in Northeastern Illinois

Illinois can flood in any season. Floods have been caused by localized storms, rain over several days on saturated ground, snow melt, and ice jams. Over the last two decades, a significant flood has occurred somewhere in the state each year. Many of them received a state or federal disaster declaration.

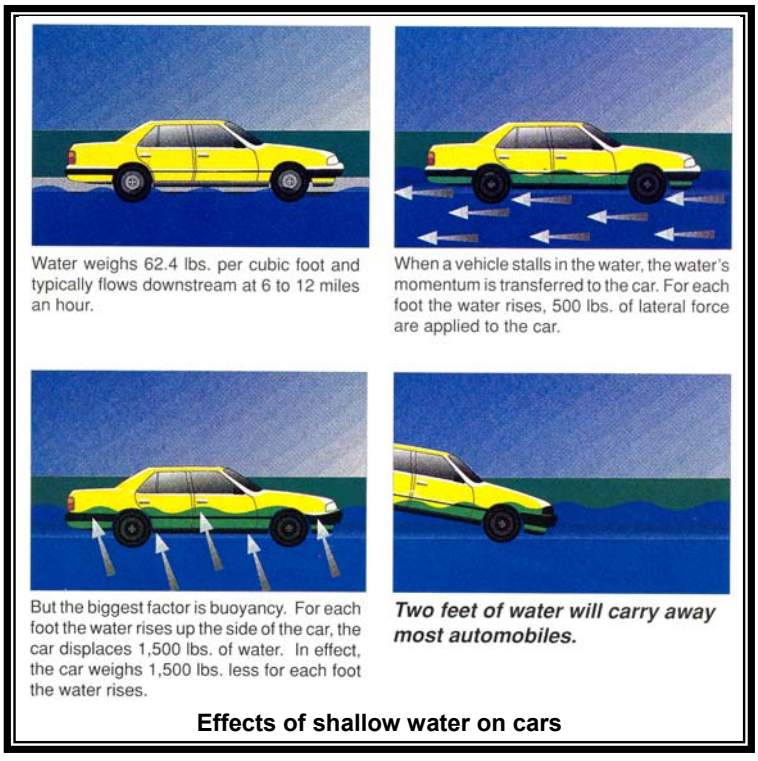
**Overbank flooding:** The most common and most damaging floods occur along the state's rivers and streams and this is called overbank flooding. Most floods are caused by too much precipitation in the watershed. Larger rivers respond more slowly to rain and runoff than do the smaller streams. But when floods do occur on the large rivers, they can last for days or weeks.

In urban areas, flash flooding can occur where impervious surfaces, gutters and storm sewers increase rain and snowmelt runoff to the receiving stream. Flash floods also can be caused by dam failure, the release of ice-jam flooding, or the collapse of a debris dam.

**Drainage problems:** Flooding can also occur in streets when rainwater can't flow into a storm sewer. Basements can flood when rainwater can't flow away from the house or when the sewers back up. These problems are usually caused by heavy local rains and are often not related to overbank flooding or floodplain locations.

**Sewer backup:** Sanitary sewers should not be affected by stormwater because they are separate from the storm sewers. However, there can be cross connections and leaks in sewer pipes that receive inflows and infiltration which can overload a sanitary line during wet weather. With no place to go, sewers back up and flow into the lowest opening in the sewer line. Sanitary sewers back up into basements and storm sewers back up into streets.

**Impact of flooding:** Most flooding in northeastern Illinois is slow moving and shallow. However, this does not mean that floodwaters are safe. A car will float in less than 2 feet of moving water and can be swept downstream into deeper waters (see graphic). This is one reason floods kill more people trapped in vehicles than anywhere else.



**Effects of shallow water on cars**

People die of heart attacks, especially from exertion during a flood fight. Electrocution is a cause of flood deaths, claiming lives in flooded areas that carry a live current created when electrical components short out. Floods also can damage gas lines, floors, and stairs, creating secondary hazards such as gas leaks, unsafe structures, and fires.

**Health:** Floodwaters carry whatever was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept can contribute polluted waters to the receiving streams. Overloaded sewer lines back up into low lying areas and some homes. Even though diluted by flood waters, raw sewage can be a breeding ground for bacteria, such as e coli, and other disease causing agents.

Another type of health problem comes after the water is gone. Stagnant pools become breeding grounds for mosquitoes, and wet areas of a building that have not been cleaned breed mold and mildew. A building that is not thoroughly and properly cleaned becomes a health hazard, especially for small children and the elderly. Another health hazard occurs when heating ducts in a forced-air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants.

**Post-flood silt, mold and mildew**

**Buildings:** Due to the relatively low velocities and shallow flood depths in the area, the most common type of building damage inflicted by a flood is caused by soaking. When soaked, many materials change their composition or shape. Wet wood will swell and, if dried too quickly, will crack, split or warp. Plywood can come apart. Gypsum wallboard will fall apart if it is bumped before drying out. The longer these materials are wet, the more moisture, sediment and pollutants they will absorb.

**Effects of soaking on walls and floors**

Soaking can cause extensive damage to household goods. Wooden furniture may become so badly warped that it cannot be used. Other furnishings such as upholstery, carpeting, mattresses, and books usually are not worth drying out and restoring. Electrical appliances and gasoline engines will not work safely until they are professionally dried and cleaned.

In short, while a building may look sound and unharmed after a flood, the waters can cause a lot of damage. As shown in the above photo, to properly clean a flooded building, the walls and floors should be stripped, cleaned, and allowed to dry before being recovered. This can take weeks and is expensive. It is better to be prepared and prevent flood damage.

## 2. Flood Protection Checklist

1. Check with your local building, planning or engineering department on flooding in your area.

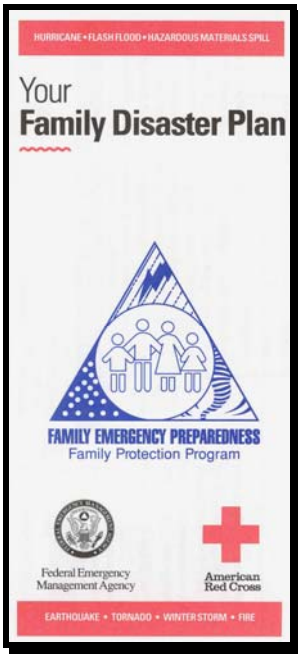
   - ✓ Where does the water come from?
   - ✓ Are you in the mapped Special Flood Hazard Area or floodway?
   - ✓ How bad has it been in the past?
   - ✓ How bad could it be? (Remember, the next flood can be worse than the last one.)
   - ✓ What is an appropriate flood protection level? (How high should you prepare for?)

2. Check out your local drainage situation.

   - ✓ Does water flow away from your house or does it tend to stand next to your walls?
   - ✓ Is the ditch, stream or storm sewer that takes water away clear of debris or obstructions?
   - ✓ Do the downspouts from your roof gutters direct water well away from your house?
   - ✓ Do you have a sump pump? If so, does it direct water well away from your house?
   - ✓ If you are in a city or village, ask your local public works office if your area is served by a combined or separate sewer system.

3. Prepare for flooding by doing the following:

   - ✓ Know the flood safety guidance on the back of this guide.
   - ✓ Mark your fuse or breaker box to show the circuits to the floodable areas.
   - ✓ Know how to shut off the electricity and gas to your house when a flood comes.
   - ✓ Make a list of emergency numbers and identify a safe place to go to (see inside cover).
   - ✓ Make a household inventory, especially of basement contents.
   - ✓ Put insurance policies, valuable papers, medicine, etc., in a safe place.
   - ✓ Develop a disaster response plan – get a copy of the brochure "Your Family Disaster Plan" from your local Red Cross chapter or check the Red Cross' website for ideas: www.redcross.org/services/disaster/beprepared/familyplan.html
   - ✓ Put cleaning supplies, batteries, camera, waterproof boots, etc. in a safe place.




4. Read the next section on construction and stream dumping regulations. Follow these rules, get permits for all your work, and report violations to your building department.

5. Construct or install appropriate flood protection measures (see section 4 − Protecting Your Property, page 6).

6. Purchase flood insurance coverage (see page 16).

## 3. Flood Protection Laws

Development in floodprone areas is development in harm's way. New construction in the floodplain increases the amount of development exposed to damage and can aggravate flooding on neighboring properties.

Development outside a floodplain can also contribute to flooding problems. Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the drainage system, cause erosion, and impair water quality. Accordingly, most communities have enacted several ordinances to protect people from activities that may cause flooding or drainage problems.

- ✓ **Before you build on, fill, alter, or regrade** your property, always check with your building department. A permit is probably needed to ensure that such projects do not cause problems on other properties.
- ✓ **Do not dump or throw anything into the storm sewers, inlets, ditches or basins**. Dumping in ditches, storage basins, and wetlands is a violation of local codes.
- ✓ **Every piece of trash** can contribute to flooding. Even leaves, grass clippings and branches can accumulate, plug storm drain inlets and channels, or kill vegetation and contribute to erosion. If your property is next to a ditch or storage basin, do your part and keep the banks clear of brush and debris.
- ✓ **If you see dumping or debris** in the ditches or basins, filling or construction near property lot lines, or filling or construction in a mapped floodplain without a permit sign posted, contact your building department. The debris or project may cause flooding on your property.

New buildings in the floodplain must be protected from flood damage. Local laws require that the lowest floor (including basement) of new residential buildings must be elevated above the base (or 100-year) flood level. There are additional local and state restrictions on filling, grading or building in a mapped floodway.

Local codes also require that substantial improvements to a building be treated as a new building. A substantial improvement is when the value of an addition, alteration, repair or reconstruction project equals or exceeds 50% of the value of the existing building. In the case of an addition, only the addition must be protected. In the case of an improvement to the original building, the entire building must be protected.

For example, if a house in the floodplain is flooded, has a fire, is hit by a tornado, or is otherwise damaged so that the value of the repairs equals or exceeds 50% of the value of the building before the damage, then the house must be elevated above the base flood level. In some communities, improvements are cumulated, so small projects add up to 50% over time.

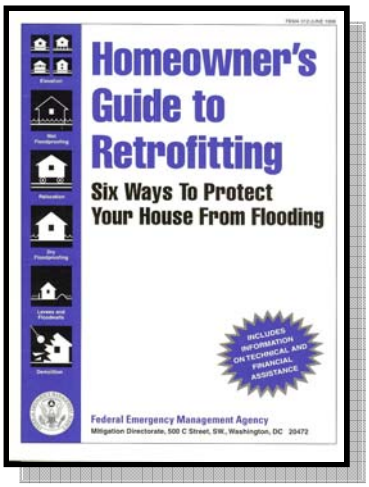
*These regulations are designed to protect you and your neighbors.*
*By keeping the drainage system clear and getting the proper permits before you build,*
*you can help prevent flooding and other drainage problems.*

## 4. Before the Flood - Protecting Your Property

Because most flooding is shallow and slow moving, there are many ways you can protect your home, garage or other property from flood damage. Different techniques are appropriate for different types of buildings. Use the following as a guideline:

- ✓ If your house is on a ***crawlspace*** → Read the sections on elevation, barriers, and wet floodproofing (pages 6, 7 and 9)
- ✓ If your house is on a ***slab*** foundation → Read the sections on barriers and dry flood proofing (pages 7 and 8)
- ✓ If you have a ***basement***, split level, or other floor below ground level → Read the sections on barriers, wet floodproofing, and basement protection (pages 7, 9 and 10 − 14)

Additional information on flood protection is available from FEMA publications, including *Homeowner's Guide to Retrofitting: Six Ways to protect Your House from Flooding*. This publication can be viewed on FEMA's website: www.fema.gov/hazards/floods/lib312.shtm. Another good publication is FEMA's *Protecting Building Utilities From Flood Damage,* which is at www.fema.gov/hazards/floods/pbuffd.shtm




It is important to note that these protection measures are for existing buildings. There are different requirements for new buildings. These measures will not relieve you from the need to buy flood insurance if your building is in a mapped floodplain.

### Elevation

Short of removing it from the floodplain, the best way to protect a house from surface flooding is to raise it above the flood level. The area below the flood level is left open to allow floodwaters to flow under the building, causing little or no damage. Elevation is required by law whenever a new house is constructed in the floodplain.

Elevation is usually most cost-effective for buildings on crawlspaces because it is easiest to get lifting equipment under the floor and disruption of the habitable part of the house is minimal. Because northeastern Illinois flood-waters are usually not very deep, the appear-ance of the elevated house is similar to that of a house on a two- or three-foot crawlspace. If the house is raised two feet, the front door would be three steps higher than before.

**This house was elevated one foot above the 100-year flood level on the Des Plaines River**

## Barriers

Barriers keep surface floodwaters from reaching a building. A barrier can be built of dirt or soil ("berm") or concrete or steel ("floodwall"). The standard design for earthen berms is three horizontal feet for each vertical foot (3:  1 slope). As a result, you should plan on needing an area six feet wide (at a minimum) for each foot in height.

**This berm protects the home from flooding from the stream to the left.**

**This home has a floodwall to protect it from low level flooding.**

Depending on how porous your ground is, if floodwaters will stay up for more than an hour or two, your barrier will need to handle leaks, seepage of water underneath, and rainwater that falls inside the perimeter. You will need a sump and/or drain to collect the internal groundwater and surface water. A pump and pipe is also needed to pump the internal drainage over the barrier.

A berm or floodwall should be as far from the building as possible to reduce the threat of seepage and hydrostatic pressure. However, it must not interfere with drainage along your property line. Where the house is close to the property line, you may need place the berm next to the wall as discussed on page 14.

**Don't forget:  a permit is needed for filling or regrading a yard.** There may be restrictions on bringing fill onto your site if it blocks the flow of flooding or displaces floodwater storage areas. For example, state regulations require that barriers located within the regulatory floodway be within ten feet of the structure (as in the example on the right, above).

**Precautions:**  Barriers can only be built so high. They can be overtopped by a flood higher than expected. Earthen berms are susceptible to erosion from rain and floodwaters if they are not properly sloped and covered with grass and maintained. Don't plant trees or shrubs on a berm (their roots can cause leaks). Barriers can settle over time, lowering their protection levels.

Some barriers have openings for driveways and sidewalks (as in the example on the right, above). Closing these openings is dependent on someone being available and strong enough to put the closure in place. You also need to account for water in the sewer lines that may back up under the barrier and flood inside your house (see the sewer backup section on page 12).

## Dry Floodproofing

This term covers several techniques for sealing up a building to ensure that floodwaters cannot get inside it. For dry floodproofing, all areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings (doors, windows, and vents) are closed, either permanently, with removable shields, or with sandbags. Many dry floodproofed buildings do not look any different from those that have not been modified.

Dry floodproofing is only appropriate for buildings on concrete slab floors (without basements) and with no cracks. To ensure that the slab is watertight and sound, an engineering analysis is recommended.

The maximum flood protection level is two feet above the slab (see below, left). The walls and slab floor were not built to withstand the type of pressures exerted by deeper water. It is smarter to let deep water into your house than to risk losing your walls or floor (see below, right).

**These walls were sealed with plastic sheeting covered by brick facing for projection from sunlight and punctures.**

**Dry floodproofing is not recommended for keeping surface water out of a basement. The water pressure can break the walls and floor.**

**Precautions:** It is very tempting for the owner of a dry floodproofed building to try to keep the flood out if floodwaters get deeper than two or three feet. This can result in collapsed walls, buckled floors, and danger to the occupants.

It is difficult to waterproof a crawl space to protect it from underseepage. Basements should not be dry floodproofed to protect them from surface flooding because of the water pressure on the walls and floors. See page 14 on the basement protection berm for an alternative approach.

Many commercial waterproofing compounds are made to protect wood from rain, but they will not withstand the pressures of standing water. Some deteriorate over time, so check with the supplier to be sure the waterproofing compound is appropriate for sealing your basement walls from water. Installing closures and seals over doors and windows requires enough warning and having someone at the building who knows what to do.

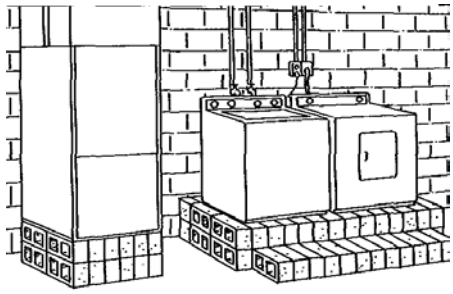
## Wet Floodproofing

Wet floodproofing means letting the water in and removing everything that could be damaged by a flood. There are several ways to modify a building so that floodwaters are allowed inside, but minimal damage is done to the building and its contents. These techniques range from moving a few valuable items to rebuilding the floodprone area.

In the latter case, structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater, and laundry facilities are permanently relocated to a higher floor. Another approach is to raise these items on blocks or platforms where the flooding is not deep (see photo).

**This wet floodproofed garage has bare concrete, unfinished drywall (for fire protection), and an elevated water heater.**

Wet floodproofing is not feasible for one-story houses because the flooded areas are the living areas. However, many people wet floodproof their basements, garages, and accessory buildings simply by relocating all hard-to-move valuables, such as heavy furniture and electrical outlets. Light or moveable items, like lawn furniture and bicycles, can be moved if there is enough warning. Fuse and electric breaker boxes should be located so you can safely turn the power off to the circuits serving floodprone areas.



**Even a minor wet floodproofing project will reduce flood losses to a home.**

Another approach is to wet floodproof a crawlspace. If your crawlspace has a furnace in it or is used for storage, these items could be moved to the first or second floor. Vents should be placed on the foundation walls to ensure that floodwaters can get into the crawlspace to equalize water pressure.

Wet floodproofing has one advantage over the other approaches: no matter how little you do, you will reduce your potential for damage. Thousands of dollars in damage can be prevented by simply moving furniture and electrical appliances out of a basement.

**Precautions:** Moving contents is dependent on adequate warning and the presence of someone who knows what to do. Flooding a basement or garage where there is electricity, paint, gasoline, pesticides, or other hazardous materials creates a safety hazard. There will still be a need for cleanup, with its accompanying health problems. **Moving water lines, furnaces, or electric service boxes requires a permit from your building department.**

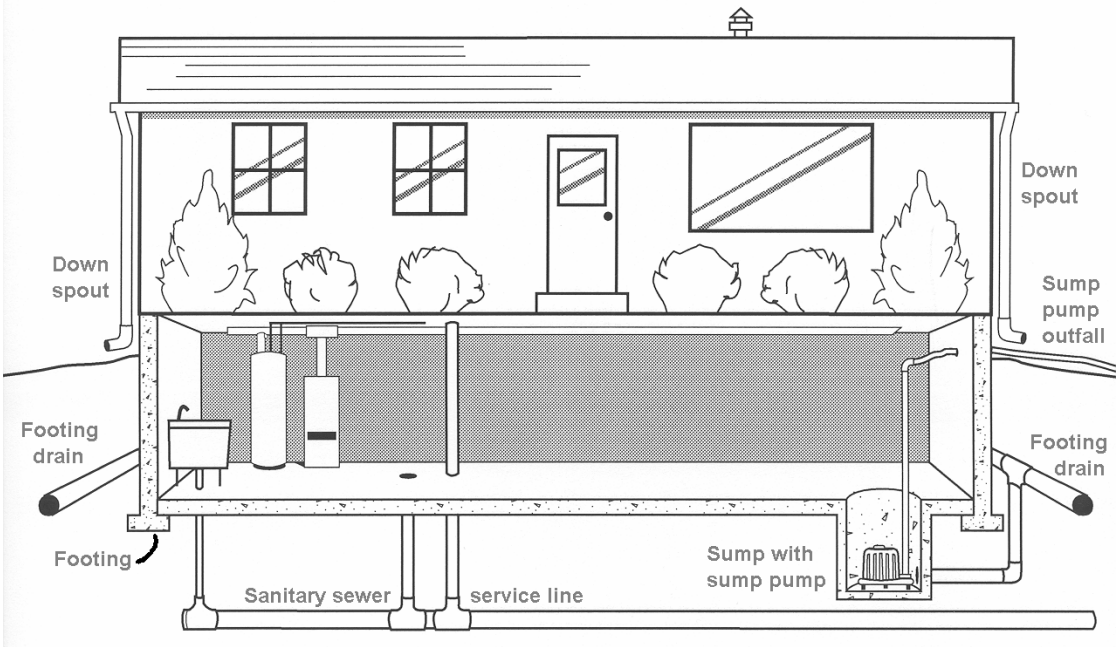
## Basement Problems: Sump Flooding

Basement flooding caused by saturated ground can be corrected by installing a footing drain around the foundation (see illustration below). The drain collects groundwater and directs it to a sump. When the sump fills, water is pumped out, usually onto the ground away from the building. Depending on local conditions, the drain and pumping system may have to handle large volumes of water.

If the pump gets overloaded, or if there is a loss of power, the system designed to keep groundwater out of your basement can act as a conduit to bring water in. You can prevent sump flooding by doing one or more of these floodproofing projects:

- ✓ Install a larger sump pump,
- ✓ Add a second battery backup sump pump,
- ✓ Be certain that downspouts are not connected to the footing drain,
- ✓ Make sure the downspouts drain away from the house,
- ✓ Redirect the downspouts and sump pump outfall farther away from the house, and/or
- ✓ Run the sump pump outfall above ground level or use a check valve to prevent back flow.

**Precautions:** When there is water in your basement, it is hard to tell how it got in. It's a good idea to check for cracks in the walls and install sewer backup protection, too. Using a battery backup sump pump is the safest alternative, plus you do not have to be home to start it. If your existing backup sump pump uses a generator for a power source, be sure the generator is set up outside (where it won't flood) or vented to the outside to direct deadly carbon monoxide exhaust fumes outdoors.




**Typical basement drain and sewer arrangement**

Note: Your floor drain may or may not be connected to the sanitary sewer line

## Basement Problems: Cracks

Groundwater can seep into your basement around pipes or through cracks in the walls or floor. This may be difficult to determine if the walls have been covered with paneling or other finishing. The best way to deal with a groundwater problem is to waterproof the walls and relieve the water pressure through a footing drain system and sump (see previous page). Footing drains are typically installed around the perimeter of the house, along the foundation. If this is not possible, drains can be installed on the interior of the basement, along the basement walls, and directed toward the sump pump pit.

Cracks can be repaired and the walls can be waterproofed from inside or outside. Waterproofing on the outside is more effective because groundwater pressure forces the sealer into the foundation. The best technique is to dig a ditch around the basement wall so that you can apply an epoxy sealant to the exterior walls. This can be done by the handyperson (many home maintenance manuals have instructions for this) or a commercial waterproofing company.

**Precautions:** Waterproofing alone is only recommended for groundwater problems. Surface water will put much more pressure on the building's walls and can even break them. If the building is affected by surface flooding, you should also install a barrier (see pages 7 and 14).

## Basement Problems: Sewer Backup

The illustration on the previous page shows the sewer arrangements for a typical house with a basement. The sanitary sewer line drains toilet waste, laundry tubs, and (sometimes) the basement floor drain to the sanitary sewer main in the street. Clean stormwater and groundwater is handled by downspouts, footing drains, and sump pumps.

Often basement flooding is caused by these two sewer systems being interconnected. Some houses have the downspouts, footing drain, and/or the sump pump connected to the sanitary sewer service. During a heavy rain, stormwater enters the sanitary sewers, causing backups into one house and overloading the main lines, contributing to backups in other houses.

Sewer backups can also be caused by events not related to storms or flooding. Individual service lines can be plugged by grease, waste, tree roots, breaks in the pipe, or saturated ground. Proper maintenance, like pouring tree root killer down the toilet or floor drain can prevent most of these problems.

**Don't cause your own flood! Keep your sewer lines clear**

- ✓ Keep roots from trees and shrubs out with root killer.
- ✓ Make sure your yard clean-out vent will keep debris out.
- ✓ Don't pour dangerous liquids down the drain (motor oil, paint, pesticides, poisons, epoxies, etc.).
- ✓ Don't pour grease, fat or cooking oil down the drain (they solidify later).
- ✓ Don't flush large solids, such as diapers, down the toilet.

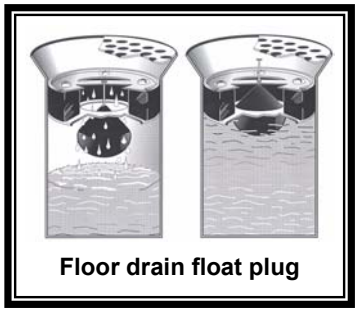
The sewer mains can also be plugged by the same causes, or by vandalism or illegal dumping in manholes. These problems can be fixed by the owner or your municipality, depending on where the stoppage occurs.

## Sanitary Sewer Backup Protection

The next three sections of this *Guide* focus on protection measures that deal with sanitary sewer backup that occurs when the sewer main is overloaded and backs up through the sanitary service line into the house. There are four ways to stop sewer backup: floor drain plug, floor drain standpipe, overhead sewer, and backup valve. Each of these measures work for buildings with basements or below-grade floors.

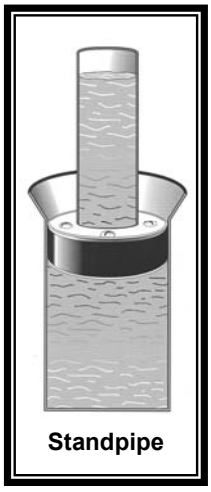
**Floor Drain Backup Prevention:** The simplest way to stop sewer backup is to plug the opening where it first occurs. This is at the floor drain, the sanitary sewer system's lowest opening in the house. Two inexpensive measures can be used: a plug or a standpipe. Both can be purchased at local hardware stores and are easy for the handyperson to install.

**Plug:** The flood drain plug stops water from flowing in either direction. Therefore, if the laundry tub overflows or other spillage occurs, it will stay in the basement unless the plug is removed. Because of this, it may be best to leave the plug out under normal circumstances and put it in place only during heavy rains.


Floor drain float plug

One variation is a plug with a float. It allows water to drain out of the basement (see illustration, left side). When the sewer backs up, the float rises and plugs the drain (see illustration, right side). A float plug permanently installed will not interfere with the floor drain's normal operation.

If the plug is not tight enough, pressure can eject it. Therefore, a plug is not recommended for flood depths greater than one foot.


Standpipe

**Standpipe:** A standpipe is an inexpensive alternative to a floor drain plug. When the sewer backs up, the water moves up the pipe. If properly installed, water pressure cannot build up to blow a standpipe out of the floor drain. The system works unless the backup is so deep that it goes over the top of the pipe.

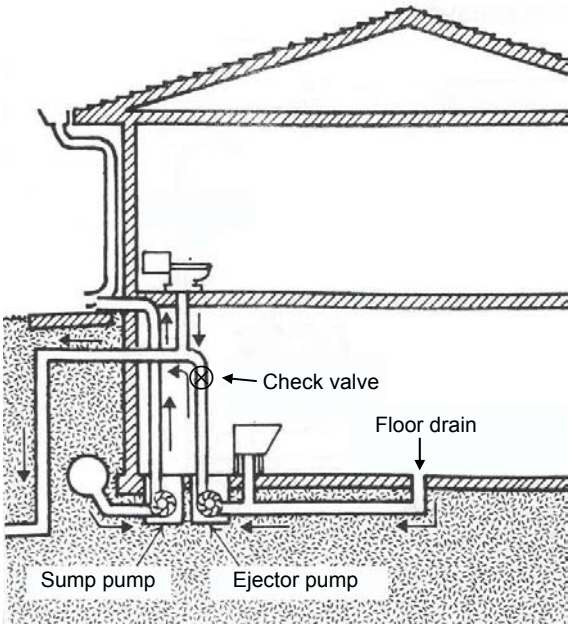
**Precautions:** A plug left in the floor drain may contribute to a wet basement if water from a laundry tub spill or a leaky pipe cannot drain out. Float plugs are known to have been jammed open by a small amount of debris. A plug does not tell you if there is a problem in your sewer service line.

Neither the plug or standpipe stops backup from coming out of the next lower opening, like a laundry tub or basement toilet. Sealing the base of the toilet to the floor will protect you until the water backs up higher than the top of the bowl.

Because water pressure depends on the height of water in the pipes, a standpipe does not reduce the pressure in the pipes (or under the floor, if the pipes leak). Because the pressure under the floor is the same with a standpipe or a plug, standpipes and plugs are only recommended for flood depths of one foot or less and for buildings with cast iron sewer lines underneath the floor.

**Overhead Sewer:** An overhead sewer is generally viewed as the most effective sewer backup protection measure. It acts like a standpipe but without the shortcomings. A sump is installed under the basement floor to intercept sewage flowing from basement fixtures and the basement floor drain. An ejector pump in the sump pushes sewage up above the flood level. From there it can drain by gravity into the sewer service line. Plumbing fixtures on the first floor continue to drain by gravity to the service line.

Unless the house is subject to overbank flooding, it is unlikely that the sewers will back up above ground level. If water does go higher, a check valve in the pipe from the ejector pump keeps it in the pipes. Backed up sewage is enclosed in the sewer pipes and doesn't overflow laundry tubs or basement toilets.



**Overhead sewer arrangement**

Although more dependable than a standpipe, an overhead sewer is more expensive. A plumbing contractor must reconstruct the pipes in the basement and install the ejector pump. It can cost $3,000 – $7,000.

**Precautions:** The ejector pump requires electricity to work, so battery backups are recommended. The basement is disrupted during construction and the ejector pump needs periodic maintenance. **This work requires a licensed plumber and a permit from your building department.**

**Sewer Backup Valve:** A backup valve stops the water in the sewer pipes. While not as foolproof as an overhead sewer, their installations are less disruptive of the basement.

Older versions of this approach were located in the basement floor and relied on gravity to close the valve. If debris got caught in the flapper, the valve did not close tight. Because of its unreliability, valves were discouraged and even prohibited in some communities. Today's systems are more secure. They include installing two valves in line, using better, more watertight materials, or counterweights that keep the valve open all the time so debris won't catch and clog it.

Larger valve systems are usually installed in a manhole in the yard, well away from the basement wall, so there is less disruption during construction and no concerns over breaking the pipes under the basement floor. The cost of this type of backup valve is comparable to the cost of an overhead sewer, in the $4,000 – $6,000 range.

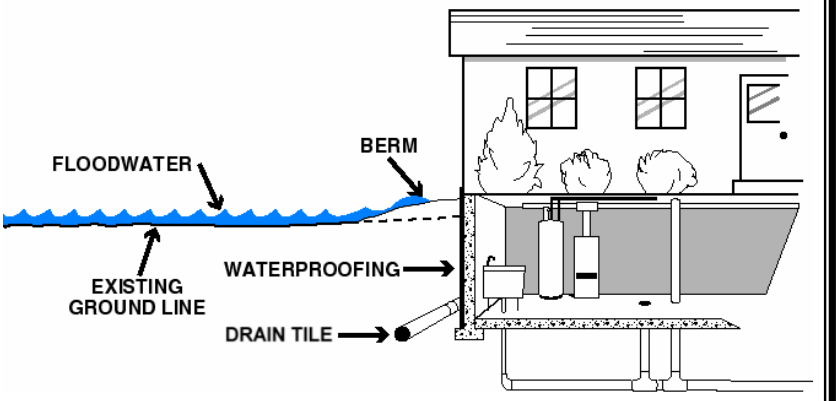
**Precautions:** The ejector pump and the valve require maintenance. **This work requires a licensed plumber and a permit from your building department.**

## Basement Protection Berm

Basements and the lower floors of split levels can be protected from surface water by construction of low walls around stairwells or using backfill. Waterproofed walls, sewer backup protection, drain tile and a sump pump are a must. The drains and pumps can keep up with the seepage before it gets through the berm and reaches your house.

Walls are built up around the window wells and basement stairwells (don't block basement windows that are needed for emergency exits). An earthen berm can be filled against the waterproofed side of the house.

A subsurface drain and one or two correctly sized sump pumps are a must. The drains and pumps can keep up with the seepage before it gets through the berm and reaches your house.



Basement protection berm

The objective is to not let floodwaters touch the house. If water on the surface of the ground gets up against the house, it probably will seep down the gap between the basement walls and the surrounding soil. This will greatly increase the amount of water pressure against the basement walls.

Sump pumps cannot keep up with surface water. If you have sandy or permeable soil, you should consult an engineer or soils expert to ensure that the berm will extend far enough away from the walls. **Don't forget: filling or grading in your yard requires a permit.**


This house is protected by a raised stairwell and a berm covered with gravel.

**Precautions:** The berm can only be built so high. It can be overtopped by a flood higher than expected. Being made of earth, it is susceptible to erosion from rain and floodwaters if not properly sloped and covered with grass and maintained. A berm can settle over time, lowering its protection level. The small floodwalls can crack and lose their watertight seals.

You also need to account for water in the sewer lines, footing drain and sump pump outfall. They may carry water under the barrier and flood inside your house. See the section on sewer backup prevention on page 12.

## Dealing with Contractors

Most building departments in northeastern Illinois require that certain work be done only by licensed contractors. Building departments usually have a register of licensed contractors, listed by their areas of expertise.

If you have been satisfied with work done by licensed local contractors, try them first. If they cannot help you, ask them for recommendations. If you must hire a contractor you do not know, talk to several contractors before you sign anything. Reputable contractors agree that you should take the following steps:

- ✓ Check several firms and their reputations: The Better Business Bureau, Home Builders Association, or building trades council are excellent sources.
- ✓ Look out for "special deals" or contractors who want to use your home as a "model home."
- ✓ Ask for proof of insurance: Worker's compensation and general liability insurance are essential. If the contractor is not insured, you may be liable for accidents on your property.
- ✓ Ask for references: Contractors should be willing to provide names of previous customers. Call some of the customers and ask if they would hire the contractor again.
- ✓ Ask for a written estimate and check it carefully.
- ✓ Ask for a contract: Never sign a blank contract or one with blank spaces. If a lot of money is involved, it may be worth your while to have the contract reviewed by a lawyer.
- ✓ Avoid cash payments: Beware if you are asked to pay cash on the spot instead of a check made out to the contracting company. A reasonable down payment is 10%–30% of the total cost of the project.
- ✓ Don't sign off before the job is finished: A reputable contractor will not threaten you or pressure you to sign if the job is not finished.
- ✓ Get your permits: Most plumbing work, home improvements, filling, fences, and other yard work require a permit from your building department to be sure that it meets code and will not cause a drainage problem on your neighbors.
- ✓ Get your inspections: When the project is finished make sure your contractor calls you and the building department to inspect work before it is covered over. Some will be hidden from view and you won't know if there is a problem until the next flood.
- ✓ Get help: If you are a victim of fraud or have problems with a less than reputable contractor, check with the Illinois Attorney General's Consumer Protection Division (312/345-2400 or www.illinoisattorneygeneral.gov/consumers/index.html). Your building department would also like to know of problems in case it needs to revoke a license.

## Insurance

**Flood insurance:** Flood insurance is highly recommended. Remember, even if the last storm or flood missed you and even if your home has been floodproofed, the next flood could be worse. Most homeowners insurance policies do not cover property for flood damage.

Almost all of the communities in northeastern Illinois participate in the National Flood Insurance Program. Local insurance agents can sell a flood insurance policy under rules and rates set by the Federal government. Any agent can sell a policy and all agents must charge the same rates.

Any house can be covered by a flood insurance policy. It does not matter if it is in the mapped floodplain or out of it. Detached garages and accessory buildings are covered under the policy for the lot's main building. Separate coverage can be obtained for the building's *structure* and for its *contents* (except for money, valuable papers, and the like). The *structure* generally includes everything that stays with a house when it is sold, including the furnace, cabinets, built-in appliances, and wall-to-wall carpeting.

There is no coverage for things outside the house, like the driveway and landscaping. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building.

Don't wait for the next flood to buy insurance protection. There is a 30 day waiting period before National Flood Insurance coverage takes effect. Contact your insurance agent for more information on rates and coverage.

Some people have purchased flood insurance because it was required by the bank when they got a mortgage or home improvement loan. *If you have a policy, check it closely.* You may only have structural coverage (because that's all that banks require). During the kind of flooding that happens in northeastern Illinois, there may be more damage to the furniture and contents than there is to the structure.

**Sewer backup insurance:** Several insurance companies have sump pump failure or sewer backup coverage that can be added to a homeowner's insurance policy. Each company has different amounts of coverage, exclusions, deductibles, and arrangements. Most are riders that cost extra. Most exclude damage from surface flooding that would be covered by a National Flood Insurance policy. The cost varies from nothing to up to about $75 for a rider on your homeowner's premium.

**Basements, split levels and bilevels:** There is limited coverage for basements and the below grade floors of bilevels and trilevels. The National Flood Insurance Program defines "basement" as "any area of the building, including any sunken room or sunken portion of a room, having its floor below ground level (subgrade) on all sides." This includes split levels and bilevels.

Coverage under building or structural coverage is limited to specific items needed for the operation of the building, such as a furnace, water heater, clothes washer and dryer. There is very limited coverage for finishings, such as wallpaper and carpeting, and contents. Flood insurance only covers damage when there is a general condition of surface flooding in the area.

## 5. During a Flood

While it can take several days for the larger rivers to flood, flooding caused by ice jams, flooding on the smaller streams, local drainage problems, and sewer backup can come with little warning. If weather conditions look like flooding, the National Weather Service issues two types of flood notices:

- ✓ *Flood watch:* flooding is possible within the area described by the notice.
- ✓ *Flood warning:* flooding is imminent or occurring.

To stay abreast of weather warnings, listen to NOAA Weather Radio. This is a radio station operated by the Weather Service. You can buy a special battery-operated weather radio at a local electronics store for $20–$35. It issues an alert signal if a watch or warning is being issued. (see also www.crh.noaa.gov/lot/nwr.php).

There are several locations on the larger rivers where the Weather Service monitors river levels. You can see their "real time" levels at www.crh.noaa.gov/ahps2/index.php?wfo=lot. These can tell you if the streams are rising or falling.

If you hear a siren or a severe weather watch or warning, check the latest instructions on local radio and TV stations. Once the emergency management agencies are sure that the danger has passed, they will issue an "all clear" message. Remember: You may not get a flash flood warning before flooding actually begins. Play it safe in stormy weather, and read the next section.

### What You Should Do

Once you hear a flood watch or warning, you should take the following steps:

1. If the radio, television, or emergency vehicle announced what to do, **follow those instructions**.

2. **Implement your flood response plan**, if you have one. If a flood watch was issued, you can still make a flood response plan that includes the items in section 3 on see page 4.

3. If you are in the mapped floodplain or suspect you are subject to **deep flooding** that will get inside your house:

   a. Turn off the electricity and gas (see pages 18 – 19).
   b. Read "Flood Safety Outdoors" on the back cover.
   c. Lock your doors and evacuate

4. If you don't have a place on high ground where you can stay, listen to the radio or TV for information on public shelters.

5. If you are not in the mapped floodplain, it is unlikely that you will be flooded deeply. **If the streets are underwater, you are better off staying in your house** (See the graphic on page 2). Read "Flood Safety Indoors" on the back cover.

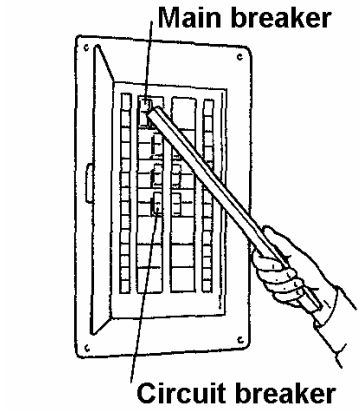
6. If you are not in the mapped floodplain, but you know that your **basement floods**:

   a. Turn off the basement electricity (see below).
   b. Turn off the gas (see the next page).
   c. Move any valuables upstairs.
   d. Stay out of the basement if the water outdoors is touching the house (the water pressure could collapse the walls).

## Turning Off the Utilities

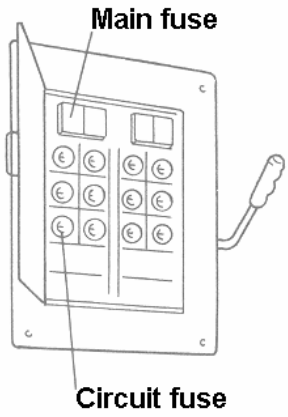
If your house or basement could get flooded, turn off your utilities to prevent greater damage. This section provides directions on how you can do this safely. If you are unsure of how to do these things, ask a friend or neighbor to help you, or don't do them at all.

**Electricity:** The most important utility to turn off is electricity. You have a fuse box or a breaker box in the house. The breaker box is more common in newer buildings or if you have had some electrical work done in the last 10 – 20 years. The illustrations below shows how to turn off the power.




**To turn off the electricity at a breaker box**

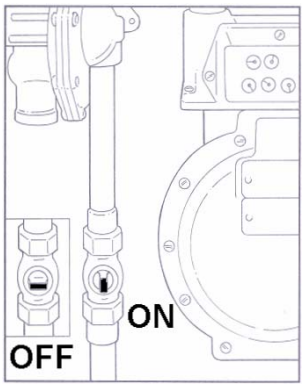
1. Stand on a dry spot.
2. Use a dry wooden stick or pole to open the door.
3. Use the stick to push the main breaker switch to OFF.
4. Use the stick to turn each circuit breaker to OFF.




**To turn off the electricity at a fuse box**

1. Stand on a dry spot.
2. If your box has a handle on the side, use a dry wooden stick or pole to pull the handle to OFF.
3. Use the stick to open the door.
4. Carefully pull out the main fuses.
5. Unscrew and remove each circuit's fuse.

**Gas:** Floodwaters may knock out pilot lights and silt may get into burners. To prevent a fire and safety hazard, you should turn off the gas before you leave. There is a valve next to the gas meter. If the valve handle is parallel to the pipe, the gas is on. You may need a pair of pliers or a wrench to turn the valve. Turn it 90 degrees (a quarter turn) so the handle is perpendicular to the pipe to shut the gas off.




**To turn off the gas**

1. There is a valve next to the gas meter. If it is parallel to the pipe, the gas is on.
2. Use pliers or a wrench and turn it 90 degrees.
3. To be sure the gas is off, write down the numbers on all the dials on the meter.
4. Check the dials at least 5 minutes later. If the numbers have changed, the valve is not closed.

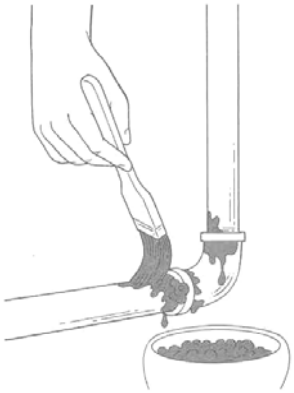
Most gas meter valves have a hole in the handle that lines up with a hole in the valve body when the gas is shut off. This hole is used by the gas company to lock or seal the valve closed when the building is vacant. When the holes are lined up, you know that the gas supply has been shut off. If you have any doubts, play it safe and call your gas company.

**Fuel oil tanks:** If you have a fuel oil or propane tank, turn off the fuel valve at the tank.

**Gas or oil leaks:** Check for leaky fuel pipes by smelling for gas. A chemical that has a disagreeable, distinctive odor is added to natural gas and propane to tell you if there is a leak. If you have any doubts, have a professional check for you. Do not use open flames.

Make sure the valve that leads to each appliance is closed. If you find any pipes that moved or any area that smells like gas, brush soapy water on each pipe connection (as illustrated). The pressure in the pipes will make bubbles appear where there is a leak.

If you find a leak, turn off the gas. Unscrew the pipe connection, clean the joint, and apply pipe joint compound or pipe tape (available at hardware stores) on the threads. Screw the pieces back together tightly. Turn on the gas and check the connection again with soapy water. If you have a leak, or you are not sure your system is safe, turn off the gas and call a professional immediately.



If you find any pipes that smells like gas, brush soapy water on each pipe connection. The pressure in the pipes will make bubbles appear where there is a leak.

**Water.** Since your water faucets are usually turned off, you shouldn't have to worry about turning all the water to the house off. However, if your washing machine is in the basement, or if the floodwaters around your house could be several feet deep, the floodwaters could get into the water lines through the appliances. If you have the time, turn off the water to the house. There should be a valve near the water meter, similar to a faucet knob. Turn it all the way clockwise.

## 6. After a Flood

If you've been flooded, your home and its contents may look beyond hope, but many of your belongings can be restored. If you do things right, your flooded home can be cleaned up, dried out, rebuilt, and reoccupied sooner than you think.

You should get a copy of *Repairing Your Flooded Home* (ARC4477), published jointly by the American Red Cross and the Federal Emergency Management Agency. Copies of the book are available free from your local Red Cross chapter or you can see it at www.redcross.org/services/disaster/ (go to "after a disaster," then "floods").

Here are some of the first things you can do after a flood. The next steps are explained (along with more details) in *Repairing Your Flooded Home*.

**Ask for help.** Many people can do a lot of the clean up and repairs discussed in this guide. But if you have technical questions or do not feel comfortable doing something, get professional help. If there is a federal disaster declaration, a telephone "hotline" will often be publicized to provide information about public, private, and voluntary agency programs to help you recover.

### Step 1. Take Care of Yourself First

You and your family have been through a disaster. Your life has been disrupted and you must allow time for things to return to normal. You should recognize that the flood can take its toll on you as well as your property. You need to look after yourself and your family while you focus on cleanup and recovery.

**Play it safe.** The dangers are not over when the water goes down. Your home's foundation may have been weakened, the electrical system may have shorted out, and floodwaters may have left behind things that could make you sick. When in doubt, throw it out. Don't risk injury or infection.

**Watch for signs of stress.** Your hidden enemy is stress. Watch for signs of trouble like short tempers, getting upset over little things, having difficulty sleeping, bad dreams, aches, pains, stomach problems, apathy, and depression. These are ways your body tells you that times are difficult. Reactions to stress are common and usually temporary. If you cannot shake feelings of despair or other telltale signs of stress, get professional help.

**Care for your children**. Watch your children closely. You can expect to see them display fear or symptoms of stress. Be understanding. Remember, they are going through a rough time too.

**Important Health Notes**

- ✓ Wash your hands thoroughly. This is especially important before eating, cooking, or smoking.
- ✓ Confirm that the water is clean and safe. Don't drink it or wash dishes until you're sure.
- ✓ Disinfect dishes and all items that floodwaters touched.
- ✓ Watch out for fatigue. When your body is tired, you are more prone to accidents, back strain, and depression.
- ✓ Report health hazards. Call your local health department if there are animal carcasses, rats, dangerous chemicals, or other hazards on your property.

## Step 2. Give Your Home First Aid

Read the safety precautions on the back cover of this guide. Each year about 150 people die because of floods. Many of those fatalities are due to electrocution or other accidents that occur after the floodwaters have gone down. Your first job is to make sure everything is safe. Follow these steps:

**Check with your insurance agent** to see if some of your cleanup and repair work is covered. If so, you may want to hire professional help for the rest of these steps.

**Walk around the outside of your house** and check for loose power lines and gas leaks. You can detect leaking gas by the putrid, rotten egg smell of chemicals that have been added to it to make a leak noticeable. If you find downed lines or leaks, call the power or gas company (see "Important Numbers" inside the front cover). Remove tree limbs or other trash that may have landed on or floated into the house.

**Check the foundation** for cracks or other damage. Examine porch roofs and overhangs to be sure they still have all their supports. Look for gaps between the steps and the house. If you see obvious damage, have a building inspector check the house before you go in.

**Turn off the electricity** at your house, even if the power company has turned it off (they may turn it back on when you're not ready). If you have to go through water to get to your fuse box or breaker box, if the boxes are wet, or if you're not comfortable with electrical matters, call an electrician. Otherwise, you can follow the instructions on page 18.

**Turn off the gas**. See the instructions on page 19.

**Go inside carefully**. It may be easier to enter your house through a window if the door won't open easily. Look carefully at the ceiling before you go in to be sure it is not ready to fall. Do not smoke or use candles, gas lanterns, or other open flames until the house has been well ventilated. There may be explosive gas.

**Rescue the most valuable items**. Find and protect the "irreplaceables," like money, jewelry, insurance papers, photographs, and family heirlooms. Wash the mud off before they have a chance to dry. Put them in a safe place like the upper story (if it's dry), a plastic bag, or take them to a friend's home. Wash the mud off photographs and papers and put them in a freezer for clean up later when you have the time to do a careful job.

**Keep the damage from getting worse**. Open the windows and doors (if weather permits) to reduce the moisture and get rid of any gas. Cover holes in the roof, walls, or windows with boards, tarps, or plastic sheeting to keep out the wind and rain.

**Check for broken or leaking water pipes**. If you find any, cut off the water supply by turning off the valve at your water meter. If sewer and water lines are damaged, don't use toilets or sinks. If the water pipes are not leaking, you can use your tap water for hosing things down and cleaning. But do not drink or cook with tap water until the health department declares it safe.

## Step 3. Start Cleaning

**Drain your basement carefully**. Water in the saturated ground puts tremendous pressure on your basement walls and floors (see the photo on page 8). The water inside your flooded basement is counteracting this pressure. If you don't follow the instructions in the box for emptying the basement gradually, your walls and floor will lose the support they need to counteract the pressure from the water outside. The weight of the saturated earth could then cause the walls to crack and collapse, buckling the floors and seriously damaging your home.

**How to Drain a Basement**

Pumping a basement out too fast can result in broken walls and floors if there is still water in the ground. To do it safely, follow these steps:

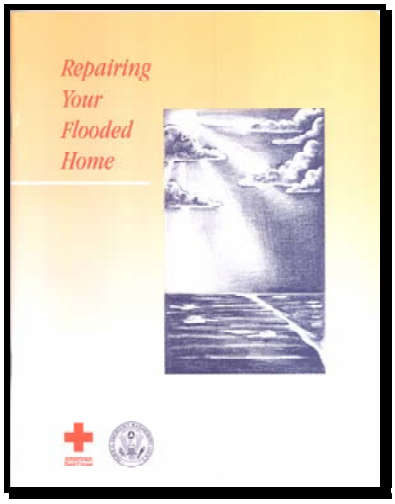
1. Make sure the electricity is off.
2. If there is no floodwater on top of the ground, start pumping the water out of the basement.
3. Pump the water level down two to three feet. Mark the level and wait overnight.
4. Check the water level the next day. If the water went back up, it's still too early to try to drain the basement.
5. Wait overnight. Then pump the water down two to three feet again. Check the level the next day.
6. When the water stops going back up, pump down another two to three feet and wait overnight. Repeat steps 4 through 6 until all water is pumped out of the basement.

**Get rid of the mud and silt**. Most of the health hazards brought by a flood are in the mud and silt that is left after the water drains away. It is therefore very important to clean it out as soon as possible. This is a lot easier if you do it before the mud dries out. Follow these steps:

- ✓ First, **shovel out the mud**.
- ✓ Next, make sure the electricity is turned off. Remove all light bulbs from sockets that have been flooded. Throw away flooded wall switches and outlets. They should be replaced later with new ones.
- ✓ **Hose the house down**, inside and out. If you have an attachment that sprays soap, wash and then rinse the walls and floors. Hose the furniture, too, and other major items that got muddy.
- ✓ Double check that the electricity is off, then thoroughly hose out the electrical outlets, switch boxes, and light sockets that you opened up.
- ✓ **Don't let the water sit on the floor** too long. Mop it up right away, especially if your floor is particle board or another wood product that tends to fall apart when wet.

**Clean everything that got wet**. Flood waters have picked up sewage and chemicals from roads, farms, factories, and storage buildings. Spoiled food and flooded cosmetics and medicines are health hazards. **When in doubt, throw them out.**

Follow the rest of the guidance in ***Repairing Your Flooded Home*** (see box).




*Repairing Your Flooded Home* can be obtained free from your local Red Cross chapter or you can see it at www.redcross.org/services/disaster/ (go to "after a disaster," then "floods").

## Steps to File Your Flood Insurance Claim

**Step 1. Contact your agent to report your loss:** Have ready the name of your insurance company (your agent may write policies for more than one company), policy number and a phone number and/or e-mail address where you can be reached. If you get in touch with your agent or company representative directly, they will advise you how to file your notice of claim. Otherwise, you must send a written notice to your insurance company with your policy number.

**Step 2. Separate your property:** Your policy requires you to separate damaged property from undamaged property. But don't throw anything away before an adjuster has seen it. If local officials require damaged items to be thrown out, take photos before disposing of them and keep samples for the adjuster to see (for example, cut out a piece of wall-to-wall carpet). Do all you can to protect undamaged property.

**Step 3. Make a list of damaged contents:** If you have contents coverage, make a list of damaged property. List the quantity of each item, a description, brand name, where purchased, its cost, model and serial number (if appropriate) and your estimate of the loss amount. Attach your bills, receipts, photos and any other documents.

**Step 4. List areas of structural damage:** As you look over your property, make a list of any areas of structural damage you want to point out to the adjuster. If you have damage estimates prepared by one or more contractors, provide them to the adjuster since they will be considered in the preparation of your repair estimate.

**When the adjuster comes:** Generally, your adjuster will contact you within 48 hours after receiving your notice of loss. However, depending on local conditions and the severity of flooding, it may take more time. Once the adjuster reaches you, a time will be set for the adjuster to view your property.

During the visit to your property, the adjuster will take measurements and photographs and note the flood damage. This is called "scoping" a loss. Your adjuster will be an experienced claims professional and will notice many points of damage you could overlook. However, you are encouraged to point out all damage you have noticed.

The adjuster uses the knowledge gained from the visit(s) − and the documentation you provided − to complete a detailed estimate of damage. You will get a copy. You may ask the adjuster for an advance or partial payment. If you have a mortgage, your mortgage company will need to sign to sign building property advance check.

Your official claim for damage is called a Proof of Loss. It includes a detailed estimate to replace or repair the damaged property. It must be fully completed, signed, and in the hands of your insurance company within 60 days after the loss occurs. In most cases, the adjuster, as a courtesy, will provide you with a suggested Proof of Loss. However, you are responsible for making sure that it is complete, accurate and filed in a timely manner. Be sure to keep a copy of the Proof of Loss and all supporting documents for your records.

# Flood Safety

## Outdoors

**Do not walk through flowing water**. Drowning is the number-one cause of flood deaths. Currents can be deceptive; six inches of moving water can knock you off your feet. Use a pole or stick to ensure that the ground is still there before you go through an area under water.

**Do not drive through a flooded area**. More people drown in their cars than anywhere else. Don't drive around road barriers; the road or bridge may be washed out. A car can float in as little as two feet of water (see page 2).

**Stay away from power lines and electrical wires**. The number two flood killer after drowning is electrocution. Electrical current can travel through water. Report downed power lines to Commonwealth Edison at 1-800/334-7661 ("1-800/Edison-1").

## Indoors

**Turn off your electricity if your building is flooded**. See the instructions on page 18. If you don't feel safe doing this, call an electrician. Some appliances, such as television sets, can shock you even after they have been unplugged. Don't use appliances or motors that have gotten wet unless they have been taken apart, cleaned, dried and inspected by a professional.

**Watch for animals**. Small animals like rats and snakes that have been flooded out of their homes may seek shelter in yours. Use a pole or stick to poke and turn items over and scare away small animals.

**Look before you step**. After a flood, the ground and floors are covered with debris including broken bottles and nails. Floors and stairs that have been covered with mud can be very slippery.

**Be alert for gas leaks**. Use a flashlight to inspect for damage. Don't smoke or use candles, lanterns, or open flames unless you know the gas has been turned off and the area has been thoroughly aired out. See page 19. If you have questions on gas, call 1-888/642-6748 ("1-888/NICOR4U").

**Carbon monoxide exhaust kills**. Use a generator or other gasoline-powered machine outdoors. The same goes for camping stoves. Fumes from charcoal are especially deadly — cook with charcoal outdoors.

**Clean everything that got wet**. Flood waters have picked up sewage and chemicals from roads, farms, factories, and storage buildings. Spoiled food and flooded cosmetics and medicines are health hazards. **When in doubt, throw them out.**

**Take good care of yourself.** Wear gloves and boots. Wash your hands frequently during clean up. Recovering from a flood is a big job. It is tough on both the body and spirit and the effects a disaster has on you and your family may last a long time. Keep your eyes open for signs of anxiety, stress, and fatigue in you and your family.